# مجلة كلية الإسراء
## الجامعة للعلوم الهندسية

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جمهورية العراق
وزارة التعليم العالي والبحث العلمي
دائرة البحث والتطوير

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**كلية الاسراء الجامعة / السيد العميد المحترم**

**م/ مجلة كلية الاسراء الجامعة للعلوم والهندسة**

**السلام عليكم ورحمة الله وبركاته ...**

أشارة الى كتابكم المرقم م.ع/٢٣٩٨ في ٣١ / ١٢/ ٢٠٢٠ بشأن اعتماد مجلتكم واعتمادها لأغراض النشر والترقيات العلمية وتسجيلها ضمن موقع المجلات الاكاديمية العلمية العراقية ، حصلت موافقة السيد وكيل الوزارة لشؤون البحث العلمي بتاريخ ٢٠٢١/٨/٢٤ على أعتماد المجلة المذكورة في الترقيات العلمية والنشاطات العلمية المختلفة الأخرى ، واعتباراً من المجلد الثالث – العدد الثالث – لسنة ٢٠٢١ وتسجيل المجلة في موقع المجلات الاكاديمية العلمية العراقية.

**للتفضل بالاطلاع وابلاغ مخول المجلة لمراجعة دائرتنا لتزويده بإسم المستخدم وكلمة المرور ليتسنى له تسجيل المجلة ضمن موقع المجلات العلمية العراقية وفهرسة اعدادها ... مع التقدير.**

**أ.م.د يوسف خلف يوسف**
**ء/ المدير العام لدائرة البحث والتطوير**
**٢٠٢١/٩/٦**

**نسخة منه الى:**
- مكتب السيد وكيل الوزارة لشؤون البحث العلمي / أشارة الى موافقة سيادته المذكورة أعلاه والمثبتة على اصل مذكرتنا المرقم ب ت م٤/ ٤٥٧٦ في ٢٠٢١/٨/٢٣ / للتفضل بالاطلاع ... مع التقدير.
- قسم المشاريع الريادية / شعبة المشاريع الالكترونية / للتفضل بالعلم واتخاذ مايلزم ... مع التقدير
- قسم الشؤون العلمية / شعبة التاليف والنشر والترجمة / مع الاوليات .
- الصادرة .

**مهند ابراهيم**
**٦ / أيلول**

وزارة التعليم العالي والبحث العلمي – دائرة البحث والتطوير – القصر الأبيض – المجمع التربوي – الطابق السادس
قسم الشؤون العلمية sedep@rdd.edu.iq

# تعليمات النشر

# في مجلة كلية الاسراء الجامعة للعلوم الهندسية

- تصدر جامعة الاسراء (مجلة كلية الاسراء الجامعة للعلوم الهندسية) في مجلد سنوي يضم عددين.
- تقوم المجلة بنشر البحوث العلمية للباحثين في تخصصات العلوم الهندسية التالية:
  - هندسة العمارة
  - هندسة مدني
  - هندسة كيمياوية
  - هندسة الحاسوب
  - هندسة كهربائية
  - هندسة المواد
  - هندسة ميكانيكية

## شروط النشر

1 - يطبع البحث بواسطة الحاسوب بمسافات مفردة بين الاسطر وبحجم خط 12 ونوع (Simplified Arabic)، اما العنوان باللغتين العربية والانكليزية فيكون بحجم خط 14 شريطة الا يزيد عدد صفحاته عن 15 صفحة بما في ذلك الجداول والاشكال والمراجع وعلى وجه واحد على ورق قياس A4 مع ترك هامش في حدود 2 سم من الاعلى والاسفل وهامش بحدود 3 سم من الجانبين الايمن والايسر.

2 - لا يفضل نشر البحوث من قبل رئيس واعضاء هيئة التحرير في المجلة سواء كان البحث منفرداً أو مشتركاً.

3 - يقدم البحث بثلاث نسخ ورقية ونسخة الكترونية بعد قبول البحث للنشر، يسلم البحث بشكله النهائي مطبوعا بالنظام الاعتيادي بمسافة منتظمة لكافة الصفحات عدا الصفحة الاولى التي تتضمن عنوان البحث و اسماء الباحثين وعناوينهم باللغتين العربية والإنكليزية متبوعا بالبريد الالكتروني للباحث الاول وعلى قرص مرن CD ببرنامج Microsoft Word / 2010.

4 - تقبل البحوث باللغتين العربية والانكليزية ويفضل كتابة البحث باللغة الانكليزية.

## دليل المؤلف Author Guidelines

ادناه الشروط والمتطلبات الواجب مراعاتها من قبل الباحث للنشر في هذه المجلة بشرط أن لا يكون البحث قد نشر أو سينشر في أية مجلة هندسية أخرى ولم يمضِ على انجازه اكثر من أربع سنوات.

1 - يجب ان يكون عنوان البحث موجزاً قدر الامكان ومعبر عن البحث.

2 - اسماء الباحثين: تكتب اسماء الباحثين وعناوين عملهم بصورة واضحة مع البريد الالكتروني للباحث الاول.

3 - يجب ان يتضمن المستخلص موجزا واضحا عن البحث مكون من 250-300 كلمة متبوعا بكلمات مفتاحية 4-6. أذا كان البحث باللغة العربية فيكون المستخلص متبوعا بالكلمات المفتاحية اولا ثم المستخلص متبوعا بالكلمات المفتاحية باللغة الانكليزية ثانيا و العكس صحيح.

4 - المقدمة: تتضمن مراجعة المعلومات وثيقة الصلة بموضوع البحث الموجودة في المصادر العلمية وتنتهي المقدمة باهداف الدراسة وأساسها المنطقي.

5 - المواد وطرائق العمل: تذكر طرائق العمل بشكل مفصل ان كانت جديدة اما اذا كانت منشورة فتذكر بشكل مختصر مع الاشارة للمصدر وتستعمل وحدات النظام العالميSystem International of Units (S.I.Us)

6 - النتائج والمناقشة: تعرض بشكل موجز وهادف وبنظام متوالي وتعرض النتائج بافضل صورة معبرة وتوضع الجداول والاشكال في أماكنها المخصصة بعد الاشارة إليها في النتائج.

7 - يستعمل نظام الارقام العربية وهكذا في البحوث المرسلة للنشر وتمثل مناقشة النتائج تعبيراً موجزاً عن النتائج وتفسيراتها.

8 - تكون كتابة المصدر في القائمة المصادر متضمنة الآتي: اسم او أسماء الباحثين، سنة النشر وعنوان البحث كاملاً واسم المجلة ورقم المجلد والعدد وعدد الصفحات، مثال:

الخفاجي، جاسم محمود و حميد، محمد حسوني و كريم، حيدر حاتم، (2018) " دراسة تجريبية على الخرسانة مع استبدال جزئي للركام الخشن بواسطة المطاط غير المرغوب فيه".

مجلة كلية الاسراء الجامعة، المجلد 1 العدد 1، 217-243. و ممكن ان تكتب كالاتي: مجلة كلية الاسراء الجامعة، 1(1)،217-243.

9 - المستخلص الانكليزي يجب أن يكون وافياً ومعبراً عن البحث بصورة دقيقة وليس بالضرورة ان يكون ترجمة حرفية للمستخلص العربي و متبوعا بكلمات مفتاحية 4-6.

## دليل المقيّم Reviewer Guidelines

أدناه الشروط والمتطلبات الواجب مراعاتها من قبل المقيم للبحوث المرسلة للنشر في هذه المجلة

1 - ملأ استمارة التقويم المرسلة رفقة البحث المطلوب تقييمه بشكل دقيق وعدم ترك أي فقرة بدون اجابة.

2 - على المقيّم التاكد من تطابق وتوافق عنوان البحث باللغتين العربية والانكليزية وفي حالة عدم تطابقهما اقتراح العنوان البديل.

3 - أن يبين المقيّم هل ان الجداول والاشكال التخطيطية الموجودة في البحث وافية ومعبرة.

4 - أن يبين المقيّم هل ان الباحث اتبع الاسلوب الإحصائي الصحيح.
5 - أن يوضح المقيّم هل ان مناقشة النتائج كانت كافية ومنطقية.
6 - على المقيّم تحديد مدى استخدام الباحث للمراجع العلمية الرصينة وحداثتها.
7 - أن يؤشر المقيّم بشكل واضح على واحد من ثلاث اختيارات وهي:
البحث صالح للنشر بدون تعديلات.
البحث صالح للنشر بعد اجراء التعديلات.
البحث غير صالح للنشر.
8 - يجب أن يوضح المقيّم بورقة منفصلة ما هي التعديلات الأساسية التي يقترحها لغرض قبول البحث.
9 - للمقيّم حق طلب إعادة البحث إليه بعد إجراء التعديلات المطلوبة للتأكد من التزام الباحث بها.
10 -على المقيّم تسجيل اسمه ودرجته العلمية وعنوانه وتاريخ اجراء التقييم مع التوقيع على استمارة التقييم المرسلة له رفقه البحث المرسل له للتقييم.

## المصادر

1 - يشار الى المصادر في متن البحث كما يلي:
اللقب او الاسم الثالث للمؤلف والسنة اذا كان البحث بإسم باحث واحد، واذا كان مؤلفين فيذكران والسنة واذا كانوا ثلاثة فاكثر فيذكر اسم الاول واخرون والسنة.
2 - ترتب المصادر حسب الصيغة العالمية (APA) وكما بالامثلة المذكورة:
أ- بحث في مجلة.
اسم الباحث أو الباحثون، (السنة)، عنوان البحث، اسم المجلة، المجلد، العدد و صفحتي البدء والانتهاء للبحث.
ب- كتب.
اسم المؤلف أو المؤلفون، (السنة) عنوان الكتاب، الطبعة، دار النشر وعدد الصفحات.

ج- الرسائل والاطاريح الجامعية.

اسم الباحث، (السنة)، عنوان الرسالة او الاطروحة، العنوان (الكلية والجامعة) وعدد الصفحات.

د- بحث في وقائع مؤتمر او ندوة علمية.

اسم الباحث أو الباحثون، (السنة)، عنوان البحث، اسم المؤتمر او الندوة العلمية، مكان الانعقاد، صفحتي البدء والانتهاء للبحث.

ترسل البحوث الى مجلة كلية الاسراء الجامعة للعلوم الهندسية على العنوان الاتي:

جامعة الاسراء– قسم التوثيق والنشر

بغداد / العراق

البريد الالكتروني:

al-esraajournal@esraa.edu.iq

**(تعهد الملكية الفكرية)**

إني الباحث..... صاحب البحث الموسوم (.....
.....)

أتعهد بأن البحث قد أنجز من قبلي ولم ينشر في مجلة أخرى في داخل وخارج العراق وأرغب بنشره في مجلة (**مجلة كلية الإسراء الجامعة للعلوم الهندسية**) التي تصدرها جامعة الإسراء.

التوقيع:

التاريخ:

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**(تعهد نقل حقوق الطبع والتوزيع)**

إني الباحث..... صاحب البحث الموسوم (.....
.....)

أتعهد بنقل حقوق الطبع والتوزيع والنشر إلى مجلة (**مجلة كلية الإسراء الجامعة للعلوم الهندسية**) التي تصدرها جامعة الإسراء.

التوقيع:

التاريخ:

# المحتويات

# دَور الفضاءات التفاعلية في تعزيز التفاعل الاجتماعي للاطفال في مؤسسات رعاية الايتام

م. م. زينب خالد رشاد الخفاجي
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الجامعة التكنولوجية - قسم هندسة العمارة، بغداد \ العراق

# The Role of Interactive Spaces in Enhancing Social Interaction of Children in Orphanage Institutions

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and Assist. Prof. Dr. Shamael M. W. Al Dabbagh

University of Technology - Department of Architecture, Baghdad / Iraq

**المستخلص**

أن الطفل الذي ينتقل الى بيئة خارج بيئته الاسرية كأن تكون مؤسسات رعاية الايتام بسبب فقدانه لاحد افراد عائلته او جميعهم فمن البديهي ان يشعر بنوع من الغربة والانعزال عن اقرانه وفقدان الشعور بالتفاعل والتواصل مع المجتمع، لذا من الممكن التخفيف من حدّة هذا الشعور من خلال تعزيز الفضاءات التفاعلية ضمن الفضاءات الداخلية لمؤسسات رعاية الايتام وعلى مستوى المجاورات، تمثلت مشكلة البحث ب "**عدم وضح طبيعة المعرفة حول دَور الفضاءات التفاعلية في تعزيز التفاعل الاجتماعي للاطفال ضمن مؤسسات رعاية الايتام**"، ومن أجل حل المشكلة البحثية اعتمد البحث فرضية تنص على " **ان الفضاءات التفاعلية تعزز من التفاعل الاجتماعي للاطفال ضمن مؤسسات رعاية الايتام**"، ولتحقيق هدف البحث تم تحديد المنهج المؤلف من عدّة مراحل، اولاً:بناء الاطار المفاهيمي الشامل للتفاعل الاجتماعي اولاً، ولمفهوم الفضاءات التفاعلية وأهم مفرداتها ومؤشراتها ثانياً، ومن ثم استعراض مثال تطبيقي، ليخلص البحث في الختام الى مجموعة من الاستنتاجات والتوصيات.

**الكلمات الرئيسة المفتاحية: الفضاءات التفاعلية، التفاعل الاجتماعي، مؤسسات رعاية الايتام.**

**Abstract**

The child who moves to an environment outside his family environment, such as orphanage institutions because of the loss of one or all of his family members, it is obvious that he feels a kind of alienation and isolation from his peers and a loss of a sense of interaction and communication with society, so it is possible to mitigate this feeling by promoting diversity in interactive activities within the internal spaces of the orphanage institutions and at the neighborhood level, the research problem was represented by "**the lack of clarity in the nature of knowledge about the role of of interactive spaces in enhancing social interaction for children within orphan care institutions**." In order to solve the research problem, the research adopted a hypothesis stating that " **interactive spaces, it enhances the achievement of social interaction for children within orphanage institutions**".

In order to achieve the goal of the research, the approach consisting of several stages was identified, first: building a comprehensive conceptual framework for social interaction first, and for the concept of diversity in interactive activities and its most important vocabulary and indicators second, and then reviewing an applied example, so that the research concludes in conclusion with a set of conclusions and recommendations.

**Keywords: Interactive spaces, Social interaction, Orphanage institutions.**

## 1- المقدمة

ان انفصال الطفل اليتيم عن ابويه واسرته يخلف لديه آثاراً سلبيةً ومن ثم فإن الانتقال الى بيئة جديدة عليه قد تكون مثيرات دافعة للخوف وفقدان الشعور بالتفاعل الاجتماعي، غير أن خلق بيئة معالجة لنفسية الطفل المتضررة من خلال تعزيز الفضاءات التفاعلية كاللعب والفن والمواهب وغيرها قد يكون له وقع ايجابي على الاطفال من شأنه التخفيف من هذه الآثار النفسية وزيادة احتماليات شعورهم بالتفاعل الاجتماعي والاندماج في المجتمع الجديد.

حاولت العديد من الدراسات تناول الفعاليات التفاعلية وتنوعها، ويهدف البحث هنا لإيجاد إجابة للكيفية التي يمكن أن يؤثر فيها تصميم المساحات المعمارية والفعاليات التفاعلية وتنوعها على تعزيز شعور الطفل اليتيم بالتفاعل الاجتماعي مع اقرانه ومع المربين، وللعثور على إجابة على هذا السؤال تطلب بناء الاطار المفاهيمي الشامل لمفهوم التفاعل الاجتماعي اولاً، وايجاد مدخل تعريفي ومقدمة موجزة لمفهوم الفضاءات التفاعلية وما يجعل الفضاء الداخلي والخارجي"متنوع بالفعاليات التفاعلية"، والبحث في مصادر انشاء الافكار لكيفية تكوين فعاليات تفاعلية متنوعة في انماط مختلفة ثانياً، ومن ثم دراسة ارتباطها بالتفاعل الاجتماعي للاطفال ضمن فضاءات مؤسسات رعاية الايتام.

وضمن هذا الاطار ركز البحث على مفهوم التفاعل الاجتماعي ومفهوم الفضاءات التفاعلية، وتم استخلاص المشكلة البحثية وتحديد أهداف البحث في ضوء تأسيس هذه القاعدة المعلوماتية، وفهم العلاقة بين مفهوم الفضاءات التفاعلية وبين تحقيق التفاعل الاجتماعي ضمن مؤسسات رعاية الايتام، ومحاولة الوصول الى نتائج تساعد على وضع توصيات من شأنها الحد من مسببات الضغوط النفسية التي قد يتعرض لها الطفل اليتيم ضمن مؤسسات رعاية الايتام والتي من شأنها ان تعزل هذا الطفل عن اقرانه والمجتمع بأكمله، وتنص فرضية البحث على "ان الفضاءات التفاعلية تعزز من تحقيق التفاعل الاجتماعي للاطفال ضمن مؤسسات رعاية الايتام"

## 2- تعريف التفاعل الاجتماعي

**أ- لغوياً:**

**في اللغة العربية:** تَفَاعَلَ: من (ف ع ل)، (فعل: خماسي لازم). تفاعَلْتُ، أتفاعَلُ، تَفَاعَلْ هو مصدر تفاعُلٌ: تفاعلتِ المادَّتانِ: أي تدَاخلتا وأثَّرَتْ كُلُّ مادَّةٍ في الاخرى. (**المعجم الوسيط**) والتفاعل الثقافي أو الاجتماعي: هو تأثر الثقافات أو المجتمعات بعضها ببعض، وتفاعل الشّيئان: أي أثَرَ كلّ منهما في الآخر.(www.maajim.com)

**التفاعل في اللغة الانكليزية**

Interaction (فعل متبادل، تداخل)

Reciprocal action, effect, or influence.

**التفاعل(Interplay) -**

The ways in which two or more things, groups, etc., affect each other when they happen or exist together.

الطرق التي يؤثر بها اثنين او اكثر من الاشياء أو الجماعات، وما الى ذلك على بعضها البعض عند حدوثها او تواجدها معا. (الخزعلي، 2016،ص37)

**ب- اصطلاحيا:**

يُعَّـرف التفاعـل الاجتماعـي بأنه: عملية التقاء سـلوك شـخصي مع سـلوك مغاير لـه ويعتمـد علـى الآخـر، حيـث يؤثـر ويتأثـر بـه فـي إطـار مـن التفاعـل المتبـادل. (المجالي، 2018، ص12)

ويُعرِّف (الجوادي، الغياض، 2002) التفاعل الاجتماعي بأنه المفهوم الذي يستخدم ليشير الى التأثير المتبادل بين طرفين (سواء أكانا فردين أو جماعتين صغيرتين او فرد وجماعة صغيرة او فرد وجماعة كبيرة) ويؤثر كل منهما بسلوك الاخر. (الجوادي، الغياض،2002،ص66)

كمـا ان التفاعـل الاجتماعـي عنـد الاطفـال هـو المهـارة التـي يبديهـا الطفل في التعبيـر عـن ذاتـه للاخريـن، والاقبال عليهـم، والاتصـال والتواصـل معهم، والمشـاركة فـي مختلـف الانشـطة الاجتماعيـة، اضافـة لاقامـة الصداقات معهـم والتواصـل معهم باسـتخدام الاشـارات الاجتماعيـة مع مراعـاة القواعد الخاصـة بالـذوق الاجتماعي العام عند التعامل معهم. (رزق الله، 2008، ص496)

وإنّ مستويات التفاعل الاجتماعي هي التفاعل بين الفرد والجماعة، التفاعل بين الجماعات، التفاعل بين الفرد والثقافة، التفاعل بين الافراد. (زهير، 2012، ص44) كما أن عمليات التفاعل الاجتماعي تتضمن: التعاون، التكيف، المنافسة (علي،2013، ص118)، هذا ويتضمن التفاعل الاجتماعي نوعا من النشاط الذي تستثيره حاجات معينة عند الانسان ومنا الحاجة الى الحب، الحاجة الى الانتماء، الحاجة الى التقدير والنجاح (Khan, *et al.*, 1966 , p.7).

**يتضح مما سبق ان التفاعل الاجتماعي عند الاطفال يمثل المهارة التي يبديها الطفل للاتصال بأقرانه او مع المجتمع والتواصل معهم وان هذه الاتصالات تتضمن التعاون، التكيف، والمنافسة لإشباع حاجات مختلفة عند الطفل كالحاجة الى الحب، الحاجة الى الانتماء، الحاجة الى التقدير والنجاح.**

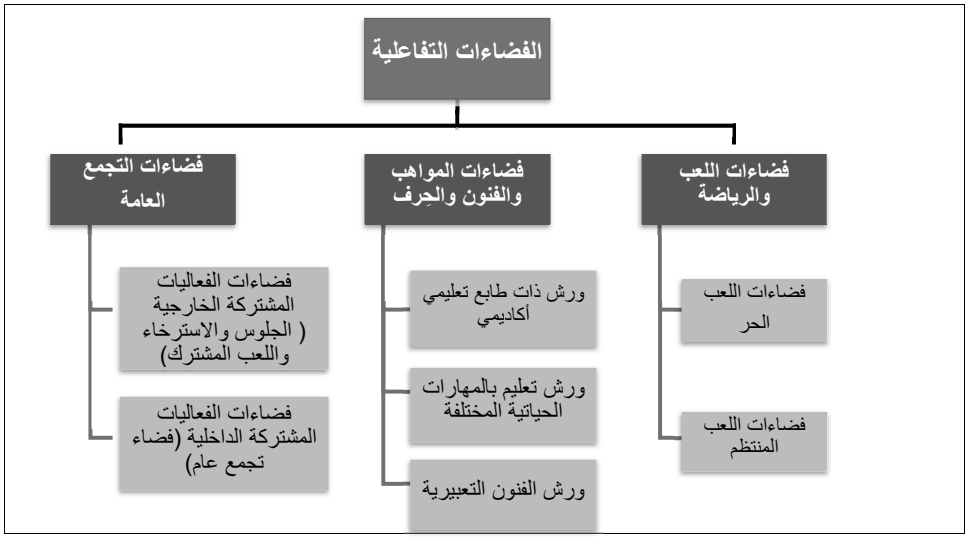
## 3- الفضاءات التفاعلية

إنّ خلق المزيد من المساحات المصممة للإستخدام متعدد الوظائف تُعد أحدى طرق سد الثغرات في توفير بيئة الطفل التي يكون فيها الأطفال قادرون للوصول الى انفسهم من خلالها وتجنب الحواجز المادية داخل الفضاء كالممرات المزدحمة على ان تكون هذة المساحات ذات مرونة تصميمية بحيث تستوعب الفعاليات الحركية المختلفة و الاعمار المختلفة من الأطفال. (Shackell, *et al.*, 2008, p.35).

إنّ تقسيم الفضاء الى اقسام بدرجات مختلفة وتنوع بالاستعمال يثير اهتمام الطفل، كما ان الأطفال بحاجة الى الفضاءات المفتوحة التي توفر الظروف الملائمة لسهولة حركتهم والفعاليات والألعاب الصاخبة وانشطة الطفل كالقفز والركض، اذ ان من المؤشرات المهمة والمفيدة في المباني التعليمية والتدريبية هو توفير مساحة كافية لحركة الأطفال. (Khanbabaei, 2016, p.950) قد تكون الفضاءات المشتركة التفاعلية: فضاءات

متعددة الاغراض او منطقة تجمع او اجتماع او منطقة النشاط الحركي الكبير بالمكان (U.S. General Services Administration, 2003, p.44)، ومن الممكن ان تكون الفضاءات التفاعلية بشكل فضاء خارجي اذا سمح المناخ بذلك، او ان يكون داخل المبنى كفضاء داخلي (Ibid., 2003, p. 63).

**وبذلك يرى البحث امكانية تصنيفها الى ثلاثة تصنيفات رئيسة تضم: فضاءات اللعب والرياضة، فضاءات المواهب والفنون والحرف، وفضاءات التجمع العامة وكما موضح في الشكل (1):**




**شكل(1) يوضح مؤشرات المفردة الثانوية للفضاءات التفاعلية على مستوى تصميم المبنى\ الباحثة**

### 3-1 الفضاءات التفاعلية على مستوى تصميم المبنى

#### 3-1-1 فضاءات اللعب والرياضة

اللعب المتكامل هو اللعب الذي ينمو في مكان اجتماعي غير منعزل ويسمح بالتفاعل ومشاركة الافكار وبناء علاقات جديدة، ولسوء الحظ تعاني اغلب مؤسسات الأيتام في مجتمعنا الحالي من استمرارية فصل التجارب ومشاركة الافكار والخبرات الحسية او

التحفيز الحسي من مفهوم اللعب، اذ ان ترابط هذين الجانبين يعد امرا اساسا للتنمية السليمة للاطفال الأيتام (Roy, 2015, p.28).

ان فضاءات اللعب والرياضة عموماً يمكن ان تساعد في توفير البيئة المعالجة نفسيا للطفل اليتيم كونه تعرض لصدمة نفسية عبر السماح لهم باللعب ضمن فعاليات متنوعة كاللعب بالماء والتراشق به مع تبليل الثياب ضمن فضاء المسبح الداخلي او البرك الاصطناعية الخارجية الصغيرة وهو الأمر الذي يمنع منه الأطفال عادة، أو الرسم على الجدران و الأرضية و هو أمر آخر يحلم به الأطفال و يمنعون منه بغياب مشرف او متابع، و بهذا الخصوص يمكن إستخدام قاعة للرسم الحر المطلية بأصباغ سهلة الغسل و يتاح للاطفال الرسم بألوان من النوع القابل للتنظيف بالماء، و يسمح للأطفال بفعل ما يشاؤون حتى الشخبطة و إستخدام الفرش العريضة للصبغ وتوسيخ ثيابهم الخاصة بهذه الفعالية كما في الشكل (2 – أ)، اضافة الى السماح للأطفال بالصراخ و الصخب و استدراجهم الى ذلك بشكل مقصود و يمكن توفير قاعة عازلة للصوت لهذا الغرض، كما في مشروع مركز حكايتي الخاص بالأيتام في النجف الاشرف. (موقع مؤسسة العين للرعاية الإجتماعية www.alayn.se)

يمكن للعمارة ان تحتضن عناصر الطبيعة وتوفر للاطفال فرص اللعب معها كاللعب بالمطر وبالحجر والرمل بالهواء الطلق وهي كلها العاب محببة لدى الطفل لكنهم ممنوعون منها (Roy, 2015, p.32)، وتضم أماكن اللعب في البيئات الطبيعية الأشجار والحدائق والنباتات الصالحة للأكل، والرمل والصخور والطين والماء وغيرها من عناصر الطبيعة. هذه الأماكن تدعو للتفاعلات المفتوحة، العفوية، والمجازفة، والاستكشاف، والتواصل مع الطبيعة. كما في الشكل (2 –ب,ج,د) The Australian Government Department of Education , 2009, p.16) )

ومن فضاءات فعاليات اللعب الأُخرى المعززة لعلاج نفسية الطفل توفير قاعات ألعاب تقمص الأدوار وهي الألعاب التي تسمح للطفل بأن يكون مسؤولا عن عالمه. على سبيل المثال: ادخال وآخراج الناس من الحافلة، وضع الدمى في العربة، الأطباق من البلاستيك والأكواب لإطعام دمى الدببة وهكذا، هذا التنظيم يسمح له بالتجربة وفهم كيف يسير العالم من حوله، فضلا عن أنه يتيح له الشعور باهميته بالمجتمع.(https://baby.webteb.com)

هذا و تتطلب حاجات النمو الجسمي الصحيح للطفل توفير فرص كافية لأداء

التمارين الرياضية، والألعاب الجماعية، الحرة أو المنظمة من خلال تنظيم برامج خاصة للأطفال, وان هذه التمارين والألعاب تقام عادة بشكل منظم في الفضاءات الخارجية، اذ انها توفر الجو الملائم لإقامة هذه الفعاليات وخصوصا كونها محمية فتشعر الطفل بالأمان، وتكون استجابته ونشاطه أكثر, وتعّد فضاءات النمو الجسمي ذات اهمية كبيرة خاصة بالنسبة للأطفال من سن الـ (5-12) بمختلف أنواعها إذ يمثل اللعب بالنسبة لهم الفعالية الأكثر حرية واسترخاء، لذلك لا بد من الاهتمام بتوفير هذه الفضاءات في دور الأيتام, ويمكن تصنيف هذه الفضاءات لتشمل بشكل عام: (العتابي, 2011, ص113)

- **فضاءات اللعب الحر:** وتشمل فضاءات مجهزة بالألعاب كالتسلق، والتزحلق، والتأرجح، وبيوت اللعب كما في الشكل (-2هـ, و)، وتوفير جدران وارضيات للرسم الحر، او فضاءات العاب جماعية، ومسارات الركض, وتزويد الفضاءات الخارجية او الداخلية بالبرك الاصطناعية واحواض الرمل للعب بالماء والرمل(العتابي, 2011, ص114), وتوفير الارضيات المنيعة المقاومة للانزلاق وتغطية ارضية اللعب بالسجاد، وتوفير ممرات سطحية ثابتة للعب بالعجلات (U.S. General Services Administration, 2003, p.81) وكذلك توفير الفجوات والتجاويف والاركان المخفية (Hua, 2002, p.34).

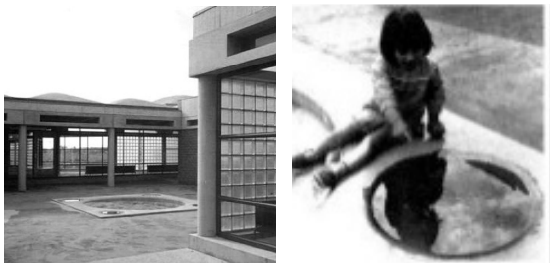
اما بالنسبة لتصميم فضاءات اللعب الخارجية فقد توضع قرب مناطق التشجير في المبنى لتوفير الاجواء الملائمة للعب، وقد تكون مسقفة بصورة دائمية، أو مؤقتة حسب طبيعة المناخ المحيط بالمبنى، او قد تكون داخلية وبالنسبة للمواد المستعملة في اكساء هذه الفضاءات فيراعى المتانة والديمومة للإستخدام المكثف بالاضافة لعامل السلامة والامان. (العتابي, 2011, ص114)


المصدر/Good Practices Handbook For Child Care Centres المصدر/ static1.squarespace.com

**أ- الرسم على الجدران والارضية**

**ب-توفير فضاءات اللعب بالماء والتراشق به في مشروع دار ايتام Wonsan في كوريا الشمالية للاطفال دون سن المدرسة/ المصدر: http://3.bp.blogspot.com/**

**ج- اللعب بالرمل والمواد الطبيعية / المصدر www.pinterest.com**



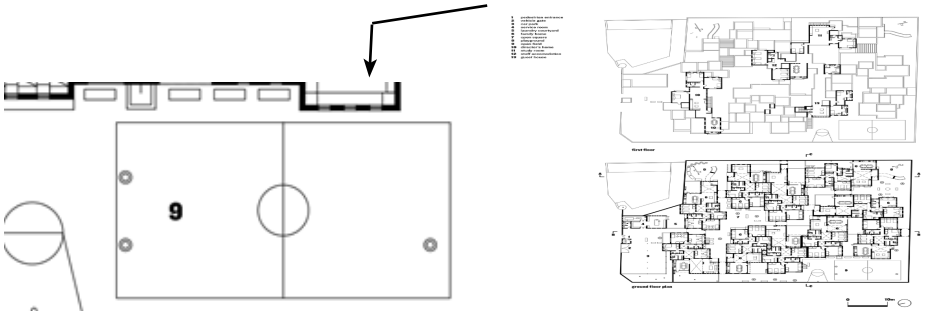
**د- اللعب بالرمل والماء في الفناءات الوسطية لمشروع دار ايتام امستردام/ المصدر: http://images.adsttc.com/**

**هـ- فضاءات اللعب الحر المجهزة بالالعاب الخارجية/ مشروع قرية الأطفال SOS في جيبوتي/ المصدر: Awards 2015 Architecture for Social Gain, p.2**

**و- فضاءات اللعب الحرالمجهزة بالالعاب الداخلية/ مشروع مركز الانجم الزاهرة التدريبي التأهيلي للايتام في الكاظمية المقدسة/ المصدر: www.aynyateem.com**

**شكل(2) أ, ب, ج, د,هـ, و: يوضح فضاءات اللعب والرياضة- اللعب الحر**

- **فضـاءات اللعب المنتظم:** وتشـمل الفضـاءات التي تقام فيها فعاليات وانشـطة رياضيـة منظمـة مثـل: ألعاب (كـرة القدم، و الكـرة الطائرة و كـرة السـلة) وغيرها من الألعـاب ذات العلاقـة بقواعـد منظمـة، وتحتـاج لمسـاحات معينـة و مخططـة ضمـن تفاصيـل خاصـة بهـا أو ذات العلاقـة بمنهـاج معيـن كـدروس التربيـة الرياضيـة , (العتابـي, 2011, ص 114) وإن تجهيـز دور الأيتـام بهـذه الفضـاءات يحقـق تفاعـلا اجتماعيـا علـى مسـتوى اكبـر، إذ يصبح بالامـكان اسـتعمال الفضاءات لإقامـة بطولات محليـة وتعـزز فاعليـة دُور الأيتـام فـي المجتمع، كمـا يمكن توفيـر فضـاء لإقامة نوع واحـد مـن هـذه الألعـاب وبحسـب مسـاحة وتصميـم المبنـى, كما فـي مشـروع قرية الأطفالSOS في جيبوتي, (Mollard),p.70,2017 شكل (3).




**شكل(3) فضاءات اللعب المنتظم-جزء مكبر من مشروع قرية الأطفال SOS في جيبوتي/ المصدر (Mollard),p.71,2017**

### 3-1-2 فضاءات المواهب والفنون والحرف

كما يُعد اللعب من اساليب العلاج النفسي للطفل اليتيم فان المواهب والفنون تعدّ علاجاً نفسياً آخر له, اذ تطرح دراسة (المهنا) بعضا من فعاليات التطوير والتدريب التي من الممكن ان توفرها المؤسسة والتي تفيد الطفل بالمستقبل وهي: (فرص تدريب دراسية, تدريب على الحاسوب, خياطة, فن الطبخ, صناعة الزهور..الخ) والتي تهدف لتعزيز اندماج اليتيم مع المجتمع (المهنا, 2005, ص237)،**مثال على ذلك مركز الأنجم**

**الزاهرة** في الكاظمية المقدسة [1]ويتكون المركز التدريبي للمشروع من مجموعة ورش تنقسم لقسمين:-

**أ- ورش ذات طابع تعليمي أكاديمي:** وهي ورش وقاعات تعليمية لمحاضرات نظرية كالمهارات الحياتية واللغات وإدارة الاعمال وقاعات تعليمية وثقافية أُخرى. شكل (4 – أ)

**ب- ورش لتعليم المهارات المختلفة:** تعليم الحدادة، النجارة، برمجة الحاسبات، صيانة الحاسبات، التصوير وبرنامج الفوتوشوب, صيانة الموبايلات والأجهزة الذكية, الطبخ، التمريض، الحلاقة، الخياطة، الاعمال اليدوية والزينة، وكذلك تعليم اعمال السقوف الثانوية والديكور, تصنيع الأبواب والشبابيك PVC والالمنيوم، تأسيس الكهرباء، التأسيسات الصحية وغيرها. (موقع مؤسسة العين للرعاية الإجتماعية, (www.aynyateem.com

تشير دراسة (Herrera ,2012) الى طبيعة الفضاءات الثقافية والتعليمية التي يحتاج اليها دار الأيتام والمتمثلة بالصفوف الدراسية، وقاعة المحاضرات، وقاعة الاحتفالات، والمسرح، والمعرض. (Herrera, 2012, p.46) شكل (4 – ب)

**اما بالنسبة لورش الفنون التعبيرية** فقد اشارت دراسة (القريطي والخراشي, 2010) الى مجالات الفنون التعبيرية وامكانية توفير فضاءات خاصة بها تشمل قاعة الفنون الموسيقية، قاعة الفنون التشكيلية، قاعة الفنون الأدبية، قاعة الفنون المسرحية (القريطي, الخراشي, 2010, ص7), اذ ان تخصيص فضاء او منصة بسيطة مصممة لغرض العرض الفني او المسرحي تشعر الطفل بمدى الاهتمام الذي توليه المؤسسة له بهذا الجانب وقد توضع فواصل جدارية، أو قواطع من مواد أُخرى لعرض اعمال الأطفال

**1- مركز الأنجم الزاهرة : احد مشاريع الصدقة الجارية لمؤسسة العين للرعاية الإجتماعية الذي تم بناءه على قطعة أرض مجاورة لمقر المؤسسة في الكاظمية المقدسة ويعنى بالأيتام للارتقاء بهم ليصبحوا أفراداً زاهرة بمستويات اجتماعية ومهنية عالية، من خلال تهيئة الأطفال الأيتام وإعدادهم للعمل في بعض المهن التي تساعدهم في الاعتماد على أنفسهم وكسب عيشهم من خلال مايحتويه المركز من ورش مهنية وتعليمية متعددة الأغراض, والهدف الأكبر منه هو تدريب الأيتام الذين لم يوفقوا لإكمال الدراسة وتعليمهم على مهن توفر لهم العيش الكريم، وترفع من المستوى المعاشي للعائلة، وتجعل منهم افرادا مفيدين نافعين لأنفسهم ولعوائلهم ثم للمجتمع, بالإضافة الى إمكانية تعليم الأيتام المستمرين في دراستهم خلال فترة العطلة على حرفة معينه , ويستهدف المشروع كل من الاناث والذكور من عمر 12 سنة فما فوق. (موقع مؤسسة العين للرعاية الإجتماعية, (www.aynyateem.com)**

للزائرين او الأطفال الآخرين مما له من أثر كبير في تنمية ثقتهم، واعتزازهم بأنفسهم وتفعيل العلاج النفسي لما بعد الصدمة للطفل اليتيم. (العتابي, 2011, ص106) شكل (4 – ج) يوضح البيت العراقي الامن للابداع الذي رغم امكانياته البسيطة الا انه يحاول ان يحقق شيء بهذا الخصوص.

### 3-1-3 فضاءات التجمع العامة (داخلية وخارجية):

هي فضاءات متعددة الوظائف (لعب وموسيقى ورسم , جلوس, قراءة)، فالفضاءات التفاعلية المشتركة من قبل اكثر من مجموعة واحدة من الأطفال والمشرفين تشعر الطفل بانها جوهر المكان الذي تقع متمركزة به كما تبدد الشعور المؤسسي للمكان وخاصة اذا كانت مصممة بطريقة مشابهة لبيئة المنزل وهي تعدّ الموزع الرئيس الذي يسمح بالتفاعل الإجتماعي بين الأطفال ويجب ان لا تكون بشكل غرف مغلقة بل يفضل رفع الحواجز المادية فيها (U.S. General Services Administration, 2003, p.44), كما وتشير الدراسات الى ضرورة توفير فضاءات عامة للتجمع عند تصميم عمارة الطفل كأحد المتطلبات والمواصفات اللازمة لهذه البيئة وان تكون ذات اضاءة جيدة ومفتوحة وواضحة للتجمع وممارسة النشاطات المشتركة كاللعب والقراءة وممارسة الموسيقى او التجمع لسماع القصص.(Kheirabad ,2015, p.99)

كما ان هناك بعض الأمور التي يجب ان تؤخذ بالاعتبار عند تصميم فضاءات التجمع وهي: المعالجة الصوتية للجدران والسقوف للحد من مستوى الضوضاء اضافة الى المعالجة الصوتية بين هذا الفضاء والفضاءات او الغرف المجاورة، السقوف العالية، الارضيات المنيعة المقاومة للانزلاق، استخدام الجدران والسطوح السهلة الادامة والتنظيف، قلة الشبابيك مع مراعاة توفير الاضاءة الطبيعية المناسبة، كفاءة إستخدام الطاقة، إستخدام الاثاث المتحرك او القابل للنقل، اضافة الى توفير معدات اللعب والاسطح المرنة المقاومة في مناطق السقوط، واماكن لتخزين المعدات واللوازم، ويفضل ان يكون هذا الفضاء بجانب المطبخ ليسهل للطفل المشاركة في الطهي وتناول الوجبات الجماعية. (U.S. General Services Administration, 2003, p81)

أ- فضاءات ذات طابع تعليمي وتوجيهي


ب- فضاءات لتعليم المهارات المختلفة

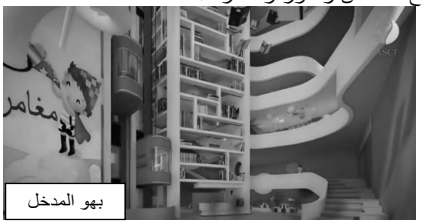

ج- فضاءات الفنون التعبيرية

**شكل (4 - أ، ب، ج) يوضح فضاءات المواهب والفنون في البيت الآمن للإبداع في بغداد/ المصدر: زيارة ميدانية للباحثة**

كما ان اشكال ومساحات الفضاءات الإجتماعية تختلف عن الأماكن الأكثر خصوصية فمكان التفاعل العام يجب ان يستوعب كل الاعمار من خلال الفضاءات المختلفة بالحجم والمادة والملمس والمناطق التي تعزز في ثناياها جميع انواع الانشطة كالسماح لمجموعات الأطفال وكذلك الكبار من ادائها كأن توفر فضاء اللعب الخارجي والمعارض واللعب الانفرادي , كما يجب مراعاة إستخدام مختلف انواع الاضاءة في مثل هكذا فضاءات كالفلورسنت والاضواء المنيرة التي تسمح بتنوع التأثيرات على مناطق الحركة والفعاليات والانشطة.(Hua, 2002, p34) كما في الشكلين (5) و (6).

**يتضح مما سبق اهمية توفير فضاءات متنوعة للفعاليات التفاعلية كـ (فضاءات الرياضة واللعب الحر والمنتظم , فضاءات المواهب والفنون والحرف، وفضاءات التجمع العامة وشبه العامة) داخل مباني مؤسسات الرعاية لما لها من دور في تعزيز التفاعل الإجتماعي بين الأطفال الأيتام، ودور كل من العناصر والخصائص التصميمية لهذه الفضاءات في تحفيز وتعزيز هذا التفاعل.**


أ- فضاءات التجمع الخارجية/ التجمع لسماع القصص والحوار والاسترخاء





ب- فضاءات التجمع الداخلية

شكل (5) أ, ب: فضاءات التجمع العامة الخارجية والداخلية لمشروع مركز حكايتي للاطفال الأيتام في النجف الاشرف القيد الانجاز/ المصدر: **www.avnvateem.com**

شكل (6) يوضح فضاءات التجمع العامة الداخلية/ المصدر **www.pinterest.com**

### 3-2 الفضاءات التفاعلية على مستوى علاقة المبنى مع المجاورات

تشير دراسة (Lee, *et al.*, 2007) الى تكامل المجتمع من خلال جعل دور الرعاية الاجتماعية قريبة من منطقة سكنية أو مركز المدينة، وغالبا ما يتم تقاسم الخدمات بين المقيمين وأفراد المجتمع ككل، وبالتالي ضمان تدفق "الزوار"من جميع الأعمار الذين يرتبطون مع المنشأة على أساس يومي. (p16, Lee, *et al.*, 2007) وان تنظيم الموقع يؤدي دوراً كبيراً ويفضل ان يأخذ بعين الاعتبار احتياجات ومصالح الأطفال بتوفير مناطق مختلفة من النشاطات المنتشرة في جميع أنحاء الموقع التي تشجع الأطفال وتبقيهم في تفاعل مستمر مع الآخرين. (Roy, 2015, p.18)

**ويمكن تصنيف الفعاليات التفاعلية التي يمكن تشاركها مع المنطقة المجاورة الى:**

### 3-2-1فضاءات اللعب والرياضة

يمكن تقسيم فضاءات الفعاليات الرياضية والأنشطة الترفيهية التي يمكن ان تسهم في تعزيز التفاعل الاجتماعي مع المجتمع الخارجي بشكل تلقائي غير مبرمج الى:

**اولاً: فضاءات خارج مبنى المؤسسة:** وتضم ساحات وقاعات الفعاليات الرياضية والانشطة المتمثلة بمراكز الشباب ومراكز التدريب والتأهيل، والنادي الترفيهي للمنطقة ضمن المجاورات. (المهنا, 2005, ص267-268) اضافة الى وجود مناطق اللقاء والتجمع كالمناطق الخضراء والحدائق ومناطق لعب الأطفال،(الجوادي ,2002, ص69) او مساحات تفاعلية بسيطة مثل مساحة للاجتماع بالقرب من الحديقة المحلية أو مركز الشباب والمقاهي. (Enns, 2011, p.7)

**ثانياً: فضاءات داخل مبنى المؤسسة:** والتي تسعى لأستقطاب المجتمع المحيط الى فضاءات وفعاليات الدار فيلعب الفضاء الخارجي او الداخلي للمبنى كجزء محفز لإداء مجموعة من الفعاليات ذات العلاقة بالمجتمع المحيط بدار الأيتام، مثل: إقامة فعاليات بعد أوقات الدوام الرسمية للمدارس، أو في أثناء العطل الأسبوعية، او السنوية، واقامة المباريات الشعبية والبطولات في ملاعب المبنى، اذ إن إقامة الألعاب الشعبية الخاصة بالحّي السكني في هذه الفضاءات، وحضور الأطفال إليها من المجتمع المحيط والتحفيز والتهيئة لها يعمل على تقوية العلاقات بينهم وبين الأطفال الأيتام.(العتابي, 2011, ص108)

### 3-2-2 فضاءات المواهب والفنون والحرف

**اولاً: فضـاءات خـارج مبنى المؤسسـة:** يمكـن للمدينة أن تؤثر علـى التفاعل بين الافـراد من خـلال أنشـطتها الفنية الخاصة ومـن خلال الفعاليـات الثقافية أو الأنشـطة لتكـون وسـائل للتواصل بين الثقافـات والتفاعل الإجتماعي واجتيـاز الحواجز الإجتماعية مـن خلال تشـجيع المؤسسـات الثقافيـة الرئيسـة (الأوبرا، والمسـرح، وقاعـات ثقافية، والمتاحـف، أوركسـترا و الكرنفالات، والنوادي الفنية، ومسـابقات الكتابـة على الجدران، ومشـاريع الفيديـو والصـور، ومـا إلـى ذلـك) كمـا ان إسـتخدام الفنـون والدرامـا في الاماكـن العامـة يشـجع علـى التفاعـل الإجتماعـي وكذلـك تصميـم السـاحات العامـة ومشـاركة الافـراد فـي مبـادرات تطوعيـة وحملات مشـتركة فـي الحي من صبـغ أثاث الشـارع كالأرصفـة والكراسـي البلاسـتيكية اذ إنّهـا تشـجع علـى التفاعل فيمـا بينهم. (Society for Children and Youth of BC, 2016, p.21)

**ثانياً: فضاءات داخل مبنى المؤسسة:** يمكن استغلال الفضاءات الخاصة بممارسة الفنون من معارض ومسارح وقاعات متعددة الاغراض في مبنى دار الايتام لإقامة المعارض الفنية الخاصة باطفال المجتمع الخارجي بالاشتراك مع الاطفال الايتام سواء في أثناء الدوام الرسمي أو في العطل الرسمية لتحفيز موهبة الأطفال و تشجيعهم على التفاعل مع المجتمع الاوسع، إذ أن هنالك الكثير من الأطفال الموهوبين بفنون (التمثيل، والرسم، والنحت) لاتتوفر لهم الأماكن الخاصة، أو العامة لعرض أعمالهم ضمن المنطقة المجاورة لدار الايتام. (العتابي, 2011, ص108)

### 3-2-3 الفضاءات الخدمية العامة

تطرقت دراسة (المهنا , (2005 الى ضرورة توفير التواصل والاتصال بين دار الأيتام والمجتمع كي لا يعيش الأطفال داخله منعزلين عن العالم الخارجي وذلك من خلال التواصل بين هذا الدار والفعاليات والمؤسسات التربوية والصحية والخدمية الممثلة بالمدارس والمراكز الصحية ومراكز التسوق, والدائرة المسؤولة عن دار الايتام.)المهنا, 2005, ص 267-268) كما في مشروع قرية الأطفالSOS في جيبوتي.

**جدول (1) استخلاص المفردات التصميمية الرئيسة والمؤشرات الثانوية لمفردة الفضاءات التفاعلية على مستوى تصميم دار الأيتام \إعداد: الباحثة**

| المفردات | المؤشرات | القيم الممكنة | |
|---|---|---|---|
| 1-الفضاءات التفاعلية | فضاءات اللعب والرياضة | توفير فضاءات اللعب المنتظم (ملاعب ذات تخطيط منظم) | كرة القدم، و الكرة الطائرة، وكرة السلة، والعاب اخرى |
| | | توفير فضاءات اللعب الحر | المزودة بالالعاب والمعدات المناسبة للعب كالتسلق، والتزحلق، والتأرجح، وبيوت اللعب |
| | | | المزودة باحواض للعب بالماء والتراشق به واللعب بالرمل |
| | | | المزودة بجدران عازلة للصوت للسماح للأطفال بالصراخ والصخب |
| | | | المزودة بجدران وارضيات قابلة للغسل للرسم الحر |
| | | | المزودة بالفجوات والتجاويف والاركان المخفية |
| | | | المزودة بالممرات والمسارات الثابتة للعب بالعجلات |
| | | | المزودة بالارضيات المقاومة للانزلاق وتغطية ارضية اللعب بالسجاد |
| | | | المزودة بالانفتاحية على المساحات الخضراء والساحات المسقفة |
| | فضاءات المواهب والفنون | توفير ورش ذات طابع تعليمي أكاديمي (قاعات تعليم لمحاضرات نظرية) | |
| | | توفير ورش تعليم المهارات الحياتية المختلفة | |
| | | توفير ورش وقاعات الفنون التعبيرية | |
| | فضاءات التجمع العامة وشبه العامة | الفضاءات تمتاز بالمرونة لاستيعاب الاعمار المختلفة | |
| | | الفضاءات المزودة بالسقوف العالية | |
| | | الفضاءات المزودة بالارضيات المقاومة للانزلاق | |
| | | الفضاءات المزودة بالجدران والسطوح السهلة الادامة والتنظيف | |
| | | الفضاءات المزودة بالمعالجة الصوتية للجدران والسقوف وبين الفضاءات المتجاورة للحد من مستوى الضوضاء | |
| | | الفضاءات المزودة بالاضاءة الطبيعية الملائمة، ومساحة النوافذ المدروسة | |
| | | الفضاءات المزودة بالاضاءة الاصطناعية المتنوعة والمناسبة لمناطق الفعاليات والانشطة | |
| | | الفضاءات المزودة بالاثاث المتحرك والمرن القابل للنقل | |
| | | الفضاءات المزودة باماكن لتخزين المعدات واللوازم | |

**جدول(2)**

**استخلاص المفردات التصميمية الرئيسة والمؤشرات الثانوية لمفردة الفضاءات التفاعلية على مستوى علاقة المبنى مع المجاورات \إعداد: الباحثة**

| المفردات | المؤشرات | | القيم الممكنة |
|---|---|---|---|
| الفضاءات التفاعلية ضمن المنطقة | فضاءات اللعب والرياضة | داخل المبنى | استقطاب المجتمع الى فضاءات اللعب والرياضة داخل المبنى |
| | | خارج المبنى | مراكز الشباب |
| | | | مراكز التدريب والتأهيل |
| | | | النادي الترفيهي |
| | | | ملعب رياضي شعبي |
| | | | ساحات اللعب والمتنزهات والمناطق الخضراء والحدائق |
| | فضاءات المواهب والفنون | | المعارض الفنية |
| | | | المسارح |
| | | | القاعات الثقافية |
| | | | الساحات العامة لاستعراض الفنون والدراما ومشاركة الافراد في مبادرات تطوعية في المنطقة |
| | الفضاءات الخدمية العامة | | المدارس |
| | | | المراكز الصحية |
| | | | مراكز التسوق |
| | | | الدائرة المسؤولة عن دار الأيتام |

## 4 – الاجراءات التطبيقية
## (وصف عام للمثال المنتخب للدراسة العملية)

تضم الفقرة تحليل مشروع قرية الاطفال SOS في جيبوتي وكما موضح بالاتي:

– **نبذة تعريفية:** يقع المشروع في مدينة تاجورة في جيبوتي وهو من تصميم Urko Sanchez Architects تم انجاز العمل بالمشروع في عام 2014 ومكون من طابقين.

تعتبر القرية اشبه بمدينة صغيرة للاطفال مصممة وفقاً لظروف الطقس المتطرفة اذ تمتاز المنطقة بالمناخ الحار الجاف السائد وتقاليد المجتمع وهي عبارة عن مجمع سكني مغلق يضم 15 منزل لايواء الأطفال فاقدي الرعاية العائلية ومصمم على وفق المباديء الاربعة لمؤسسة SOS العالميــة (الام، الاخوه والاخوات، البيت، القرية) وتتميز القرية باحترام المناخ والهوية واستلهام تصميمها من العمارة المحلية التقليدية للمنطقة العربية, ويتم توفير عناية خاصة بالأطفال من قبل الامهات العاملات بالقرية وتدريبهم وتدريسهم مابعد المدرسة. (p.1,Architecture for Social Gain Awards, 2015) وتعتمد القرية في تصميمها نهج المعماري Aldo van Eyck (مصمم دار ايتام امستردام 1960) في اعتبار قرية الأطفال هي صورة منزلية مصغرة اذ يقول هذا المعماري" ان البيت يجب ان يكون بشكل مدينة صغيرة اذا اردناه بيتاً حقيقياً , والمدينة كبيت صغير اذا اردناها مدينةً حقيقيةً". (Mollard, 2017, p.70)

– **التكامل الإجتماعي مع المجاورات:** تم تصميم روضة للاطفال ومدرسة على بضع مسافة مشي قليلة بالقرب من القرية التي تستقبل اطفال القرية والمنطقة المجاورة ولتجنب الفوارق الاقتصادية والإجتماعية تفرض مؤسسة SOS على روضة الأطفال والمدارس القريبة من القرية الزي الموحد, كما يوجد جامع مجاور للقرية يستطيع اطفال القرية والمنطقة المجاورة الذهاب اليه وكما موضح في الشكل (7) (Mollard),2017,p.69, وتحتوي القرية على ملعب لكرة القدم وبدلا من ان يتشكل فريق خاص بالقرية تم تشكيل فريق بإسم الحي يضم اطفال القرية والمنطقة المجاورة من أجل تكاملهم وادماجهم مع اطفال المجتمع ويرحب بدخول وخروج الأطفال الاخرين للقرية لكن وجود الجدار كان

لضمان البيئة الآمنة والحفاظ على خصوصية القرية وقد حاول المصمم عمل فتحات مربعة في الخرسانة لكسر صلابة الجدار وتخفيف حدة الحافة كما يساعد في ادماج الأطفال داخل القرية مع الأطفال خارجها من خلال اجراء المحادثات عبر الحائط ويمنح وجود الجدار الأطفال الصغار حرية اللعب والركض قرب السياج دون الحاجة لاشراف مستمر اما الأطفال الاكبر فيستخدمون الجدار للتسلق لالتقاط الكرة الخارجة من فوق السياج مع وجود المتابعة وممكن السماح لاطفال الامهات العاملات بالدخول الى القرية ايضا فهذا يساعد على التكامل الإجتماعي ايضا. (Mollard),2017,70.p

- **الفضاءات:** القرية بتركيبها المعقد والممرات الضيقة واقواس حدوة الحصان والمباني الموجهة داخليا والسطوح غير المزينة والسياج المحيط تشكل كلها لغة معمارية مشابهة لما موجود في المدينة الاسلامية. اذ تحتوي على 100 طفل يتيم وتكون اغلب مبانيها من طابق واحد لتراعي المقياس الطفولي وتتكون فضاءاتها كما موضح في الشكل (8).

إنّ الفضاءات المغلقة تماما من الجدران الأربعة هي الاماكن الخاصة كالحمامات وغرف النوم ومكاتب الموظفين اما الفضاءات المفتوحة على بعضها البعض فهي المطابخ وغرف المعيشة والفناءات الوسطية التي تفصل بعضها عن بعض الحواجز الكونكريتية والفتحات الكبيرة والمشربيات, ويوضح الشكل (8) مخططات المشروع والشكل (9) مقاطع المشروع. (Mollard),2017,69.p

- **المواد والالوان المستخدمة:** البناء باستخدام هياكل الخرسانة والاثاث التقليدي واستخدام اللون الاصفر الشاحب المتجانس في اكساء داخل وخارج القرية وهو مشابه لما موجود في المنطقة المجاورة ليزيد الانسجام بين القرية والبيئة المحيطة, (Mollard),2017,70.p ان الالوان المستخدمة مناسبة لاقامة دائمة للاطفال وليس مؤقتة كالموجود في الحضانة او المدرسة اذ يقضي الطفل فيها بضع ساعات. (Architecture for Social Gain Awards, 2015,p.1)

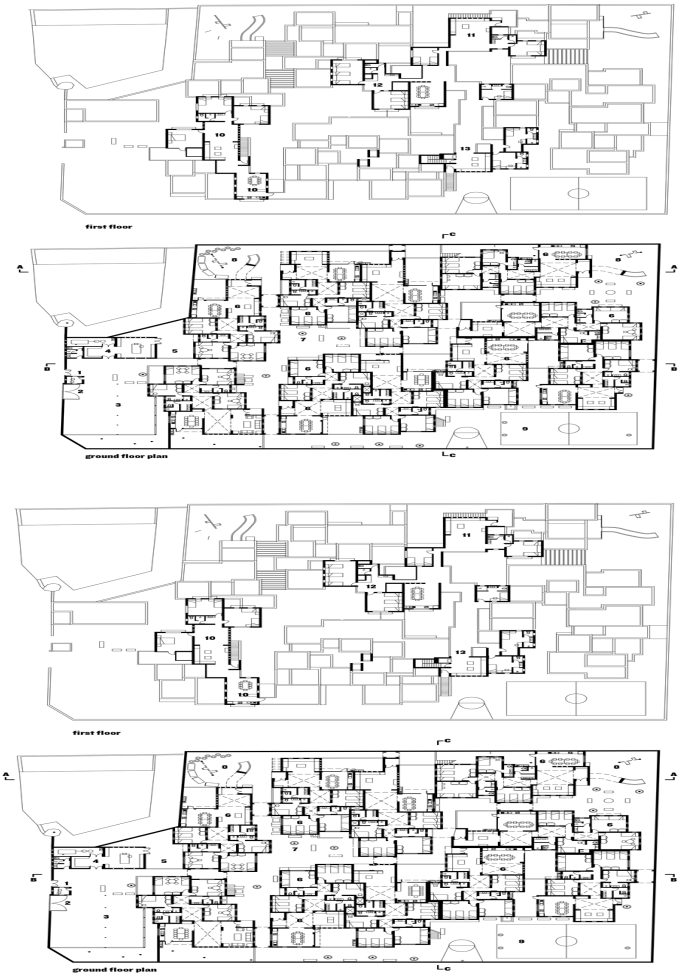
- **التدفئة والراحة الحرارية:** ان الشوارع الضيقة والاتجاه الامثل للاروقة(ممرات التهوية) والفتحات الكبيرة او الصغيرة على سطوح المباني ادت للحصول على التهوية الطبيعية المثلى لكن توجبت في الاوقات الحارة جدا ضرورة الحاجة الى الابراج الماسكة للرياح (ملاقف الهواء) التي تلقف الهواء وتوجهه نحو الغرف الداخلية, (www.aeccafe.com) وكما موضح في الشكل (10).

ولتحسين التظليل الشمسي والتهوية المتبادلة, اتبعت المنازل المخطط نفسه ولكنها توضع مع بعضها بعضاً بطريقة مدروسة جيدا اشبه بالمتاهات وبعض الاحيان يتشكل كل منزلين بشكل متراكب حيث تكون الاسقف مترابطة (www.oikodomos.org) وكما موضح في الشكل (11).

- ان مجتمع تلك المنطقة يتسم بكونه بدويا مما استلزم ضرورة وجود العلاقة بين السكان المحليين والمساحة المفتوحة من خلال خلق الفضاءات الداخلية المفتوحة وجعلها في كل منزل والانفتاح على الداخل لزيادة الحميمية والشعور بالامان، وان وجود الفضاءات المفتوحة والمسافات المثالية بين المنازل هي أداة للحفاظ على خصوصية كل منزل كما انها تسهم في تعريف الاماكن العامة والخاصة مما يشجع الساكنين على استخدام الهواء الطلق الذي يسمح للطفل باللعب الحر مع توفير فرصة للزراعة فيها اضافة الى وجود العلاقة القوية بين الفضاءات الداخلية والخارجية(وجود النفاذية) من خلال عدم وجود الابواب المنهجية في كل افتتاح اذ نادرا ما تمطر في تلك المنطقة وخروج الهواء الحار من الداخل للخارج خلال هذه الفتحات هو امر هام كما ان هذه الفتحات من شأنها ان تعزز من المراقبة البصرية للامهات العاملات في المنزل، كما قد تكون في بعض الاحيان هذه الفتحات نصف مغلقة من خلال وجود المشربيات وهو حل تقليدي للتهوية والرؤية القليلة. (www.aeccafe.com)

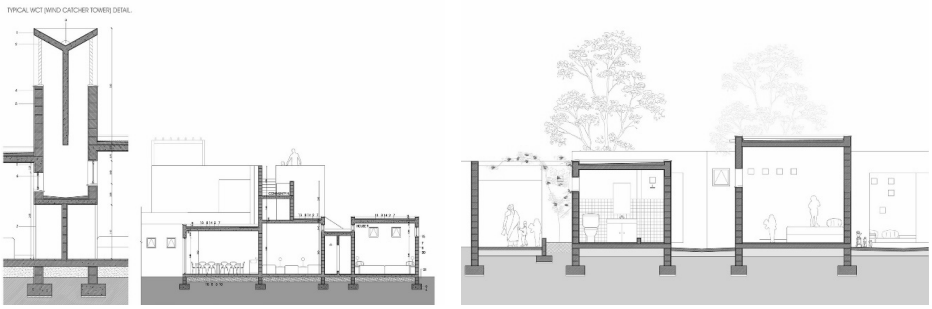

**شكل(7) يوضح مخطط موقع مشروع قرية الأطفالSOS في جيبوتي يظهر فيه المدرسة والروضة القريبة من المشروع والجامع المجاور له/**

**المصدر: https://www.architectural-review.com/buildings/medina-morphology-for-large-artificial-family-sos-childrens-village-in-djibouti-by-urko-sanchez/10019171.article**

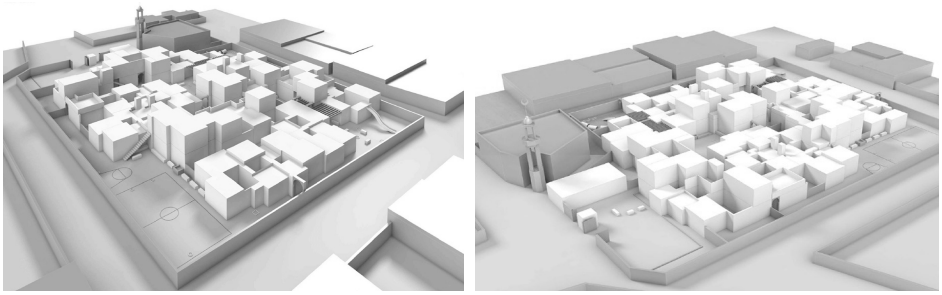



**شكل(8) يوضح مخطط الطابق الأرضي والأول لمشروع قرية الأطفالSOS في جيبوتي/المصدر/ https://www.architectural-review.com/buildings/medina-morphology-for-large--artificial-family-sos childrens-village-in-djibouti-by-urko-sanchez/10019171.article**


**شكل (9) مقاطع (A-A, B-B, C-C) لمشروع قرية الأطفالSOS في جيبوتي/**
**المصدر: https://www.architectural-review.com/buildings/medina-morphology-for-large-artificial-family-sos-childrens-village-in-djibouti-by-urko-sanchez/10019171.article**




**شكل (10) مقاطع (A,B)) لمشروع قرية الأطفالSOS في جيبوتي توضح ملقف الهواء المصدر/**
**http://www.oikodomos.org/workspaces/app/webroot/files/deliveries/itikiz45833_323_building-analysis.pdf**



**شكل(11) يوضح مناظير خارجية لمشروع قرية الأطفالSOS في جيبوتي/ المصدر: www.pinterest.com**

- **السلامة والكفاءة الذاتية:** الشوارع الضيقة في بعض الاحيان تتوسع لتصبح بشكل مربعات مختلفة الاحجام لتجري الانشطة المجتمعية فيها وتوفير المكان الآمن للعب الأطفال والقراءة والتواصل والتفاعل الإجتماعي مابين الأطفال اذ ان القرية مخصصة للمشاة فقط وتخلو من السيارات عدا عدد من مواقف السيارات في أحد المداخل وبذلك يكون المشروع مكاناً ثابتاً للترفيه والمساحات الخلالية هي مناسبة لمختلف الانشطة, (www.aeccafe.com) كما يوجد غطاء نباتي بمستوى عالٍ في المشروع وتشجيع الأطفال على زراعة بعض النباتات والعناية بها لتوفير الظل والهدوء في القرية وتعلم استثمار الموارد الطبيعية, (www.oikodomos.org) اضافة لذلك فقد تمت الاستفادة من المناخ الحار والمشمس في المنطقة من خلال استخدام منازل الطاقة الشمسية (استخدام الخلايا الشمسية في اسقف المنازل) (www.aeccafe.com) وكما موضح في الشكل (12).

**شكل (12) استخدام منازل الطاقة الشمسية في اسقف المنازل في مشروع قرية الأطفالSOS في جيبوتي/المصدر: www.pinterest.com**

# تحليل مشروع قرية الأطفال SOS في جيبوتي

## اولا: على مستوى تصميم القرية

**الفضاءات التفاعلية:-** من خلال فضاءات اللعب و الرياضة سواء كانت فضاءات اللعب المنتظم (ملاعب ذات تخطيط منظم) كملعب كرة القدم وكرة السلة او فضاءات اللعب الحر المجهزة بالالعاب كالتسلق و التارجح و التزلق والمزودة بالممرات والمسارات الثابتة للعب بالعجلات و كذلك يتمثل تعزيز التنوع بفضاءات التجمع العامة و شبه العامة المفتوحة و التي تمتاز بالمرونة لاستيعاب الاعمار المختلفة و توفير المعالجة الصوتية للجدران و السقوف للفضاءات المجاورة لها، ن كما تتوفر في هذه الفضاءات الارضيات المقاومة للانزلاق و تغطية ارضية اللعب بالسجاد و السطوح ذات الانهاء القابل للغسل اضافة لاماكن تخزين المعدات و اللوازم الخاصة للعب الأطفال, وكما موضح في الشكل (13)

**شكل(3-12) تعزيز الفضاءات التفاعلية لمشروع قرية الأطفالSOS في جيبوتي من خلال فضاءات اللعب الحر \المصدر\ Mollard, Manon 2017,,city of angels,**

**ثانيا: على مستوى علاقة المشروع بالمجاورات**

**الفضاءات التفاعلية ضمن المنطقة:** اذ تضم المنطقة حول القرية فضاءات للعب و الرياضة متمثلة بالمناطق الخضراء و الحدائق و تضم فضاءات التجمع العامة متمثلة بالمدرسة و الحضانة و الجامع قرب القرية كما ان المشروع يسمح باستقطاب المجتمع الخارجي الى فضاءات اللعب و الرياضة داخله المتمثلة بالملاعب الرياضية مُشكِّلا فرقا جماعية باسم المنطقة بين الأطفال الأيتام و الأطفال خارج القرية.

## 5 – الاستنتاجات

أكدت الطروحات النظرية الى أهمية وفاعلية المعرفة المطروحة حول مفهوم" الفضاءات التفاعلية" وما له من دور في تعزيز التفاعل الاجتماعي للاطفال ضمن مؤسسات رعاية الايتام سواء على مستوى المبنى نفسه او على مستوى علاقته مع المجاورات، وإنّ خلق المزيد من المساحات المصممة للإستخدام متعدد الوظائف وتقسيم الفضاء الى اقسام بدرجات مختلفة وتنوع بالاستعمال يثير اهتمام الطفل ويشجع على تفاعل الاطفال مع بعضهم البعض لذا تبرز اهمية توفير فضاءات متنوعة للفعاليات التفاعلية كـ (فضاءات الرياضة واللعب الحر والمنتظم , فضاءات المواهب والفنون والحرف، وفضاءات التجمع العامة وشبه العامة) داخل مباني مؤسسات الرعاية لما لها من دور في تعزيز التفاعل الإجتماعي بين الأطفال الأيتام، ودور كل من العناصر والخصائص التصميمية لهذه الفضاءات في تحفيز وتعزيز هذا التفاعل , وفيما يأتي تفصيل لهذه الفضاءات على مستوى تصميم المبنى:

**فضاءات اللعب والرياضة:** يمكن ان تساعد بتوفير البيئة المعالجة نفسيا للطفل اليتيم كونه تعرض لصدمة نفسية عبر السماح له باللعب ضمن فعاليات متنوعة وتعزيز الشعور بالتفاعل الاجتماعي مع اقرانه بتوفير فضاءات اللعب المنتظم، وتوفير فضاءات اللعب الحر.

**فضاءات الفنون والحرف:** اذ ان استغلال المواهب لدى الطفل اليتيم هي طريق آخر للعلاج النفسي له وتضمن تحسين ثقته بنفسه وتفاعله مع الاطفال الاخرين من خلال توفير ورش ذات طابع تعليمي أكاديمي (قاعات تعليم لمحاضرات نظرية), توفير ورش تعليم المهارات الحياتية المختلفة, وتوفير ورش وقاعات الفنون التعبيرية.

**فضاءات التجمع العامة وشبه العامة (داخلية وخارجية)**: إنّ الفضاءات التفاعلية المشتركة من قبل اكثر من مجموعة واحدة من الأطفال والمشرفين معاً تشعر الطفل بانه جوهر المكان، كما تبدد الشعور المؤسسي للمكان وتسمح بالتفاعل الإجتماعي مابين الأطفال انفسهم وبينهم وبين المشرفين عليهم.

أمّا على مستوى علاقة المبنى مع المجاورات فيمكن تصنيف الفعاليات التفاعلية التي يمكن تشاركها مع المنطقة المجاورة الى:

**فضاءات اللعب والرياضة:** تسهم هذه الفضاءات في تجاذب الاطفال ومشاركتهم مع بعض من خلال اللعب والرياضة سواء كانت هذه الفضاءات هي نفسها الفضاءات داخل المؤسسة او خارجها كالمراكز الرياضية والترفيهية والشبابية والتدريبية والساحات والمتنزهات.

**فضاءات المواهب والفنون والحرف:**اذ يمكن للمنطقة أن تؤثر على التفاعل بين الافراد من خلال أنشطتها الفنية الخاصة ومن خلال الفعاليات الثقافية لتكون وسائل للتواصل بين الثقافات والتفاعل الإجتماعي واجتياز الحواجز الإجتماعية أو ممكن ان يكون التفاعل نابع من داخل المؤسسة نفسها وإستثمار فضاءاتها لإستقطاب أطفال المجتمع وزيادة فرص تفاعلهم مع اطفال المؤسسة.

**الفضاءات الخدمية العامة:** إنّ التواصل بين مؤسسات رعاية الايتام والمؤسسات التربوية والصحية والخدمية الاخرى المجاورة ضروري جدا كي لا يعيش الأطفال داخل المؤسسة منعزلين عن العالم الخارجي سواء كان هذا التواصل بقرب هذه المؤسسات من بعضها البعض او بالفعاليات المشتركة المقامة بينها او بطرق اخرى تعزز الشعور بالتفاعل الاجتماعي لدى الاطفال الايتام مع المجتمع.

## 6 – التوصيات

يقترح البحث الاهتمام بالفعاليات التفاعلية والتأكيد على تنوعها ومعرفة المتطلبات الاساسية عند تشكيل التصميم الخاص بالاطفال، اذ من الضروري للمصمم النظر في متطلبات التصميم الاساسية للاطفال والبحث عن مصادر الالهام في تصميم فضاءات الطفل المستلهمه من العاب الطفل والفنون والمواهب المختلفة بهدف تحقيق التفاعل

الاجتماعي من خلال تواصله مع اقرانه والاخرين وتحسين البيئات الداخلية والخارجية لدور ومراكز رعاية الأيتام بشكل يساعد على تخفيف الآثار النفسية التي خلفها فقدان الجو الاسري ولتجنب العزلة الإجتماعية بين الأطفال الأيتام وبينهم وبين المجتمع الخارجي ومن خلال مجموعة من التوصيات:

- تصميم مؤسسات الايتام وفق الاعتبارات التصميمية التي تطرق اليها البحث مع التأكيد على الاعتبارات التي تحتل الاولوية والأهمية من وجهة نظر الأطفال الايتام التي تفتقر اليها مؤسسات الايتام في البلد من خلال:
- تلبية العوامل المتعلقة بتوفير الفضاءات التي تساعد على العلاج النفسي لما بعد الصدمة للطفل اليتيم وليشعر بالاطمئنان في المبنى من خلال فضاءات اللعب والرياضة اذ يعتبر اللعب نوع من العلاج النفسي الناجح وكذلك من خلال فضاءات المواهب والفنون اذ ان العلاج من خلال الفن هو وسيلة انمائية مناسبة تساعد الاطفال على التغلب على الآثار والجروح النفسية واستعادة حياتهم الطبيعية في أوضاع ممتلئة بالفوضى سواء كانت على مستوى المبنى الخاص بهم وعلى مستوى المنطقة المجاورة لضمان انسجامهم مع المجتمع.
- أهمية التركيز على فضاءات التجمع العامّة وشبه العامّة داخل المبنى وخارجه اذ انها وسيلة لقضاء اوقات فراغ الأطفال وبالتالي تواصلهم وتفاعلهم مع بعض.
- يوصي البحث ضرورة التركيز على اهمية العلاقة مع المجاورات وخلق الفرص لتفاعل الأطفال الأيتام مع المجتمع الخارجي من خلال الفضاءات المعمارية المختلفة والانشطة والفعاليات المجتمعية والتطوعية لا ان يعزل في مكانه ويفصل عن العالم الخارجي وبالتالي يلاقي صعوبة كبيرة في الاندماج عند خروجه من المبنى بوصوله للسن 18 , كما يجب ان تكون بيئة المؤسسة ملائمة وسليمة صحياً واجتماعيا وبيئيا وثقافيا وجماليا ومن ناحية اتصالها بالمجتمع ايضا.

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# تأثيرات التشظي الحضري
# تحليل الاسباب والتحديات في بنية المدينة

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# The Effects of Urban Fragmentation / Analysis of the Causes and Challenges in the City Structure

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**المستخلص**

التشظي هو مصطلح اساسي في تاريخ الفكر الحضري النقدي، ومع ذلك فإن نتاج التشظي يتجلى في الشظايا. والتشظي الحضري (Urban fragmentation) يُستخدم لوصف الظاهرة التي تحدث عندما يتم تفكك البيئة الحضرية إلى وحدات أصغر أو مناطق متفرقة. يعني ذلك أن المدن تصبح متجزأة بدلاً من أن تكون متماسكة ومتكاملة. هذا التفكك يمكن أن يكون نتيجة للعوامل المتنوعة مثل التخطيط السيئ، ونقص البنية التحتية، واختلاف الاستخدامات الأرضية، والتفرق الاجتماعي. يتناول هذا البحث مشكلة التشظي الحضري كواحدة من التحديات التي تواجه البنية الحضرية للمدن، وايضاح اهم العوامل المؤثرة على بنية المدينة خلال عملية النمو المستمر ومن خلال دراسة وتحليل الطروحات المتعلقة **حددت مشكلة البحث** انتشار التشظي في البنية الحضرية للمدن، مما يتسبب في تفكك المجتمعات الحضرية وزيادة التحديات في مجالات التخطيط الحضري وتوفير الخدمات.

وفي ضوء تلك المشكلة تم تحديد **هدف البحث** التوصل الى اطار نظري متكاملا لتشظي البنية الحضرية يتضمن الاسباب والسياسات المعتمدة في التعامل معه، **وطرح البحث فرضيته** ان تشظي البنية الحضرية هو ظاهرة طبيعية لابد ان تحدث نتيجة للتغييرات الديموغرافية والاقتصادية والسياسات الحضرية ولا يمكن تجاوزها الا من خلال دراسة الاسباب ومعالجتها.. ولتحقق ذلك اعتمد البحث في منهجه على تعريف التشظي والمفاهيم المرتبطة به، ومن ثم دراسة الاسباب التي تساعد على التشظي في البنية الحضرية، ويطرح البحث اضافة سياسات للتعامل معه. لذا يسهم البحث في توضيح نظره شموليه للمفهوم بشكل عام والتغييرات الحاصلة للبنية الحضرية.

**الكلمات المفتاحية: التشظي، المفاهيم،، البنية الحضرية، الاسباب**

**Abstract**

Fragmentation is a fundamental term in the history of critical urban thought, yet the product of fragmentation is manifested in fragments. Urban fragmentation is used to describe the phenomenon that occurs when the urban environment is broken up into smaller units or dispersed areas. This means that cities become fragmented rather than cohesive and integrated. This disintegration can be the result of various factors such as poor planning, lack of infrastructure, different land uses, and social dispersion. This research addresses the problem of urban fragmentation as one of the challenges facing the urban structure of cities, and clarifies the most important factors affecting the city structure during the process of continuous growth. Through studying and analyzing related proposals, **the research problem identified** the spread of fragmentation in the urban structure of cities, which causes the disintegration of urban communities and increases challenges. In the areas of urban planning and service provision.

In light of this problem, **the goal of the research** was determined to reach an integrated theoretical framework for the fragmentation of the urban structure that includes the causes and policies adopted to deal with it. The research put forward its hypothesis that the fragmentation of the urban structure is a natural phenomenon that must occur as a result of demographic and economic changes and urban policies, and it cannot be overcome except through a study. Studying the causes and treating them. To achieve this, the research relied in its methodology on defining fragmentation and the concepts associated with it, and then studying the causes that contribute to fragmentation in the urban structure, and the research proposes adding policies to deal with it. Therefore, the research contributes to clarifying a comprehensive view of the concept in general and the changes occurring in the urban structure.

**Keywords: Fragmentation, Concepts, Urban structure, Causes**

## 1 – المقدمة

تداول مفهوم التشظي الحضري في مدن ما بعد الصناعة في أواخر الثمانينات، وأصبح من أهم التحديات في ميدان التصميم الحضري والتخطيط العمراني. هذه الظاهرة ليست مقتصرة على الجوانب المادية للبنية الحضرية فقط، بل تمتد أيضًا لتأثيرات اجتماعية ومكانية ومؤسسية. بعد قرون من التحضر السريع، تركت تركيبة المدن وبنيتها التحتية الكبيرة انقطاعات تجزئ الأحياء المتصلة ببعضها. على الرغم من دور هذه البنية في توصيل المدن والمناطق بفعالية، إلا أنها في بعض الأحيان أسهمت في تكوين انقسامات اجتماعية. وبالتالي، التشظي الحضري ليس مجرد مشكلة شكلية، بل هو أيضًا مشكلة حجمية وراثية. يشمل التحدي استخدام هذه البنية الضخمة وتجديدها بطرق تتناسب مع احتياجات وتطلعات المجتمعات الحضرية الحديثة.

## 2 – تعريف مفهوم التشظي في اللغة والاصطلاح (Fragmentation)

عرف مفهوم التشظي في القواميس والمعاجم العربية والانكليزية لغويا، و عرف في المراجع الاساسية والحقول المعرفية اصطلاحيا.

### 2-1 التشظي لغة

ورد التشظي في معجم اللغة العربية المعاصرة اذ يعطي الكلمة: التشظي. الجذر: شظي. الوزن: التفعل. (التَّشظي): تَشَظَّت العصا: إذا تفلقت (الحميري،1999،ص3471). ويورد (لسان العرب) في فصل الشين، حرف الواو والياء (شظى)، ويشير أن كل فلقة من شيء شظية، والشظية شقة من خشب أو قصب أو فضة أو عظم، وتشظى الشيء تفرق وتشقق وتطاير شظايا، وشظيت القوم تشظية أي فرقتهم فتشظوا أي تفرقوا أو شظي القوم إذا تفرقوا، والشظية الفلقة من العصا ونحوها والجمع الشظايا وهو من التشظي، التشعب والتشقق (ابن منظور، 2016، ص433). أما في (الفيروز ابادي، 2008، ص

865) فيعرف التشظية بالتفريق، والشظية كل فلقه من شيء، وتشظى العود تطاير شظايا.

وفي اللغة الإنكليزية يشير قاموس (المورد الحديث) الى frag.ment (.n.;vt.;i) بالمعاني الاتية: 1 – شظية، كسرة، جزء، 2 – يشظي، 3 – يتشظى. ويعطي (.frag.ment ta.tion n) بالمعاني الاتية: 1 – تشظية، 2 – تشظ، 3 – انهيار. ويعرف (.frag.men.tize; frag.men.tate vt.; i) 1 – يشظي، يفتت، يجزئ، 2 – يتشظى، يتفتت، يتجزأ. (البعلبكي،2008). ويعطي قاموس (The Shorter Oxford English dictionary,1964,p.745) الكلمة المعنى الآتي: فعل التكسر أو حالة الانفصال إلى أجزاء مستقلة قائمة بحد ذاتها. أما القاموس (American Heritage Dictionary of the English Language) فيعرف الشظية (.fragment n) على انها جزء صغير مقطوع او منفصل، جزء غير كامل او منعزل.

### 2-2 التشظي اصطلاحا

ورد مفهوم التشظي في مجالات مختلفة ابرزها:

### 2-2-1 التشظي في علم الاجتماع

يطلق على التشظي الاجتماعي على انه مجموعة من التحولات في النسيج الاجتماعي بسبب التغيرات الاجتماعية والاقتصادية والتكنولوجية. يشير إلى التفكك في عالم يمكن أن يكون معاكسًا للعولمة أو متناقضًا معها، وهو مفهوم أساسي في دراسات العولمة. (Mooney&Evans,2007, p.96)

عرف التشظي الاجتماعي عند (Edwards) بأنه ميل المجتمع الى التفرقة والانشقاق و فقدان التماسك لحالة السلم. (Edwards,1991,p.349)

### 2-2-2 التشظي في علم النفس

يشير التشظي النفسي إلى حالة يمكن أن تواجهها الأفراد عندما يشعرون بضعف تقدير الذات وتشتتهم. يمكن أن يظهر هذا التشظي على المدى القصير أو الطويل ويؤدي

إلى مشاكل مثل الكآبة والارق والذعر. يعتمد تماسك النفس على القدرة في السيطرة على الضغوط وتحقيق الأهداف، وعندما يفتقر الشخص لهذا التماسك، فإنه يواجه صعوبات في الأداء وتقدير الذات.(Coady & Lehmann, 2008,p.147)

ويذكر(Coady & Lehmann) بأن النفس المتشظية بالإمكان وصفها بالهشاشة وفقدان الهوية والشعور بالانقطاع مع النفس والآخرين مما يحدث حالة من القلق المزمن لدى الاشخاص الذين يعانون من تشظي النفس.

### 2-2-3 التشظي في علوم الحاسوب

يشير (Danseglio) إلى أن البيانات تتم كتابتها وقراءتها من القرص الصلب بطريقة خطية لزيادة كفاءة وسرعة أداء القرص. عند كتابة العديد والعديد من الملفات ومسحها، ستظهر فجوات في المساحة الفارغة على القرص الصلب، وستؤثر هذه الفجوات على الملفات التي سيتم كتابتها في المستقبل، اذ سيتعين وضع هذه الملفات بشكل متماثل في هذه الفجوات، وإذا تعذر وضع هذه الملفات في هذه الفجوات بشكل مماثل للفجوة، فسيتم وضعها في فجوتين أو ثلاث فجوات، وهذا ما يسمى بالتجزئة. عندها ستكون النتيجة سرعة وكفاءة أداء أقل للقرص الصلب. (Danseglio, 2006,p.16)

ويشير (Glass) إلى أن هناك نوعًا آخر من التجزئة، وهو تجزئة ذاكرة الوصول العشوائي، حيث توجد ثقوب صغيرة غير مستخدمة متناثرة فيها. النوع الشائع من تجزئة الذاكرة في أنظمة التشغيل المتقدمة هو التجزئة الداخلية، ويحدث هذا النوع عند تسجيل الذاكرة في الإطارات (frames). حيث يكون حجم الإطار أكبر من حجم الذاكرة المطلوبة. (Glass,1996, p.47)

### 2-2-4 التشظي في طروحات اللغة والادب

يشير (المسيري) إلى أن ترجمة مصطلح (dissemination) هي "تشتت المعنى" وأن الكلمة يستخدمها (دريدا) في مكان كلمة "دلالة" بمعنى: نشر الحبوب أو نثرها، وللكلمة معاني أهمها: أن معنى النص ينتشر فيه ويتناثر فيه كبذور متناثرة في كل الاتجاهات ثم لا يمكن الإمساك بها. ومن بين معانيها أيضًا: تشتت المعنى - لعب حر لما

لا نهاية له لأكبر عدد ممكن من الدالات، تأخذ الكلمة معنى كما لو كان لها دلالة دون أن يكون لها دلالة، أي أنها تنتج التأثير فقط. في الدلالة (المسيري، 1999، ص، 437) يركز على فائض المعنى وتفككه، وهي خاصية تصف استخدام اللغة بشكل عام.(الرويلي والبازعي، 1415، ص 66)

**2-2-5 التشظي في طروحات الفن**

يشير (Moneo) إلى أن أول دليل واضح على التشرذم موجود في رسومات (Piranesi) عن (Campo Marzio). إنهم يظهرون، بفهم واضح، انهيار الوحدة الذي أعقب عمدا بعد عصر النهضة. كان هدف (Piranesi) هو التحرر الكامن للشكل. (Moneo,1999, p.16) ويشير (Zevi) إلى أن العقل البشري اكتشف أن البعد الرابع له موجود بالإضافة إلى الأبعاد الثلاثة للمنظور، وهذا ما قدمته التكعيبية على أنها ثورة ضمن مفهوم الفضاء، كما ظهرت قبل الحرب العالمية الأولى بفترة وجيزة. (Zevi,1957,p.26) حيث تم تطويره بواسطة (Braque) (Picasso) لغة بصرية تمزج التجريد مع أجزاء من الواقع الذي نلاحظه، وتفتح الفضاء والشكل لتظهر بطريقة جديدة. (Curtis,1996, p. 151)

## 3 - المفاهيم النظرية المرتبطة بالتشظي الحضري

في سياق البحث عن مفهوم التشظي في المعاجم العربية والاجنبية برزت بعض المفاهيم النظرية الاكثر ارتباطا بالمصطلح والتي يمكن اعتبارها نظائر او مرادفات له، وهي كالاتي:

**3-1 التجزئة Retail**

التجزئة في اللغة العربية يعود الى الفعل تجزأ وهو بالضد من الاندماج ويعني الشيء انقسم الى اجزاء أي تم تفتيته الى قطع (المعجم الغني)، كما يعرف في المعاجم والانطولوجيا التجزئة بعملية انفصال الشي الواحد الى عدة اجزاء مستقلة ومختلفة الحجم.

يشير Santos بأن التجزئة تحدث نتيجة عمليات متعددة تتقارب في انقطاع الاستمرارية والتواصل والتماسك المورفولوجي للمساحات والشبكات الحضرية والريفية والطبيعية. كعملية، تعكس التجزئة ديناميكية متسارعة للتحول، وهي سمة مشتركة للتحضر في القرن العشرين حول العالم. وهي تعكس الأنماط المتغيرة لاستخدام الأراضي، وقيمة الأرض، والأسباب الاقتصادية، فضلاً عن التكوينات الوظيفية والمكانية الجديدة الناتجة عن العناصر المادية شديدة الاضطراب

مثل حركة المرور الكثيفة والبنية التحتية للنقل. إلى حد كبير، فإن التعقيد المكاني للمناطق الحضرية هو نتيجة لتراكم أشكال مختلفة من التنمية الحضرية والبنية التحتية، والتي يمكن وصف بعضها بأنه يعتمد على نمط إنتاج مجزأ. يمثل فهم هذه الظاهرة مهمة صعبة ولا تزال غير مستكشفة على نطاق واسع، خاصة عند النظر في المنظورات المكانية والصرفية والإجرائية من جهة، وتنوع الأدلة التجريبية.(Santos,2020)

**2-3 التحول Transformation**

يعني التحول في اللغة التغير في الشكل، فالمصطلح يتكون من مقطعين (Trans-Form)، فهو يشمل مفهومين هما التغير والشكل، ويشير الى المعاني التي ترتبط بمفهوم التغير في الشكل، الهيئة (Shape)، أو المظهر، أو تغير الطبيعة، أو تغير الخاصية. (Oxford, 1974, p.919)

عرف (Eisenman) التحول بأنه مجموعة من العمليات التي تجري على المستويات العميقة من العمارة لتحويلها الى مستويات سطحية، والتي تمثل قراءتها وتفسيرها مفتاحاً لسلسلة متعاقبة ومستمرة من القرارات التي تأخذ بالعمق تدريجياً لتكشف عن عمليات التحول التي ولدتها.(Eisenman, 1993)

كما عرفها (Gadelson) بانها تلك القواعد او التحركات التي تتبع في البنية العميقة لتؤدي الى بنية سطحية وشكل معين، فهي تتعلق بالعلاقة بين ما هو معلن وما هو ضمني. فهي تسمح برؤية الاشكال بصورة جديدة.(المحمدي،2008،ص30)

وقد جاء مفهوم التحول ضمن كل من: (عمارة الحداثة- وعمارة ما بعد الحداثة- وعمارة التفكيك) وكما يلي:

1 - **عمارة الحداثة:** ظهرت بوادر التحول عندما ثارت المناقشات والجدال الذي يبرز سلبيات الحداثة وتدعو إلى التغيير لسبب انفصال الحداثة المعمارية نهائيا عن لغة العمارة، هذه اللغة التاريخية التي عبرت عن الإنسان الذي أنشئت العمارة من أجله.

وبقت عمارة الحداثة بدون لغة وبدون هوية ثقافية وعليه ظهرت أهمية البحث عن عمارة تتجه نحو الاهتمام بأسلوب البناء التقليدي المحلي وتطويره لخلق تواصل بين العمارة والجمهور العام. من هنا ظهر بزوغ نجم عمارة ما بعد الحداثة أداة تحول عن الحداثة وفي محاولة للرد على سلبياتها من وجهة نظر الناقدين لها.(هابي،2008،ص6)

2 - **عمارة ما بعد الحداثة:** ظهرت بوادر التحول فيها بتحرك العمارة لبعض الاتجاهات المنبثقة من الحركة بعيدا عن صلابة المدلولات الثقافية والتاريخية والتقليدية والطبيعية. كما أن وجود التباين بين شكل المبنى والمحيط البيئي والتباين التقليدي بين الهيكل الإنشائي والزخارف أثره في إثارة النقاش والجدال في جدوى التمسك بمبادئ مضمون حركة ما بعد الحداثة. إن التوجه نحو معمار يعكس وجه التقدم العلمي والتقني مهد للبحث عن أشكال جديدة تمثل روح الاكتشاف والمغامرة والتنوع البصري.

وقد عرف التحول من قبل منظري ما بعد الحداثة بأنه الحاجة إلى تغيير أي نسق لكي يصبح اكثر ملائمة للظروف والمؤثرات الجديدة.(هابي،2008،ص8)

3 - **عمارة التفكيك:** ظهر التحول أساساً للدراسة المستقبلية والنظرة الجادة لما ستكون عليه مباني المستقبل حيث تخيل بنيتها من العناصر النحتية التي هي محور العمل وأساس التصميم وأهم العناصر هي المواد النحتية مع الاعتماد كليا على الحديد والزجاج. والتوجه نحو التحرر الفكري الكامل حيث عدم الترابط بأي حركة أو اتجاه أو مسمى معين يقع تحته المبنى ولذا نجد التوجه نحو التحررية في التصميم وأساليب الإنشاء. المباني لا تتقيد بشكل من حيث التوجه نحو الاستقلالية والانفصالية عن الواقع ككل. (هابي،2008،ص10)

### 3-3 الانقطاع (Rupture & Discontinuity)

يحدث الانقطاع بسبب التغيرات في الفكر والأساليب التي اعتمدت في التصميم الحضري وكيفية التعامل معها، إذ أدت الأفكار المتطرفة الى قرارات حاسمة وأدى تعميمها

وإقصاء جوانب أخرى الى حدوث الانقطاع، فالانقطاع وكما يشير (الصفدي) هو اللحن المضاد للحن الأساسي، يتطابق معه وينفصل عنه في الوقت نفسه. (الصفدي، 1990،ص6) جاء مع ظهور الحداثة التي دعت الى الانعزال التام عن كل ما هو ماضي وتاريخي وادخلت مفاهيم جديدة غيرت النسيج الحضري الموجود فحدث الانقطاع بين التصميم الحضري(Urbanism) والعمارة (Architecture)، وما بين المتلقي والمشهد الحضري بسبب عدم قدرة المتلقي على ادراك معاني البيئة الحضرية، لان هذه المعاني تصل الى المتلقي بشكل اشارات متواصلة تتفاوت ما بين البساطة والتعقيد وما بين الوضوح والغموض وهذا يعتمد على ما يحمله المتلقي من خبرة وثقافة وذكريات في ادراك تلك المعاني والاستمرار على التواصل مع المشهد الحضري، لذلك يعد ادراك المتلقي لهذه المعاني هو (تواصلا) واذا لم يدركها فهو(انقطاع)، يرتبط الانقطاع بالتحولات التي تصيب الجوهر ويشير (Antoniades) "الى امكانية دراسة التحول في الأشكال ذات المرجعية فقط، اما الاشكال المنقطعة يصعب دراســة التحول فيها لانعدام الاتصال بالأصل"(Antoniades,1990,p,68) وهذا لا يصيب المشهد الحضري فحسب وانما يمتد الى المجتمع حيث يرى (Lynch)" بان الانقطاع في البنية الحضرية ينتج عن فقدان الاحساس بالتوجيه (Lynch,1960, p.174). "فهو يحدث في حالة عدم وجود حوار وفي حالة وجود خطاب منولوجي او يقوم على النفي المطلق والهيمنة وهو انقطاع سلبي يهدف الى انتزاع حق الطرف الاخر في الوجود، ويصل الى القطيعة والكسر والتنافر.

### 4-3 التغريب Estrangement

ان اصل فكرة التغريب جاءت من اصحاب (حركة التنوير Enlightenment) في القرن الثامن عشر على يد روسو، والمقصود به "ان كل خروج على ما هو مألوف في ثقافة جماعية بشرية معينة بحيث يؤدي الى ارباك قناعات المتلقي وخلخلة مسلماته ويدفعه الى اعادة النظر فيها" (العاني، 1998، ص 85) نقلا عن (علي واخرون، 2002، ص 60)، فالتغريب يقوم على اساس اثارة الدهشة لدى المتلقي من خلال اضفاء صفة اللامألوف عن طريق تجميع وتجاور المتنافرات بشكل غير مدروس فتتولد حالة انقطاع بسبب الانتقال المفاجئ) وقد ظهر مؤخرا في معظم المدن المعاصرة مما ادى الى اخفاقها في تحقيق

الانتماء الزماني والمكاني وفقدان التواصل بين المتلقي والمحيط العمراني، فهو فقدان الهوية والشخصية الفردية المتميزة من خلال فقدان التواصل الاجتماعي مع الاخرين من جهة ومع الموروث الحضاري والثقافي الذي يمتلكه الفرد من جهة اخرى" (العاني، 2011، ص198)، "فالإنسان جزء متكامل من بيئته ونسيان هذا الامر يقود الى الاغتراب والانقطاع عن البيئة.(Lynch, 1960, p.174)

### 3-5 العزلة Segregation

هو فقدان البنية العمرانية للانسجام والتكامل بين المبنى والمحيط العمراني الذي يعاني من ظاهرة التفكك والانعزال وفقدان التوافق والترابط العضوي بين اجزائه المختلفة، "وتتمثل بعدم تلبيتها للمتطلبات والحاجات الانسانية مما يؤدي الى انقطاع معنوي اولا ثم مادي عنها، ويؤدي الى فقدان الوحدة والتجانس وظهور الفردانية" (العاني، 2011، ص38)، "كما ان احساس الانسان بالبيئة احساس متغير وغير ثابت، يتأثر بعوامل ترتبط بالشخص وبالمتغيرات الحضارية" (Lang,1987, p.111) نقلا عن (نعمة، 2013، ص15).

### 3-6 الاقحام Intervention او التجاور القسري Juxtaposition

تتعلق مشكلة الاقحام بمفهوم الاضافة (Adding) في المدن القديمة او التقليدية، ويناقش Sola-Morales العلاقة بين التدخل الجديد والعمارة التاريخية وتؤثر بذلك سلبا الى اهداف التدخل المعماري الجديد (Nesbitt, 1998,288p)، ومعظم هذه الاهداف تتعلق بالابتعاد عن الرتابة والملل في العمل وتحقيق المتعة والتنوع، حيث اشار باشلار الى ذلك بقوله ان ادخال العناصر الجديدة في نوع عملنا يعود علينا بالفائدة، فيذوب حينئذ الجديد مع القديم ويساعدنا هذا على تجنب الرتابة والملل، لكن اذا كان العنصر الجديد غريبا جدا عنا فان ذوبان القديم في الجديد لا يتم لان الطبيعة فيما يبدو تشمئز من كل انحراف مفرط عن طريقتنا العادية وكذلك بنفس الدرجة من غياب اي درجة من الانحراف). (باشلار،1980،ص 78)

ان عملية الاضافة الناجحة تكمن في الحفاظ على هوية المبنى القديم او النسيج العمراني الاصلي وبقائها قابلة للإدراك، فالإضافة ليست مشروطة بتطبيق نوع معين من الطرق، وانما هي تعنى بالنتيجة الناجحة والتي هي في استمرارية الحفاظ على هوية المكان والبيئة العمرانية الموجودة اصلا ومعانيها ضمن مكانة متميزة مع الاندماج الجديد والاضافة الجديدة، ويفضل في ذلك الاستخدام الية اضافة الاشكال المألوفة (ذات الدلالات والرجعيات المعروفة). (موسيسيان،2001،ص5)

ويعتقد Sola-Morales بان الاقحام الذي لا يأتي بشكل مترابط فيزيائيا مع ما هو موجود اصلا (Exist) يؤدي الى حصول عدد من المتناقضات بين الجديد والقديم والتراث والمعاصرة، مشيرا الى ان استراتيجية الاضافة تولد انقطاعا او تفككا وبالتالي تشظياً في النسيج الحضري الاصلي للمدينة التقليدية:

(It produces a genuine interpretation of the historical material with which it has to control) (Nesbitt,1998, p.288).

ان العلاقة بين الاقحامات المعمارية المتناقضة(الجديدة المضافة والقديمة الموجودة اصلا) هي ظاهرة تؤدي الى تغيير في العلاقة بين القيم الثقافية التي تساهم في اعطاء المعنى الى العمارة التاريخية والى النوايا الخاصة بالعمارة الجديدة (Nesbitt,1998,p.228-230) فالإقحام هو المداخلة القسرية بين مراجع تاريخية مختلفة (موسيسيان،2001،ص9)، او معركة ونزاع بين الطرز المعمارية وخليط متناقض بين الاجزاء يدل على تجاهل المصمم لمفهوم السياق. (Tagnutts,1987, p.108-109)

### 3-7 عدم الانتماء Non belonging

يرتبط هذا المصطلح بإحساس وشعور المتلقي بافتقاده لشيء ما وهذه حالة فسيولوجية، أي فقدان العلاقة بين الفرد والبيئة العمرانية التي تؤدي الى التفكك الاجتماعي بسبب التناقض بين الموروث والمعاصرة في الحجم، الشكل، التفاصيل، مواد البناء، الالوان وغيرها، ساعد على فقدان الخصوصية واصبح لا يوجد حد فاصل بين الداخل والخارج فبعد ان كانت العلاقات الفراغية يسودها التكامل والانسجام بين الداخل والخارج، اصبحت الفراغات الحديثة تعتمد الاثارة عن طريق الحيز اللاحدودي.)العاني، 2011، ص 38)

ولان المجتمع لا يتقبل اقحام أفكار وتوجهات فكرية حضرية تتعارض مع التوجهات الفكرية المحلية الذي لا يستطيع التكيف السريع مع هذه التوجهات المقحمة الأمر الذي يؤدي الى العزلة الحضرية ومن ثم العزلة الاجتماعية، والأخيرة هي مرحلة متطورة باتجاه عدم الانتماء لذلك تقود هذه الظاهرة الى التغير في المضمون أو المعنى.(نعمة، 2013، ص 64)

**ومن خلال ما تم طرحه في المحاور السابقة وبالاعتماد على المفردات توصل البحث الى ما يلي:**

**التعريف الاجرائي: التشظي هو حالة تؤدي إلى فقدان التماسك والوحدة في شكل وهيكل المدينة، اذ يؤثر على النسيج الحضري ويجعله ينقسم إلى أجزاء منفصلة وغير مترابطة، مما ينتج عنه فجوات وانعدام التكامل بين المباني والبيئة الحضرية. يتسبب التشظي في فقدان الارتباط بين الجزء والكل نتيجة للتغيرات في القيم الاجتماعية والاقتصادية والظروف السياسية والتقدم التكنولوجي والاحتياجات الوظيفية.**

## 4 – البنية الحضرية

### 4-1 البنية في الطروحات الادبية والفكرية

يوضح إيغلتون (Eagleton البنية كمصطلح يتعامل مع التراكيب، وبالأخص مع اختبار القوانين التي تمكن من تحويل الظواهر الفردية إلى أمثلة تجسد هذه القوانين. (ايغلتون، 1992،ص 104)

وقد عرفها غارودي (Garoudi) كمنظومة من العلاقات داخل إطار تحولات مختلفة، دون النظر إلى المكونات الفردية فيه. حيث يمثل هذا النظام حالة تنظيمية لأجزائه، والفكرة المركزية في هذا النهج هي التأكيد على أن العلاقات تأتي قبل الكائنات ذاتها، وأن الكل يأتي قبل الأجزاء. وبالتالي، ليس للعناصر معنى أو وجود مستقل إلا من خلال العلاقات التي تربطها بالأخرى. وبالتالي، يتم تعريف الوحدات فقط من خلال هذه العلاقات، مما يجعلها أشكالًا وليست جواهر. (غارودي، 1981، ص 13)

### 2-4 البنية في الطروحات المعمارية والحضرية

تنبأ (Kevin Lynch) ببعض المفاهيم والاهتمامات المتعلقة بالبنية الحضرية في دراسته. فأكد أن البنية الحضرية هي ترتيب معقد من العلاقات بين مكونات النظام الحضري، حيث تمثل هذه العلاقات الارتباطات المتبادلة بين أجزاء المدينة داخل النظام الكلي (Lynch, 1960,p.08)، وعرَّف القطاعات الحضرية من خلال الممرات التي تربط بينها، وكذلك من خلال العقد والشواخص التي تسهم في تعريف هوية البنية الحضرية.

كما تعرف البنية الحضرية أيضا بالهيكل الحضري، تمثل مجموعة من العناصر المادية والروحية التي ترتبط بالإنسان وتأثيراته على البيئة المحيطة به. هذه العناصر تحمل خصائص شكلية تعكس تفاعل الإنسان مع البيئة الطبيعية والثقافية التي يعيش فيها، وتسهم في تكوين الهيكل الحضري بشكل شامل.)يعقوب، 1999، ص8)

## 5 - مفاهيم التشظي ضمن البنية الحضرية

تم انتخاب مفاهيم كلا من التحول، والانقطاع، والتجزئة على وجه الخصوص في السياق الحضري لأنها تمثل مظاهر رئيسية للتشظي الحضري ولها تأثير كبير على تطور المدن.

### 5-1 التحول في البنية

البنية الحضرية تُشكل نفسها عبر تفاعل أجزائها وتكتسب تجارب متراكمة، وتتطور وتنمو لتلبية الاحتياجات المتغيرة على مر الزمن.

وفقا لـ (Antoniades)، التحول يُمثل تغييرا في الشكل نتيجة تأثيرات داخلية وخارجية متعددة. (Antoniades, 1990, p. 66).

تشير الدراسات البنيوية إلى أن عمليات التحول تحدث في تسلسل محدد. وفي هذا السياق، اقترح (Hillier) فكرة التحول من خلال تنسيق الاحداث وتتابعها. (Hillier, 1996, p.22)

ويشير (Rossi) إلى أن التحول في المدينة لا يتعلق بالمكان فقط، بل يتعلق أيضا بالزمن. يُظهر أن الدراسات تشير إلى أن المدينة تتغير بشكل

كامـل كل خمسـين عامـا، وأن كل مـن يعيـش فـي المدينـة يتأثـر تدريجيـا بهـذه التحولات. (Rossi, 1982, p. 104).

ووصف التحول في البنية الحضرية على أنه نتيجة لإقحام أفكار وتوجهات جديدة من خلال استخدام العناصر الحضرية الجديدة في المدينة. يتضمن هذا التغيير إعادة تنظيم للبنية الحضرية من خلال إضافة نسيج جديد حول المعالم البارزة في المدينة وربطه بتلك المعالم بهدف تجديد الشكل التقليدي للمدينة. وفي هذا السياق، يعتمد هذا النموذج على الاستفادة من أفكار لي كوربوزيه والحفاظ في الوقت ذاته على السمات الأساسية للمدينة. يعد هذا النموذج نموذجا قابلا للتطبيق في مجموعة متنوعة من المدن، باستخدام تحليل تفكيك الهياكل الحضرية لإنشاء نظام يمكن تنفيذه بنجاح وفقا لمفاهيم الحداثة. (الحنكاوي، 2004، ص 54)

وتناول (Luchinger) في كتابه "Structuralism in Architecture and Urban Design"، مفهوم التحول كجزء أساسي من التكيف مع التغيرات الحديثة. هذا المفهوم يسعى إلى الاحتفاظ بالروابط التاريخية وربط الماضي والحاضر والمستقبل بشكل يعزز من إنتاج نتائج تحمل معاني ذات عمق زمني. يمكن تحقيق هذا التواصل من خلال استخدام المعاني القديمة وإضافة معاني جديدة للواقع الحالي، مما يساعد في الحفاظ على اتصال مستدام مع التاريخ.(مهدي، 2008، ص 17)

ويشير(Colquhoun) إلى أن نسيج المدينة هو كتلة مستمرة في التحول، ويمكن تحقيق هذا التحول بعدة طرق. يمكن أن تكون الإضافات صغيرة، مثل إضافة بناية واحدة في موقع معين داخل النسيج الحضري القائم. ويمكن أيضا أن تكون الإضافات أكبر وأكثر تعقيدا، مثل إدخال تراكيب كاملة من مباني تمتد داخل النسيج الحضري الأصلي. بالإضافة إلى ذلك، يمكن أن يكون التحول أيضا على مستوى الحركة، حيث يتم إدخال مسارات حركة خطية تربط أجزاء مختلفة من المدينة مع بعضها البعض. (Colquhoun, 1975, p.6)

### 2-5 الانقطاع في البنية

يحدث الانقطاع نتيجة للتغيرات في الأفكار والأساليب المستخدمة في التصميم الحضري وكيفية التعامل معها. يمكن أن تتسبب الأفكار المتطرفة في اتخاذ قرارات

حاسمة واستبعاد جوانب أخرى، مما يؤدي إلى وقوع الانقطاع. وفي سياق الانقطاع، يمكن أن ينظر إليه على أنه لحن مضاد للحن الأساسي، حيث يتشابه معه في بعض الجوانب وفي الوقت نفسه ينفصل عنه. (الصفدي، 1996،ص6)

جاءت الحداثة في القرن العشرين لتجلب تغييرا جذريا في العقلية البشرية والفن والثقافة. فهي تقوم على العقلانية والعدمية، واعتمدت على الوضعية الفلسفية واللوح الأبيض كأيديولوجيا تميزت عن ما سبقها. أثر هذا التغيير الثقافي بشكل كبير على المدينة ونسيجها الحضري، مسببا تحولات جذرية في البنية الحضرية. (Venturi & Scott, 1972, p.311)

أشار(Lynch) إلى أن انقطاع البنية الحضرية يمكن أن ينشأ نتيجة فقدان الإحساس بالتوجيه، وهذا يؤثر بشكل سلبي على الشعور بالأمان في البيئة الحضرية. وبين أن العناصر الأساسية للبنية الحضرية مثل المسارات والعقد والقطاعات تشكل صورة ذهنية تعزز هذا الإحساس بالأمان. وأكد على أهمية أن يكون الإنسان جزءًا مكملًا في بيئته الحضرية، وأن تجاهل هذا الجانب يمكن أن يؤدي إلى الشعور بالعزلة والانقطاع البيئي. (Lynch, 1960, p.147)

في دراسته حول الانقطاع في البنية الحضرية للمدينة العربية، أشار (Masfer) إلى أن المشاكل والتحديات التي تواجه العمارة العربية المعاصرة والتصميم الحضري ناجمة عن المواقف المتطرفة. تتعامل تلك المواقف مع التوازن بين الموروث المعماري العالمي والمحلي، وهذا يظهر في توجهين متناقضين: التمسك بالتقاليد وثقافة التكيف مع الآخر مقابل التفرغ للذات. يتجلى هذا الانقطاع في التصميم الحضري في فقدان العمل المشترك وتجاوز نظامين حضريين مختلفين (التقليدي والمعاصر)، ويُعرَف هذا التفرق بـ "كسوف الحضارة" كما وصفه (Masfer). وأشار إلى أن هذه الظاهرة كانت ملموسة في المدن الإسلامية، حيث شهدت قطيعة عنيفة في الهيئة والهيكل والتوجهات بين التقاليد الإسلامية الناضجة والتأثيرات الاستعمارية ذات الأصل الغربي. أدى هذا التفرق إلى تفضيل العناصر المعاصرة على التقاليد القديمة، مما أسهم في تراجع المدينة التقليدية وقدرتها على البقاء في الزمن الحالي. (Masfer,1984,p.75)

### 3-5 التجزئة في البنية

أن تصميم البيئة العمرانية لا يمكن ان يشكل بمفرده، بل أن هناك التزامات اجتماعية وثقافية يجب أن تؤخذ بنظر الاعتبار، وهذه قد تغير من الأشكال والتقنيات الحتمية التي وضعت في الأساس (Chermayeff&Tzonis,1971,p.15)، فالتجزئة لها الأثر في محو القيم التقليدية، وكان لتشويه الصورة التقليدية للعمارة أو النسيج الحضري أثره في تقليص المعنى التاريخي للعمارة(Boyer,1996,p.41)، وقد أشار Hall الى وجود نوعين من التجزؤ، وهما:

الأول: يستجيب الى مفهوم فقدان التواصل والمعلومات وزوالها، حيث الأجزاء تتحطم ولا يمكنها تنظيم نفسها ضمن النظام او البقاء فيه لأنها لم تعد تعمل بكفاءة، وبالتالي فأن هذا النوع من التجزؤ يقود الى اللانظام.

الثاني: يستجيب الى النمو العضوي للنظام حيث يتغير بصورة تلقائية نحو زيادة التقسيم الى انظمة ثانوية التي بدورها تنقسم الى أنظمة ثانوية أخرى خاضعة الى مفاهيم التطور والتجديد، وقد تتحول الى أنظمة مختلفة الفعاليات وذات كفاءة أكثر، أي بمعنى اخر تحول النظام الأولي نتيجة للتحولات الداخلية التي تجري فيه باعتباره نظام حي A living system الى نظام متطور عن الأول. (Abel,1997, p.19)

أن كلاً من الفردية والتجزؤ حالتان متناقضتان لمفهوم ألتكامل بين العمارة المنفردة كجزء والنسيج العمراني ككل، وهذا بدوره يؤدي الى ظهور الفوضى والعناصر المتصارعة والمتضاربة في المدينة(Chermayeff&Tzonis,1971,p.43)، وبداية التفكك في النسيج التقليدي والعام للمدينة (Ibid,p.107)، وبالتالي فان كل ما يصنعه الانسان سوف يتحول الى حالة او محيط لا مكاني In no place reality يعكس خلو الانسان والفراغ الذي يعيش فيه (Ibid,p.95)، وقد أشار هايدكر الى أن مشاكل البيئة العمرانية المعاصرة المحيطة بالإنسان هي الوقتية Provisionality والازاحة Displacemen والفشل Failure والعزلة( Isoiation Sola-Morales,1997,p.64)، وأن نمو العزلة والتجزؤ والانفرادية في ثقافة المدينة تؤدي الى: (Chermayeff&Tzonis,1971,p.142)

- ثقافة عامة ضعيفة.
- أضعاف نسيج المدينة والبيئة العمرانية.

- اضعاف الاتصال الاجتماعي وبالتالي أحساس الأفراد بأنهم غرباء في المدينة التي يعيشون فيها.

## 6 – اسباب تشظي البنية الحضرية

تمثل اسباب ظهور التشظي في اغلب بلدان العالم مشكلة لازمت التغييرات التي طرأت على البنية الحضرية، ومنها:

### 6-1 اسباب تخطيطية وتنظيمية

#### 6-1-1 البنية التحتية

تمثل البنية التحتية الأساس الحيوي الذي يؤثر بشكل كبير على أداء ووظيفة المدينة. إنها عنصر أساسي لتشكيل وتطوير المدن، حيث يمكن أن يتسبب أي انقطاع أو نقص في أحد عناصر هذه البنية في تعطيل الحياة اليومية في المدينة. تُتميز البنية التحتية بنوعين من العناصر. (Rudoe,1972,p.123)

**عناصر اجتماعية:** تشمل المستشفيات، العيادات العامة، محطات الإطفاء، المؤسسات التعليمية مثل المدارس والجامعات، وغيرها من الخدمات التي تؤثر في جوانب الحياة الاجتماعية والصحية للمجتمع.

**عناصر فيزيائية:** تشمل أنظمة معالجة المياه، وشبكات الطرق والجسور، ووسائل النقل العامة، ومحطات توليد الطاقة الكهربائية، وأنظمة الصرف الصحي، بالإضافة إلى الموانئ البحرية والمطارات.

هناك تجدد في النقاش حول تشظي البنية الحضرية بسبب تفكك وتشتت شبكات البنية الحضرية، وهذا يُعزى بشكل رئيسي إلى ظاهرة "التمدن المنشق" في فترة الحداثة. في الماضي، كانت هذه الشبكات متكاملة تقنيا وهيكليا، وكانت تعتمد على ترتيب هرمي لأنظمتها، مع التحكم التقني والاحتكار. ولكن مع تقدم التكنولوجيا والاتصالات، تتداعى هذه الشبكات وتتجزأ. يقلل هذا التغيير من دور البنية التحتية ككيان متكامل مع الفضاء الحضري، مما يؤدي إلى إنشاء مجتمعات منفصلة مع تفكك البنية التحتية وتقسيم الخدمات

والوصول بشكل غير متكافئ. يظهر هذا في تفكك الشبكات المتقاطعة وتجزئتها، مما يؤدي إلى وجود حواجز فضائية تفصل بين الفضاءات والمستخدمين، وتؤدي إلى تقسيم الخدمات والتصميم الفضائي. يمكن أن يؤدي هذا إلى إنشاء مجتمعات مادية منفصلة مع نظم مياه وكهرباء واتصالات مستقلة ونظم مراقبة إلكترونية(Burgess,2000,p.11).

### 6-1-2 الابنية الشاغرة / المهجورة

عرفت (Susana Luisa) المباني المهملة، بظاهرة تشبه الامراض المعدية تسبب العدوى الحضرية اذ تبدأ في مبنى واحد وتنتشر في عدة مبان بسرعة مما يسبب تمزيق الانسجة الحضرية وفقدان الترابط والاستمرارية بين اجزائها، وتخلق الانقطاعات والاستهلاكات غير الضرورية للمساحات، فتوثر على العلاقة الايكولوجية المتوازنة في النسيج. (Luísa,2010, p.38-84)

أشار (Leah Marie Hollstein)، ان الأبنية الشاغرة /المهجورة، تؤدي الى تفكك وتجزأه الكتل الحضرية والاحياء فتؤدي الى فقدان التماسك ووحدة النسيج، وتخلق الثغرات البصرية في بنية الشارع والمشهد الحضري. وتؤثر المباني الشاغرة/المهجورة على الترسيم الفعلي والتعبير عن المجالين العام والخاص في المناطق الحضرية، باعتبارهما منطقتين متميزتين، فتكون المساحة او الفضاءات الناتجة عن سوء التعريف، بسبب المباني المهجورة غير مريحة بالنسبة للزوار والمقيمين، فتؤثر هذه المباني على ترسيم الحافات والحدود فتتراجع الحافات التفاعلية، وبالتالي يقل التفاعل والنشاط الاجتماعي، اذ تؤثر الشواغر عل القيم المكانية والتراثية في النسيج بسبب التدهور والاهمال الناتج عن هذه المباني التي تؤدي الى فقدان الاعتراف بفائدتها وقيمتها المحتملة للنسيج الحضري. ويؤثر هذا التدهور أيضاً على الاستعمالات المميزة في المنطقة وامكانيات تشغيل هذه المباني في المستقبل. وبالتالي تؤدي الى غياب الشخصية المميزة والطابع العام للمكان. (Hollstein,2014, p.81-88)

### 6-1-3 مفهوم المشهد المورفولوجي

يشير (Jacobs) بأن الظاهرة التي نعرفها بالتشظي الحضري ليست جديدة، ولكن في بداية القرن الواحد والعشرين، اتخذت هذه الظاهرة أشكالا ومعاني جديدة نتيجة للتحضر المتفرع (Suburbanization)والتحضر المتفكك (disurbanization) نتيجة للعوامل الاجتماعية والاقتصادية (Jacobs,2002,p.18). بالنظر إلى هذا التحول، لم يعد التشظي الحضري يصور عادة على أنه تجمع للشظايا في المدينة بل كان يصور كانعزال هذه الشظايا. في هذا النموذج الحضري ذي الكثافة المنخفضة، تزداد تباعد هذه الشظايا عن بعضها البعض بشكل متزايد. على سبيل المثال، تعد مدينة لوس أنجلوس مثالا على ذلك، حيث أشار (Fogelson) إلى تفككها المورفولوجي.

كما أشار كتاب اخرون الى وجود أسباب اجتماعية واقتصادية تعزى إليها عدم التكامل الحضري، ولوس أنجلوس أصبحت تمثل هذا التحول بشكل ملحوظ. وأشار(IonTeaford) الى ان هذه الظاهرة تاريخية ومستمرة، حيث يمكن رؤية التشظي الفضائي والاجتماعي كجزء من تطور المدن على مر الزمن. (Jacobs,2002, p.18)

### 6-1-4 ظاهرة العشوائيات والتجاوزات

يعد النمو العشوائي من اهم مشاكل المدن حاليا، حيث ان المناطق العشوائية هي المناطق التي تنمو وتنتشر بشكل مخالف للمعايير التخطيطية ونتيجة لكونها غير مخططة لذا فأنها تفتقد الى العديد من البنى التحتية والخدمات. ظهرت الكثير من الاخطار التي عانى منها المجتمع الحضري المحيط وسكان المناطق العشوائية انفسهم منها:

**أ-التلوث البصري والبيئي:** يحدث التلوث البصري نتيجة تغير استعمالات الارض لما هو محدد في المخطط الاساسي، فضلا عن الاضافات البنائية للوحدات السكنية، كالسلالم الخارجية، المسقفات واللوحات الاعلانية العشوائية مما شوه جمالية البيئة الحضرية. (الحنكاوي واخرون،2012،ص171)(الملا حويش،2010،ص10-12)

**ب-مشهد حضري كئيب،** والناتج عن جدران متهالكة وابواب ونوافذ مكسورة، فضلا عن فوضى تجاوزات الارصفة وسوء التخطيط والادارة، مما ادى الى تدهور النسيج الحضري. (الحنكاوي،ومحمود،2018،ص226)

**ج- الفوضى واللانظام**، ان مفهوم الفوضى واللانظام يأتي من خلال عدم تطبيق الانظمة والقوانين والتمرد عليها ومخالفتها. (علي،2016،ص41-43)

**د- الضغط المتزايد على خدمات البنى التحتية الاساسية الفنية والاجتماعية**، ونتيجة لتجاوز عدد السكان حجم المدينة اتضح القصور في توفير الخدمات بصورة كاملة للجميع، حيث الضغط على الخدمات يجعل من المدينة غير قادرة على القيام بوظائفها كمدينة.(النعيمي،2010،ص80)

### 6-1-5 التجاوزات في التشريع

تلعب قوانين التخطيط دورا حاسما في تحديد تنظيم المدينة من حيث استخدامات الأراضي، ارتفاع المباني، الكثافة، وتصميم الطرق والمشاة، وخصائص المباني ومواد البناء.

يظهر أن في المدينة العديد من المخالفات التنظيمية، والتي تتخذ أشكالاً عديدة يعود وجودها إلى أسباب ومصادر مختلفة، وتركت هذه المخالفات آثاراً سلبية بالطبع على بيئة المدينة العمرانية، وبالإمكان تلخيص الآثار ألسلبية للمخالفات على البيئة الحضرية فيما يلي:

- **الأثار الصحية والبيئية** المتمثلة بإزالة المساحات الخضراء امام وحول المنازل وتحويل المدينة الى منطقة خرسانية تؤثر بشكل سلبي على الصحة والبيئة. هذه الآثار تشكل تهديدا للتوازن البيئي، لذا ينبغي العمل على توفير مناطق خضراء للحفاظ على هذا التوازن.

- **الأثار الصحية والبيئية** تحدث نتيجة سوء الإضاءة والتهوية والتعرض المفرط للشمس بسبب عدم كفاية المساحات المفتوحة نتيجة دمج الأنشطة المختلفة واستخدام المناطق لأغراض غير مرخصة وغير متوافقة مع البيئة المحيطة، مثل تواجد مصنع للبلاط في منطقة سكنية.

- **الأثار النفسية والصحية** نتيجة ترك مخلفات البناء والأنقاض أمام منازل الجيران وإغلاق الشوارع بسبب تراكم كبير لمواد البناء.

- **غياب ألطابع المعماري** في المدينة حيث تفتقر إلى التوحيد في تصميم المباني والمظهر العام، وهناك نقص في اللوائح التي تحدد ارتفاعات المباني وتصميم واجهاتها، بالإضافة إلى نقص الضوابط المعمول بها في تنظيم المشهد الحضري للمدينة.

- **غياب ألطابع للنسيج العمراني في المدينة** بسبب تأثير التشريعات القديمة، وعدم وجود نظام واضح في تخطيط ألشوارع.

- **الأثار على تخطيط الشوارع** نتيجة التقسيم العشوائي للأراضي على تخطيط الشوارع يتجلى في عدم مراعاة التدرج الهرمي للشوارع (من الشوارع الإقليمية إلى الشوارع الرئيسية والتجمعية والمحلية) في بعض المناطق، وأيضا وجود شوارع متفاوتة في العرض في مناطق أخرى.

- **غياب الهوية والطابع الإسلامي للمدن** بسبب تأثير الأفكار الحديثة المستمدة العمارة الغربية.

- **الأثار الاجتماعية** وتظهر بوضوح من خلال فقدان العلاقات الجيدة بين المواطنين، وهذا يحدث بشكل خاص عند حدوث تعديات على الامتدادات الجانبية للعقارات أو تجاوز الجيران حدود البناء.

- **آثار اجتماعية** تظهر ذلك من خلال فقدان الثقة بين الجمهور والبلدية نتيجة عدم قدرتها على تنفيذ القوانين بفعالية، وكذلك بسبب فقدان الخصوصية للمنازل نتيجة التعديات غير المنظمة على المباني..(كوثر،2014،ص84)

### 2-6 اسباب تكنولوجية

إن تشظي المدن هو حالة مستمرة ناتجة عن عمليات النمو نتيجة لعدة عوامل اهمها التكنولوجيا الصناعية وتكنولوجيا المعلومات الاتصالات، ويختلف التشظي من مدينة الى اخرى بحسب خصوصية ألمجتمع والمدينة. إذ أدى التطور التكنولوجي في مرحلته الصناعية الى تشظي واضح لكل من شكل المدينة وبنيتها، إذ تحولت مراكز المدن التقليدية من التمركز الاحادي الى ألتوسع في الاتجاه الخطي، في حين أن مرحلة التطور التكنولوجي اللاحقة المتضمنة مرحلة المعلومات والاتصالات قد افرزت اعادة تكوين لمراكز متعددة أخرى ضمن المدينة وإعادة ضم وارتباط لاستعمالات الارض المتشظية بسبب المرحلة الصناعية الاولى، وبالتالي اصبحت المدن المعاصرة تتميز بما يمكن تسميتها بالمدن ضمن المدينة. واظهرت المراكز الجديدة في المدن المعاصرة الناتجة عن تقنيات المعلومات والاتصالات على انها مراكز إعادة ارتباط لاستعمالات الارض المتشظية بسبب الفترة الصناعية. (حسن،2010،ص 120)

### 3-6 اسباب اجتماعية وثقافية

يشيرEdwards)) الى التشظي الاجتماعي بأنه ميل المجتمع الى التشتت او الانقسام وفقدان حالة السلم المتماسك. ويشير إلى أن هذا التشظي يحدث على مستوى المناطق والمدن. وعلى مستوى المدن يجد أن الأجزاء المركزية من أوروبا لديها اندفاع إضافي نحو الرفاهية من خلال تمركزها في أوروبا وان الحافات تزيد الوضع سوءا بالنسبة لعدة مدن اخرى. وضمن المدن يستمر الانقسام الاجتماعي الطبقي على المدى الطويل. فهناك دائماً مناطق غنية في المدينة ومناطق فقيرة، مما يعكس تأريخ التطور الصناعي وامكانية الاغنياء على الشراء في مناطق ذات مناظر طبيعية جيدة وطرق نقل جيدة و مدارس جيدة ونوعية هواء افضل. كما ان هناك تشظياً اجتماعياً طبقياً ضمن الطبقة الواحدة في الاحياء السكنية أو القطاعات السكنية،إضافة الى التشظي الاجتماعي المألوف ما بين مختلف الطبقات. (Edwards,1991, p.349)

### 4-6 اسباب سياسية واقتصادية

ظهور المناطق المتهرأة لا تقتصر على مدن معينة، بل تظهر في مدن الدول المتقدمة والنامية، سواء كانت قديمة أو حديثة، صغيرة أو كبيرة. وان الخصائص الاقتصادية تعد من ابرز العوامل المؤثرة في نشأة وتطور ظاهرة التهرؤ في المدينة.

اشارت ألعديد من الادبيات إلى ان التدفق والتوطن للاستثمارات في مختلف المجالات، وعلى وجه الخصوص الاستثمارات العقارية التي من شأنها ان تساهم في تطوير أوضاع المراكز الحضرية التي تتواجد فيها، كما تساهم هذه الاستثمارات في زيادة الكفاءة وتطوير الخدمات والبنية التحتية، وكذلك توفير فرص العمل وتحسين المستويين الاجتماعي والاقتصادي للكثير من السكان، إلا أنه يواكب هذه الاستثمارات نشوء العديد من الضغوطات على التقدم العمراني في هذه المراكز العمرانية. (Sheng,2011)

أدى تدفق الاستثمارات وتوطينها إلى حدوث تغير جوهري في رفع معدلات النمو للمراكز الحضرية وتوسع عمرانها بطريقة فاقت كافة المعدلات التاريخية، وأدى ذلك الى حدوث تغيرات جذرية في تراكيب استخدامات الاراضي على مستوى معين لهذه المراكز. (Zhou, 2010)

نظـرا لطبيعة الانشـطة المرافقـة للاسـتثمارات والاحتياجـات المكانيـة المتعلقة بهـا، فقـد حـدث ارتفـاع متعاقـب فـي معـدلات الطلـب علـى الاراضـي على مسـتوى المراكـز الحضريـة لتلبيـة احتياجـات المشـاريع الاسـتثمارية السـكنية والخدميـة والصناعيـة مـن الاراضـي، سـواء مـن الاراضـي الجديـده، او اسـتبدال بعـض المناطق القائمة داخلها وعلى وجه الخصوص المناطق

## 7 – سياسات التعامل مع التشظي

غالباً ما تُفهم الشظايا Fragments على أنها نتاج التشظي Fragmentation الا ان الدراسات الحضرية المهمة قد ورثت قواعد قوية ومتطورة لفهم التحضر على انه تشظي، كما يتم استخدام الشظايا أيضا كأدوات سياسية. يتم استخدامها وتجديدها وتصبح أسلوباً لتسييس المدينة بطرق مختلفة، حيث ان السياسة الحضرية هي مجال واسع من العمل والخلاف. McFarlane,2018, p.2))

تعد نقاط المفاهيم الأساسية في التطوير الحضري هي اكتشاف الشظايا في أشكال متميزة من علاقة "الشظية الكاملة" Whole–Fragment. فالكل الذي ينتمي إليه الجزء في الاصل قد يكون أو لا يزال موجودا. وهذا لا يعني بالضرورة ان الاجزاء المقطوعة "مقطوعة"، فقد تم تصميم بعض الشظايا أو صنعها ليس بشكل كلي كامل، مثل بعض أشكال الكتابة أو الفن فتشكيلها يكون بشكل كلمات متقطعة ومتباعدة وفي الوقت نفسه تشكل جمعا واضحا ذا معنى.هذا يعني إن فكرة "الكل" حاضرة، حتى لو كانت خيالية وان الشظية يتم الكشف عنها في العلاقة بين الوجود والغياب. لذا فإن سياسات الشظايا الحضرية ليست ثابتة. McFarlane,2018, p.10–11))

**حيث أمكن تحديد ثلاثة سياسات للشظايا الحضرية:**

(McFarlane,2018, p.12–24)

**أولا – سياسة الاهتمام (الحضور)**: هي سياسة الجماعات الاجتماعية التي تعمل مع المباني او البنى التحتية او المؤن المجتمعية المتهدمة او غير الملائمة، تتضمن هذه السياسة ايقاعات الصيانة والارتجال، والتحسين التدريجي، والعمل القائم على النوع

الاجتماعي المتمثل في تجميع الاشياء معاً حتى يتم انهيارها. ينظر على انه العديد من المستوطنات العشوائية، تجبر الناس كل يوم على ادارة التذبذبات غير المؤكدة بين الممارسات المؤقتة والمتغيرة باستمرار من اجل تنفيذ سياسة الحضور هذه، وهي عملية تعلم حضري.

تتألف سياسة الحضور من الوكالات البشرية والمادية المفتوحة التي تتوسع وتضيق بشكل مختلف. نظرا لان الاحداث المختلفة "تتراكم" وتتم على بعضها البعض، لذا فأن الحضور يستلزم المراقبة والتدخل في كيفية تمازج وتعايش المسارات الاجتماعية او "التآزر". حيث يمثل الحضور الاسلوب المستخدم في كيفية الترابط والتشكيل والتعايش.

غالبا ما يتم تسييس الشظايا من خلال العمل اليومي المتمثل في الاهتمام بالأشياء الحضرية غير الملائمة. تتجلى سياسة الحضور بشكل واضح في اللحظات التي تنهار فيها المؤن الحضرية. فأن سياسة الحضور سياسة فوضوية و مؤقتة وفي الوقت الحالي، تنطوي على مجموعة من الفاعلين المحليين المتميزين.

يتم تطبيق سياسة الحضور من خلال تجديد المناطق الحضرية القديمة، عند تحسين المباني والبنية التحتية في المناطق القديمة للمدن. كما تستخدم الحكومات والمنظمات الدولية سياسة الحضور لإعادة تأهيل المستوطنات العشوائية، فضلا عن برامج التنمية المحلية، ويمكن ان تظهر سياسة الحضور من خلال اعادة تفعيل المساحات العامة بفعاليات فنية او مؤقتة تجمع الناس معا وتجدد حياة المدينة وتعزيز جودة حياة سكانها.

**ثانيا – سياسة الترجمة التوليدية:** هي عملية ترجمة الشظايا الى علاقات اجتماعية وسياسية جديدة، وهي ايضا شكل من اشكال المواجهة او المضي قدما. تستخدم الشظايا أحيانا كأدوات للنقد السياسي. او كمولدات سياسية، حيث الشظايا ليست مجرد اشياء ولكنها امكانات يمكن وضعها في استخدامات مختلفة واعطائها معاني مميزة.

لهذه السياسة عدة طرق منها: التمثيل الرمزي، حيث تأخذ جزءا من الصورة الرمزية، وتفصلها عن سياقها، وتعطيها معنى جديدا جنبا الى جنب مع الاجزاء الاخرى. أي تعمل على اعادة تجميع المعنى في علاقات جديدة، بدلا من التدمير. وبطريقة اخرى تمثلت بـ "نسج الشبكات من اجزاء السرد" في "انقاض المدينة"، وهي عملية التنقيب عن الاجزاء ثم اعادة تجميعها، او تفككها ثم اعادة تشكيلها في اجزاء. ان اعادة تشكيل الشظايا بشكل

ابتكاري يتم من خلال تحدي الطرق التي يتم بها تخزينها وتنسيقها والتعبير عن الشظايا الحضرية في سياق جديد للتعبير عن الاختلاق الحضري Urban Fabrication، ومحاولة ترجمة الشظايا واعادة تهيئة الظروف الحالية من خلال قوة التكثيف والنسج التاريخي.

يمكن تطبيق سياسة الترجمة التوليدية في تصميم مشروعات حضرية مبتكرة. على سبيل المثال، تحويل مساحات فارغة الى حدائق عامة تفاعلية او مساحات للفعاليات الثقافية. كما تستخدم بعض المدن الشظايا لإعادة تفسير المساحات الحضرية من خلال تحويل مواقف السيارات المهجورة الى مساحات فنية او ملاعب مؤقتة. اذ تمثل عملية اعادة تشكيل الشظايا بشكل ابداعي لانشاء علاقات اجتماعية وسياسية جديدة.

**ثالثا – سياسة المسح الشامل:** تركز هذه السياسة على المدينة كلاً بعيدا عن الجزء، حيث ان الشكلان الاولان من سياسات التشظي يميلان الى البقاء مع الشظايا، سواء من خلال الاهتمام بها او ترجمتها كأدوات سياسية، فان هذه السياسة تعالج الاحكام غير الملائمة من خلال الابتعاد عن الشظايا، وان تجاوز الشظايا يتطلب صراعات للتركيز على أراضي المدينة بالنظر إلى أن تجارب واحتياجات الناس تختلف جغرافيا ليس فقط بين المدن بل داخلها.

يتضح من ذلك بأن الشظايا لها أهمية خاصة في تجربة الحياة الحضرية وإيقاعاتها وسياساتها. وان جميع المدن مجزأة بطرق مختلفة وبدرجات متفاوتة، حيث التمدن المجزأ باقٍ مع إمكانات الأشياء المهملة والمكسرة وغير الكافية التي تنسج الحياة الحضرية والفقر وعدم المساواة، والتي تصبح منخرطة في العلاقات السياسية من أنواع مختلفة.

تتضمن تطبيق مبادئ المسح الشامل في التخطيط العام للمدينة، حيث يتم وضع استراتيجيات لتطوير المدينة بأكملها بناءا على احتياجات وتطلعات السكان. كما يمكن استخدامها لتوجيه الجهود والاستثمارات في تنمية المدينة بشكل عام مع التركيز على تحسين البنية التحتية والخدمات العامة. فضلا عن تقديم الخدمات العامة والتنظيم الاداري للمدينة، اذ تسعى هذه السياسة الى تحقيق التنمية المتوازنة والعادلة في المدن وتجنب التفرقة بين اجزاء المدينة.

# 8 - الاطار النظري المستخلص لتشظي البنية الحضرية

يستند الاطار النظري ادناه على ما تم طرحه في الادبيات السابقة ومن خلال جمع المؤشرات التي تم التوصل لها:

| المفاهيم المرتبطة بالتشظي | | اسباب التشظي | | سياسات التعامل معها | |
|---|---|---|---|---|---|
| | | المفردات الرئيسية | المفردات الثانوية | المفردات الرئيسية | المفردات الثانوية |
| التحول | التغيير (ضد الثبات) | تخطيطية وتنظيمية | البنية التحتية | سياسة الاهتمام (الحضور) | المجالس البلدية |
| | | | | | منظمات المجتمع المدني |
| | | | | | الدوائر البلدية |
| | | | الابنية الشاعرة والمهجورة | سياسة الترجمة التوليدية | اعتماد الشظايا بؤر للنمو والتطوير(اذ فيها امكانات تعزز عملية التطوير مع الحفاظ على مقومات البنية) |
| | | | | | تفكيك الشظايا واعادة تركيبها |
| | | | | | خلق مباني وفعاليات تساهم في ربط اجزاء البنية المفككة |
| التجزئة | الانقسام(ضد الاندماج) | | المشهد المورفولوجي | سياسة المسح الشامل | تتعامل مع البنية الحضرية ككل |
| | | | | | لا تتعامل مع الشظايا والاجزاء |
| | | | العشوائيات والتجاوزات | | اعطاء المخطط الشامل للبنية الحضرية |
| | | | التجاوزات في التشريع | | |
| الانقطاع | الانعزال التام | تكنولوجية | | سياسة الترجمة التوليدية | إعادة تجميع(أخذ جز ء وفصله عن سياقه واعطاؤه معنى جديدا جنبا الى جنب مع الاجزاء الاحرى) |
| | | | | | الحوار بين التفاصيل (الأخذ من الماضي الذي تم إهماله ووضعه في العمل المتضمن الماضي الحاضر) |
| | | اجتماعية وثقافية | | سياسة الاهتمام(الحضور) و المسح الشامل | تنظيم موجه نحو الداخل |
| | | | | | الاستقطاب الاجتماعي |
| | | | | | القوة البشرية والمادية |
| | | | | | التحسين التدريجي واعمال الصيانة |
| | | سياسية واقتصادية | | الاستثمارات العقارية<br>النظم السياسية والادارية<br>الجمعيات و المنظمات الدولية | |

## الاستنتاجات

- التشظي الحضري يمكن ان يسهم في تدهور البنية التحتية بما في ذلك الطرق والصرف الصحي.
- التشظي الحضري يمكن ان يؤدي الى تفكك الهوية الحضرية والتمييز بين مناطق المدينة.
- العمل على توجيه الاستثمارات والمشاريع التنموية نحو المناطق المهملة يمكن ان يعزز من توازن البنية الحضرية.
- تعزيز التعاون بين القطاعين العام والخاص يمكن ان يكون حلا للتغلب على التحديات المالية المترتبة على التشظي الحضري.
- الاستفادة من التكنولوجيا والاتصالات في تحسين ادارة المدينة وتقديم الخدمات بشكل فعال.
- تحسين الوعي المجتمعي بأهمية التخطيط الحضري المستدام يمكن ان يساهم في التقليل من تأثيرات التشظي.
- التحديات الامنية تزداد في المناطق المتشظية نتيجة لقلة الوجود الامني والفجوة الاجتماعية.

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11. Making deals with the property ownership in the city, as it causes environmental problems, able to be considered to be one of the thresholds for urban development in the city. It is essential to take the public interest into account, Above all, in the creation of towns appropriate for maintainable living, and to move towards mixed utilize at the buildings level.

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6. The city should increase its capacity to stabilize its EF, as well as the population's purchasing habits and lifestyle, to lessen its environmental impact. All news reporters should have access to the EF results. The work of significant tot methods in the estimating process of EFM, making the city sustainable, should be covered in an introduction guide.
7. Reducing foreign imports and promoting domestic goods financially and in the media will boost farming and industrial production, create more jobs, protect fertile land, and stop it from being put to use in a manner that is incompatible with other nearby uses.
8. Reducing reliance on fossil-fuel private automobiles and the C emissions they produce that are bad for the city's environment and people's health will be made possible by using public transportation, separating pedestrians from autos, and building rail and subway infrastructure.
9. Increase the clean energy use using wind power, the sun, and the ground. The roof of the buildings able to be utilized to put solar panels, the desert lands in the city able to be utilized to construct high wind turbines, and the exploitation of the heat of the ground. It should be considered that the Najaf city is hot and dry most of the year and this contribute to the use of technologies to extract energy stored in the ground. All these trends will reduce the process of electricity consumption and therefore preserve NR.
10. Modern approaches able to eliminate many environmental and urban problems.

Built-up area, EF, and CF are the mostly noteworthy factors which increase the EF because of our NR excessive use. The EF of the NG, measured using the operational framework, is 1,58 hs per person, which implies that there has been a significant tot loss of NR that has outpaced the land's biological carrying capacity. The presence of the highest EFs was observed in the research year, 2019, and it was evident from the land use scheme that there are numerous planning issues. This was accomplished through applying the extracted EF value to the image of the Najaf city within 3 timeframes, 2009, 2019, and 2030.

## 9. Suggestions

Considering the statistics included in this study, the researcher suggests few points as follows:

1. Rethinking the 2030 main plan for Najaf since it doesn't address the city's present issues.
2. Re-evaluating the legal authority for carrying out plans for urban development in the city that have an environmental component.
3. To solve the city's environmental and urban concerns, government institutions must implement the future possibilities that have been proposed throughout the research.
4. It is essential to use a collaborative method (group) when creating urban improvement plans, and then to offer them to academic institutes for feedback on the developed solutions.
5. It is good to encourage civil society organisations to host meetings or make use of social media to gather people's issues and viewpoints in order to gain from them. These groups, on the other hand, are built around promoting consumer culture toward NR.

The transportation issue was not addressed in the future master plan, and conventional approaches to road planning and design continued to resemble the existing old domestic neighbourhood's hierarchy. Besides, the absence of a sustainable design for the street basin, they neglected to account for the rise in the number of cars in the neighbourhood. The plan takes all of this into consideration.

## 8. Conclusion

Most government organisations employ the planning process, along with recurring reports and research, to address strategic issues. In the discipline of planning, whether urban, environmental, or regional, there is specialisation environmental dimension and a vision dearth. Utilizing contemporary technology to acquire descriptive, digital, and particularly geographical data (geographic data systems) that aids in improving the environmental issues monitoring and performance is one of the instruments for environmental planning.

Besides, the numerous components existence utilized in the EFM calculation i.e., C, agricultural land, pastures, forests, etc., there are numerous methods to gain the EFM for each stage (individual, city, or region).

The EFM analysis, which is entirely distinct from the environmental influence evaluation now utilised in the environmental evaluation of strategies, is involved with the identifying process of the human activities environmental effects on NR. A variety of other planning issues exist in the city of Iraq as a whole, including environmental degradation, resource decline, desertification, climate change, and other urban issues. These factors—the agricultural sector, urbanisation, rapid population expansion, and migration—all skew the city's EI.

Following the process of displaying all of the city's land use proportions during three phases and the EF generated by each of them, a comparing between the land use proportions will be made to understand changes in the environmental city reputation.

What were the causes of these changes, which in turn produced several urban and environmental issues that altered Najaf's perception of its environment?

Following making a compare between 3 elementary charts, in 2009, 2019, and 2023, significant tot points were observed.

These designs have the potential to significant totly alter residential, commercial, and green space use. Additionally, it was discovered that there are no locations specifically for house shopping and that commercial utilize of tape and large-scale utilize overlap in whole residential neighbourhoods and the areas around every neighbourhood. Additionally, it appears that few green spaces don't meet the needs for planting design, while others are soil spaces utilized for other things like playgrounds for kids or generator yards.

By 2030, the implementation of the future master plan, which was created in 2010, will have been complete. However, we discovered a signifiable tot number of violations in the land use plan in 2019—nine years after the intended plan was put into effect. In the Al-Barakya neighbourhood and in the vicinity of the Najaf International Airport, for instance, agricultural areas have been transformed into residential plots.

We also observe that, except for one section that was located directly in the southern part of the city, close to the current Najaf International Airport, further development has not been considered. They have also repeatedly failed for including the industrial zone in the plan's periphery.

**Table (3), The relative distribution of the area of land use in the Najaf city in 2019**

| Type of area | Existing value | Ratio value for each use | Footmark for each use |
|---|---|---|---|
| Residential | 2012.12 | 31.98 | 44.19 |
| Commercial | 342.71 | 4.98 | 7.65 |
| Green areas | 543.69 | 8.84 | 12.46 |
| Educational | 259.64 | 4.101 | 4.98.32 |
| Health | 31.95 | 0.69 | 0.86 |
| Religious | 16.32 | 0.53 | 0.42 |
| Industry | 132.23 | 1.89 | 2.99 |
| Roads | 1269.12 | 19.89 | 27.85 |
| Services | 385.32 | 5.89 | 7.89.22 |
| Special use | 1689.79 | 26.96 | 37.49 |

The main plan for the Holy Najaf city was made by the Lewin Diver (British company) in cooperation with the Engineering Consultants of Architectural Design Office for 2008-2023. Although the design was finished in the last 9 years, a big part of it has not been implemented due to many reasons. The estimated proposed land usage percentages for the Najaf city for the year 2030 are mentioned in the following Table (4):

**Table (4), The relative land area use distribution in the Najaf city for 2030**

| Land type | Plan for 2030 | Ratio value for each use | Footmark for every utilize use |
|---|---|---|---|
| Residential | 4743.23 | 27.46 | 41.36 |
| Commercial | 678.36 | 4.89 | 6.32 |
| Green areas | 2784.36 | 17.12 | 22.89 |
| Educational | 259.76 | 1.83 | 3.01 |
| Health | 31.95 | 0.69 | 0.86 |
| Religious | 164.13 | 1.01 | 1.26 |
| Industry | 1628.11 | 8.99 | 12.98 |
| Roads | 2469.12 | 16.01 | 23.09 |
| Services | 1241.23 | 6.88 | 11.06 |
| Special use | 2589.26 | 14.97 | 22.36 |

- Lewin Dever (British company), in architectural design office cooperation with the engineering consultancy, has also prepared a plan for 2030.

It will discuss 3 city EIs that are from 2009 and 2019 and the future image for 2030, after identifying the fundamental plans created for the Najaf city. We apply the amount of the EFM to the amount of usage for every period to reach a deeper understanding of environmental picture and its impacts.

In 2009, the Najaf city population is 521864 (Central Bureau of Statistics). The area city is 5891 h, whereas the density of population is 455.2 people / h.

Table (2) below displays the land use areas in h within the city in 2009.

**Table (2), The relative land use area distribution in the Najaf city in 2009**

| Type of area | Plan 1 | Percentage for each use | Fingerprint per use |
|---|---|---|---|
| Housing | 1856.72 | 41.00 | 52.86 |
| Commercial | 42.64 | 1.82 | 1.22 |
| Green areas | 329.59 | 5.81 | 8.97 |
| Educational | 239.64 | 5.32 | 6.56 |
| Health | 23.89 | 0.62 | 1.23 |
| Religious | 6.41 | 0.29 | 0.49 |
| Industrial | 141.20 | 2.99 | 3.99 |
| Public services | 465.31 | 8.99 | 12.95 |
| Special uses | 1056.23 | 21.63 | 31.84 |

The Najaf EF value is 1.58. By applying the land use percentage, the EFM of the city's master plan will be attained in 2009. Considering such, the EI will be analysed and the positive and negative influences will be assessed.

Statistical estimation mention that the Najaf city population as 7, 71279 in 2019 (Information published by the Central Statistics Bureau, 2019). Table (3) shows area of land use in Hs:

The CF, which accounts for 15.9% of the high environmental impact, is the final important factor. Because of the heavy reliance on fossil fuels, companies, residences, and car exhaust all contribute to the emission of emissions of C and gases to the surrounding atmosphere, which results in a wide range of environmental and health issues for both individuals and towns. The mostly detrimental fingerprints in the Najaf province are the footmark built-area, EF, and CF. They cause the city's environmental reputation to be distorted, whilst the other footmark had a smaller influence but produced numerous, unresolved issues. Such issues must be dealt with through sustainable environmental management on both a short-term and long-term basis.

## 7. Fundamental plans for the Najaf city

At the current section, the Najaf city EF amount (1.58) will be utilized and applied to all land utilizes in the city for 10 years (2009-2019) to analyse the environmental city picture and indicate the -ve and +ve the city’s image effects over that period.

The main plan outlines how the city will develop and evolve throughout time. The fundamental plan relies on the spatial and temporal dimensions, and it establishes how the land is utilized and distributed in space. There are few basic plans considered for the Najaf city:

- In 1958 AD, the first main plan has been made through a Greek company of planning named Doxiades.
- The plan was set up by the Commission of Urban Planning in Planning Ministry, following the creation of the NG, and making the city the centre of administration, was suggested for extending the city until 2000.

Thus, the city footmark f = 0.69*1462706=1009267.14 Considering the EFM indicators, the total EF = 2080 951.064 h/s. Dividing such by the total governorate population (2882400), we gain the EF of Najaf city which is mentioned in Table (1) below:

Built-up footmark =479%

**Table (1), The EF of NG in 2019**

| Element | Area (Hs) | Percentage % |
|---|---|---|
| Farming footmark | 142584.62 | 5.9 |
| Footmark as pastoral land | 18.99 | 0.002 |
| H2O footmark | 158576347 | 0,732 |
| Footmark as waste | 120,59 | 0,007 |
| Footmark as power of energy | 656,968.176 | 28.9 |
| CF | 336385. 22 | 15.9 |
| Built-up footmark | 1239268,12 | 47.9 |
| Print set | 2163854.125 | 100 |
| The footmark of individual in province of Najaf | 1,58 (per Person) | _ |

According to the conclusion, the value of the extracted EF for NG is 1.58 hs, as it is 1.82 hs for Iraq. It indicates that this percentage will increase over the future years and beyond the permitted international limit. "The built-up area" accounts for 47.9% of NG's EF, making it one of the most significant tot factors. It denotes the land resource overuse in terms of the fundamental design city's excesses and the disadvantages of its regular and uniform distribution of land use. The EFM increases by 28.9% after the (energy) footmark, which is what comes following. There are various causes for this, including the absolute reliance on one energy source for everyday needs and the absence of an electric energy consumer culture.

1 ton =1.8 hs and thus 0.075/1.8=0.041 footmark per a family Therefore, the footmark of the city:

0.041 h *292541 family = 11994.18 h

### 6.1.8 Oil footmark

The family's annual share of oil = 100 L/year.

The constants needed are as follows:

(Billion BTU/ tons of C) = 19.35

(BTU/gallon) =138700

The conversion from liter to gallon is = 200 / 4.5 = 44.4 gallon

The converting from gallon to BTU is 44.4 gallon*(BTU/gallon) 138700= 6158280, that is = 0.0061 billion BTU.

Thus, Area (hs) of emissions = (billion BTU/tones C) *19.95*0.0061 billion BTU= 1.21-ton C.

1 ton = 1.8 hs and thus 1.21/1.8=0.67 footmark for each family. Therefore, the footmark of the city:

0.67 h *292541 family = 196002.47 h

The final CF is equal to = gasoline footmark + fuel footmark + oil footmark

= 96538.53+11994.18+196002.47 = 304535.18 5 hs.

Whole CF =15.9%

## 6.2 Area as built-up

The footmark of the area as built-up in a city comprises the space occupied by businesses, buildings, and industrial facilities. Built-up area In NG is 20031.25 H/s. Individual footmark of average h = area as built up/ Governorate land area = 20031.25/2882400= 0.69 the individual footmark.

4.5 liters = 1 gallon, so from litter o gallon 1120, 56/4.5= 249. From gallon to BTU as follows:

249 gallons *125000 (BTU/GALLON) = 31125000 BTU =0.031125 billion BTU.

0031125*billion BTU* (billion BTU/tubes C=19.35) = 0.698 tons C.

1 tons = 1.8 hs thus: (0.698/1.8) =0.34 (City footmark)

City footmark = 0.33 hs * 292541 households =96538.89 hs footmark for each family.

### 6.1.7 Gasoline footmark

The average daily Gasoline consumption is 100 m3 =100 thousand L

Population served number = Population of governorate / household number as average: 2882400/5 = 292541 households.

Average car ownership is one car per a family. When the family daily share is 100000/292541 = 0.34 L/ day.

Annual gasoline share for every family = 0.34 L x 365 days = 124 L per a year.

For extraction a C emissions h from the annual consumption index gasoline, we will depend on few constants as following:

(Billion BTU/ tons of C) = 19.35, it is the constant utilized in conversion for obtaining the CO2 quantities.

(BTU/gallon) =138700, it is stable and is considered a unit of heat utilized to heat 1 gallon

124 / 4.5 = 27.5 gallon

The converting from gallon to BTU is 27.5 gallon*(BTU/gallon) 138700= 3814250= 0.0038 billion BTU.

Area (hs) of emissions = (billion BTU/tones C) *19.95*0.0038 billion BTU= 0.075-ton C.

It is common to estimate the annual tonnes of CO2 produced which able to be paired with tonnes of emissions from other fossil gases like nitrous oxide and methane. When calculating a CF, many factors are considered. For instance, transporting gasoline to a store uses up a lot of fossil fuels and emits greenhouse gases. Such store is powered by electricity and probably has its own C emissions. Likewise, the commodities in the shop have all been carried there so it is necessary to consider the whole C emissions.

Additionally, all of the berries, veggies, and meats that the store sells are grown and processed on farms using a procedure that releases 25 times as much CO2 greenhouse gas. Both of these elements must be included in order to fully account for the CF of a certain activity.

The consumption of gasoline: 900000 L

Population served number = population of governorate / household average number.

Number of populations served = 2882496/5 = 292539.

The average car ownership is one car per a family.

A family's daily ration: 900000/292541 = 3.48 liters per day

the family's annual share of gasoline: 3.48 liters x 365 days = 1120,65 liters/ year.

For extraction a C emissions h from the index annual consumption of gasoline, we need few constants:

The utilized constant in the conversion for obtaining the C CO2 quantities is BILLION BTU/TONES CARBP= 19.35.

The constant to be utilized as a standard unit when heating 1 gallon is BTU/gallon= 125000

specifically CO2, to draw attention to the issue and open the door for remedial action. Environmental problems such heavy urbanisation, agricultural activities, changes in land usage, or global or local farming practises have drastically reduced the ability of soil to absorb CO2 in several locations.

In 1999, the whole volume of the EF was about 6, 72 billion hs. The field comprises of 11, 4 billion hs (including land employed, plus future crops). The whole EFM was 13, 65 billion hs.

Along with the use of environmentally friendly technologies like solar and wind, increased growth of plant (sequestration) is one primary way that the EF is expanding. Similar to the oil footmark, the EF is a degree of change which is applied to organize collective intervention. This term has been quickly grasped by developing the meaning to the individual's perspective. Additionally, it supports collaboration and coalitions between various stakeholders in an effort to find novel, workable, and less trouble few solutions.

Total load for power in NG = (3555616) MB = 35555616000 Kilowatt hours.

To convert the electrical load into area (hs), it must be multiplied by conversion constant (0.000174), so 35555616000 × 0.000174 = 618679.286 hs (governorate).

The EF per capita footmark = 618679.286/ 1462706 = 0.42 hs per capita.

Energy power footmark =28.9%

### 6.1.6 C footmark (CF)

A CF is a measurement of the amount of greenhouse gases, primarily CO2 that one human action releases into the environment. A person, a family, an event, an institution, or even an entire behaviour of nation able to all is included in a CF measurement.

The following equation able to calculate the EF:

- the amount of daily water use and all uses x the total population of the study area x 365 days X 350 L X 1,462,726 Population =19686069169.
- For every million litters, 0.08 hs of space is needed 19686069169 /1000000 = 186860,9
- 186860,9 x 0.08=149480856 hs county EF for individuals = 149480856/14627.8 = 0.12
- Water footmark =0,732 %

### 6.1.4 Waste footmark produced

The daily waste production is 1 kg. Every 1 cubic meters of waste equals 450 kg. To obtain the waste fingerprint, we need the dependence on levels of consumption, annual waste production, and then it able to be measured in worldwide scale. The waste Footmark able to be measured as follow:

The daily waste amount production (kg per capita) × the total study area population = 1x365x1462709= 533887690 kg

Waste Footmark measured according to each cubic meter:

533887690/ 450= 1186417

every one h is equal to 100000 cubic meters. So:

the governorate of Najaf waste Footmark: 1186417/ 100000= 11869

Waste Footmark for individuals: 11869/1462709= 0.0000832

Waste footmark =0,007%

### 6.1.5 Energy Land footmark

The land measurement required for absorbing CO2 emissions is the energy footmark (EF). Such strategy focuses on the energy use effects,

The utilized equation for that is as follows:

- Average h = cereal crops production quantity / total governorate area = 22992898/2882419 =7.9

The following step is calculating the farming land footmark which is according to the proportion and ratio method, and such is done according to the following method:

- 2882422 hs (governorate area) * 22992898 tons (crop production) 7.896945059* X tons (consumption per capita per year) 0.08997 h= 0.0876
- Then such result multiplied by the population number in the city which is 1482708 = 139287,56
- The farming land footmark = 5,9%

### 6.1.2 Foraging land

Extensive pasture lands are there in the Badia, Najaf that had received no care, nonetheless are managed by the Nomads population of an area of 66,266 hs.

The EF is measured by the equation as follow: Average h = pastoral area / decertified land area

= 66266/3320= 16, 99.

Pastoral Land footmark =0.002%

### 6.1.3 The area of water space

The study will focus on the surface water of 18163075 hs needed to produce fish for human consumption in (Shatt al-Kufa and Bahr al-Najaf), mentioning that the daily consumption of water is 350 litters.

- NG population: 1462708 inhabitants
- The population of study area: 781386
- The population as urban: 71%
- The rural population: 29%

## 6.1 The EF in the Najaf holy city

At the current part, the whole governorate of Najaf area and the whole population of governerate is utilized to extract as indicators quantitative for obtaining the governorate's EFM. After applying these indicators scientifically, a proposal will be drawn up for the Najaf city fundamental plans to crystallise the EI for every city.

Elements of the EFM are exemplified in terms of farming land, rural land, H2O footmark, waste production footmark, C footmark, alternative footmark of energy, and built-up area.

### 6.1.1 The crop land analysis

The three main agricultural crops (rice, wheat, and barley) are widely grown in the province of Najaf, with annual production numbers measured in tonnes. The community of Najaf will determine the ecological agricultural yields impact according to knowledge of consumption.

The EF able to be measured with information as follow:

- Agricultural crop production: 22982898 tons
- Agricultural grains production exploited area: 98386.9 h
- Daily consumption rate per capita from the food group = 1989g / person / day, annually = 736589 g / person / year, i.e. 0.683726 tons per person in a year.

according to the national footmark utilizing the proportion between the locally set information and the similar nationally set information. This approach does not rely heavily on local information collecting, making it one of the easiest approaches for determining towns' EFMs. The following equation explains the combined approach for estimating the EFM as the ultimate footmark is generated from the estimate of the national footmark. (Vačkář, 2012).

- **Direct Method**: This approach is frequently utilized to estimate a company's, a household's, or an individual's EFM. The strategy makes use of information gathered from various consumer activity groups, and direct information collecting is not always possible. Therefore, it is unknown whether the direct method is employed to calculate towns' EFMs. However, a research firm in the UK known for its environmental effects and specialising in the measuring of the EF exists (Teixidó-Figueras & Duro, 2014).

## 6. Najaf city EF

NG is responsible in extracting the EF value as the essential information is available. The investigator made the use of few general indicators for boundaries explanation. The study information includes: The present NG administrative division comprises 3 districts: Al Manathira, Kufa and Najaf district centre. It also comprises of 9 sub-districts: Shabaka, Al-Haidariyah, Al-Qadisiyah, Al-Abbasiya, Al-Hurriya, Al-Mashkhab. In the following some information information about the city .

- area of Najaf province: 2882419 hs
- The study area: 6584 hs

## 5. How to estimate the EF?

The calculating methods of EF are Component method, Compound method, and direct method. They basically vary according to diverse information sources. Few towns in the EF research benefit from the mixture technique that mixes elements from few or all of the three methods (Wang, *et al.*, 2013)

- **Component method**: The Components Method, which uses a bottom-up methodology, is the best way to assess a city's or region's EF. It also covers any actions that are carried out in close proximity to and contact with the populace. Rather of adopting the economic model's commodity dynamics (Albarracin, 2017). Because of the connection between citizens' consumption behaviours and the availability of citywide consumption information, it is signifiable tot to note that the element technique is utilized in many towns. Depending on the circumstances in each city, each consumption component is described in greater detail. Numerous studies have employed particular sets of consuming components to simplify various products for calculation reasons (Zakari, *et al.*, 2012).
- **Compound method**: This method comes after the approach of Wackernagel and Rees, in which information is utilized for all produced commodities or exchanged. For instance, we gather information on the pine wood amount in USA, if it is imported or exported, and after that compute it’s EF. The same is true for whole other goods (Jiao, *et al.*, 2013). The footmark able to be predicted

Therefore, The EF basically determines supply and demand. It also determines the assets of ecology (assimilation biological volume or biologically fertile seas and land) which is essential for individuals to make services and the NR they rely on basis as regular, like vegetables, livestock, marine animals and wood) (Hoekstra, 2009).

The genetic footmark assesses the impact of trash in addition to the regions allotted for infrastructure (CO2 as a result from the process of incineration). Biological absorption capacity is utilised in the display process to keep track of the ecological resources that are available both locally and globally (Kratena, 2008).

### 4.3 The EF function

The EF able to also contribute to resources conservation and waste management as it able to be utilized to assess towns by comparing the ecological provided services with the demand intensity on the earth (Wackernagel, 2009). It as well aims to persuade officials and the public as general for incorporating accounting of environmente into their routine work so that the area able to continue to have a healthy, sustainable environment and a competitive, viable economy for a very long period (Solarin, *et al.*, 2019).

The EF is a global strategy which aims to keep the environmental resources that are accessible to people from excessive use, and it has the capacity to turn sustainability from an imprecise idea into a quantifiable goal. Applying these ideas is what EF aims to do to make towns environmentally sustainable. (Lustigová & Kušková, 2012).

decision on regional or local planning approaches that is additionally noteworthy compared to that only making instructive comparisons (Fiala, 2008).

## 4.2 EF components

A comprehensive EF Index key elements informationbase, as it comes in the following part, should be available for calculating the EF (Hopton & Berland, 2015).

- Land of energy: Woodland would be needed for removing CO2 emissions from energy of every person usage.
- Harvest land: the farmland required to grow the food that is consumed.
- Land of pasture: the area requisite for producing essential products for animals.
- Woodland: the area of forest requisite for producing paper and wood.
- Sea area: the sea area utilized for the production seafood.
- Built area: the area utilized as housing accommodation and infrastructure

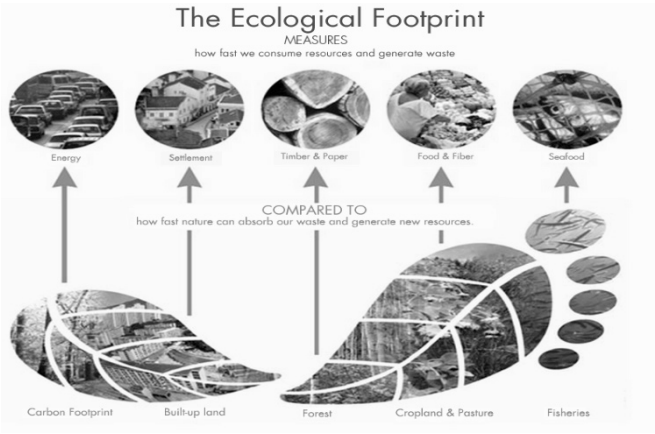


**Figure 1: the EF component**

## 3. What does this research focus on?

This study targets the following goals:

A. Developing a methodology to measure the EFM in towns, the Najaf city in particular.

B. Increasing the quality of modern life by the use of the EFM.

C. Suggesting feasible and cutting-edge approaches for enhancing the environment and the well-being of life in Najaf, with the help of one of the environmental planning techniques as a result of the abilities offered for producing the environmental town's image in Iraq.

## 4. Background

The purpose of employing the EFM, its elements, and the ways where the EFM able to be computed will all be covered in this part, which will also introduce the concept's key dimensions.

### 4.1 EF Definition

The EF is an indication of the how a specific people affect the earth and its systems as typical (Ismael, *et al.*, 2019). It demonstrates the point to which a nation's population's lifestyle is sustainable as well as the severity of its effects and harm to the environment (Wood & Garnett, 2009). The EF is a technique mathematically unique as it able to calculate the effects of humans on the ecosystem at whichever magnitude (Santoso & Aulia, 2018).

Fingerprints are able to be measured for people, firms, towns and states, and then compare the findings across these metrics and places (Ding & Peng, 2018). The EF able to also be utilized as a tool for assisting local makers of

2016). Having that said, politicians will be able to assess a community's environmental impact using EF information and compare it to the environment's capacity to recover (Scotti , *et al.*, 2009) .

With the help of these studies we able to work on ecological effectiveness, identify the impediments to ecological load decline and see the progress attained in sustainable approaches (Scotti, *et al.*, 2009). Therefore, the EF is able to be utilized to assess the practicality of theoretically useful proposals and lead to creating applicable methods and scenarios (Siche, *et al.*, 2008).

Due to a variety of factors, such as the world's rapid population growth, we are currently experiencing several environmental repercussions in metropolitan areas (Hopton & Berland, 2015)., as reported by the United Nations Population Division, 54% of the population of the world resided in areas being urban in 2016. By 2020, Ministry of Planning projects that there will be 40 million people living in Iraq (Ding & Peng, 2018).

According to the survey, 30% of Iraq's people live in rural areas, compared to 70% in metropolitan areas (Lee & Peng, 2014). Because of this, towns produce several indications of natural resource high levels use, and decisions made by urban should be ready to deal with and detect such repercussions of the environment (Wiedmann & Barrett, 2010).

## 2. Barriers

The failure to embrace indicators of the environment (such as the EF) throughout the urban growth procedure of towns resulting in a loss in the offered urban services functional effectiveness and, as a result, distorts the city's environmental reputation.

## 1. Introduction

The (EF) is an accounting as a biomass-based approach designed for tracking human demand for fundamental services of nature and their availability as a critical service for the environment (Petric, 2004). The main goal of such accounting approach is to provide a standard for evaluating the strain that humans place on the environment and their applicability to a range of goods globally (Xie, *et al.*, 2014).

Basically, it enables consumers to comprehend the regional resource market and investigate how it affects the worldwide sustainability issue. Finding a style of living that works for everyone while preserving the resources of the world is what is meant by sustainability (Wang, *et al.*, 2007).

When it comes to urban environments, it is essential to create a healthful relationship between towns and the planet (Santoso & Aulia, 2018). Although all towns have been prospering so far, they have been deteriorating the survival climate too. This is only feasible because of the historical EF expansion, the surrounding area where towns produce the energy and gather the contaminants and garbage of their own (Syrovátka, 2020).

Since the NR is limited, there is a need to expand the environmental development consideration through speeches on environmental preservation and cover the entire field which is presently around areas being urban (Fiala, 2008).

With the current climate warming, the concept of EF becomes increasingly crucial. By explaining the components in a transparent and ecologically sound manner, sustainability able to be achieved (Yao, *et al.*,

**المستخلص**

البصمة البيئية (EF) هي واحدة من أحدث وأهم المعايير لتقييم قدرة السكان على الحفاظ على نمط حياة مستدام. تقيم إلى أي حد لديها المؤشرات تأثيرًا على الموارد الطبيعية (NR) للنظام البيئي مثل الغابات، وأجسام المياه، والأراضي الزراعية، والمراعي، وثاني أكسيد الكربون، والممتلكات لأغراض البناء.

تم استخدام هذه البصمة لتقييم استخدام الموارد الطبيعية لسعة الأرض للتجديد. يناقش هذا البحث الجزء النظري التصوري لإطار البصمة البيئية والخطط المتعلقة بقضايا البيئة. يتم تسليط الضوء أيضًا على عملية تجسيد الصورة البيئية في هذه الدراسة. يعتبر التقييم العلمي للبصمة البيئية (EFM) لمحافظة النجف (NG) تمثيلاً للجانب العملي.

أدت تطبيقات البحث إلى اكتشاف أن لدى كل فرد في NG تأثيرًا بيئيًا بحجم 1.58 هكتار. يعتبر هذا القيمة تطبيقًا لتصور النجف في عام 2006 والوضع الحالي في عام 2019 خطوة تالية.

تم تقييم الخطة الرئيسية لمدينة النجف لتأثيراتها المحتملة على البيئة حتى عام 2030. الهدف هو تقليل البصمة البيئية للنجف في السنوات القادمة وتعزيز سمعتها البيئية بالإضافة إلى البحث في المواقف المستقبلية المحتملة.

**الكلمات المفتاحية : البيئة ، البصمة ، التأثير ، الإستدامة .**

## Abstract

TheEcological Footmark (EF) is one of the utmost recent and important criteria for assessing the capacity of the population to uphold a life sustainable way. It tests the extent which the indicators have an influence on the natural resources (NR) of the ecosystem such as forestry, water bodies, agricultural lands, pastures, CO2, and properties for construction purposes. This footmark was utilized to evaluate the use of NR to the capacity of the land for regeneration. This research paper discusses the theoretical conceptual component of the EF framework and plans regarding issues related to the environment. The environmental image (EI) crystallizing process is also highlighted in this study. The scientific assessment of the environmental footmark (EFM) of the Najaf Governorate (NG) serves as a representation of the practical aspect.

The application of the research led to the finding that each person in the NG had an environmental impact of 1.58 hs. Such value of application to the Najaf perception in 2006 and the current situation in 2019 is the following step. The main plan for Najaf city has been evaluated for its potential effects on the environment up to 2030. The goal is to lessen Najaf's environmental imprint in the following years and to enhance its environmental reputation in addition to researching potential future situations.

**Keywords: Environment, Footmark, Effect and Sustainable .**

# Environmental Footmark and Its Effects on the Sustainability of Towns

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# البصمة البيئية وأثرها على استدامة المدن

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intervention, and improved outcomes. When these models are implemented into clinical practice, there is potential for more individualized treatment and ultimately lessened the burden of gestational diabetes on the mother and the child.

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## 6. Conclusions

Artificial Neural Networks (ANNs) for the diagnosis of gestational diabetes in early pregnancy are a useful technique for accurately assessing the risk of prenatal diabetes mellitus (GDM). Different clinical, demographic, and laboratory data may be used with ANNs to generate prediction models that might be used to identify women who have a high chance of developing GDM.

The studies covered here demonstrate how effectively ANN models complement our method for determining GDM risk. These models' exceptional accuracy has allowed for early therapies, customized care, and improved monitoring of expecting moms. Artificial neural networks (ANNs) hold great potential for enhancing GDM therapy in general and early intervention strategies in particular.

Artificial neural networks (ANNs) have various advantages when it comes to early pregnancy gestational diabetes risk assessment. Because these models can handle complex and non-linear interactions between risk factors and outcomes, better prediction accuracy may be achievable. Because they can incorporate a range of features and adapt to changing input patterns, ANNs are robust and adaptive.

However, there are still several problems in this study that need to be fixed. Large and varied datasets are necessary for the generalizability and reliability of the ANN models, as is external validation. Additional hyper parameter tweaking and feature finding for additional optimization and refinement are also necessary to improve the models' performance.

Finally, employing ANN to identify gestational diabetes risk early in pregnancy shows great potential. With further research and refinement, ANN models may help women at risk of GDM with early identification,

Overall, this approach combines training, evaluation, validation, and performance assessment to develop an ANN-based system for risk detection of gestational diabetes, providing a better understanding of the disease and its predictive capabilities.

However, when compared to the results found in the other academic articles evaluated in Table (3) below, the first instance's results from the suggested approach demonstrated a greater caliber of excellence.

**Table (3) Comparison between Proposed Methods and Previous Researches.**

| Study | Methodology | Accuracy |
|---|---|---|
| Watanabe, *et al.*, (2023) | SVM | 97.4% |
| Wu, *et al.*, (2021) | Proposed accurate methods for GDM prediction in first trimester | 96.1% |
| Malhotra, *et al.*, (2020) | Developed an ANN model using factors such as age, BMI, etc. | 98.6% |
| Li, *et al.*, (2019) | Developed an ANN model based on maternal features, etc. | 97.9% |
| Wang, *et al.*, (2018) | Used an ANN model with demographic, clinical, and biochemical variables | 95.6% |
| Yildirim, *et al.*, (2017) | Utilized an ANN model based on clinical and demographic characteristics | 98.4% |
| Our method* | Using ANN | 100% |

visualizing important features or variables contributing to the risk detection. This can provide insights into underlying factors associated with gestational diabetes. Table (2) illustrated the initializing input data normalization.

**Table (2) Represent Initializing Input Data Normalization.**

| Epoch | Iteration | Time Elapsed (hh:mm:ss) | Mini-batch Accuracy | Validation Accuracy | Mini-batch Loss | Validation Loss | Base Learning Rate |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 00:00:09 | 11.00% | 21.00% | 3.2582 | 2.5465 | 0.0010 |
| 20 | 20 | 00:00:44 | 98.00% | 100.00% | 0.0540 | 0.0011 | 0.0010 |

Where:

**Epoch: During the training phase, each epoch denotes a full run of the whole dataset. Epoch 1 and Epoch 20.**

**Iteration: The quantity of mini-batches processed in a given epoch is referred to as an iteration. Iteration 1 and iteration 20 .**

**Time Elapsed (hh:mm:ss): This column shows the time needed to complete the related epoch or iteration.**

**Mini-batch Accuracy: It is a measure of how well the ANN predicted the mini-batch of data during training.**

**Validation Accuracy: On a different validation dataset, it shows how accurate the ANN's predictions were. This aids in assessing the model's generalization performance.**

**Mini-batch Loss: It shows the mistake or loss that was determined when training on the mini-batch of data. Usually, backpropagation is employed to update the ANN's weights after this loss.**

**Validation Loss: It displays the error or loss that was determined using the validation dataset. In order to avoid overfitting and to keep an eye on the model's performance during training, this loss is employed.**

**Base Learning Rate: It stands for the training process's applied learning rate. The step size at which the weights are changed during backpropagation is determined by the learning rate. While a lower learning rate might result in longer convergence but greater accuracy, a higher learning rate can lead to faster convergence but run the risk of overshooting the ideal answer.**

Overall, this figure 2 provides useful information about the training progress of our proposed classification model. It shows that the model is converging to a good solution with low training and validation losses and high accuracy. It also shows that the learning rate is decreasing over epochs.

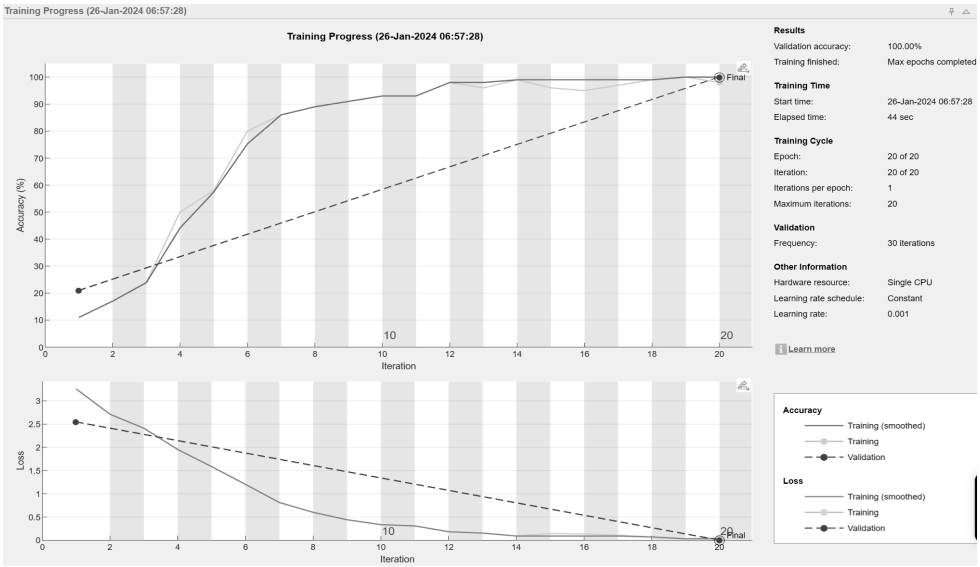



**Figure 2: Training Progress Plot**

## B. Validation and Improvement:

The trained model is validated using techniques like cross-validation to assess generalizability and identify overfitting or under fitting issues. Hyper parameter tuning can be performed to enhance model performance. The performance of the ANN model is compared with other existing models or standards, considering metrics like accuracy, sensitivity, specificity, and AUC-ROC curve, to determine its effectiveness in detecting gestational diabetes risk. The final step involves interpreting the results of the ANN model and

because of the low rate of learning, but it finally converges. A faster pace of learning encourages learning even though it might not converge. Usually, it is suggested to take your time studying. The number of periods indicates how many times the entire training set is transmitted to the network during training. The accuracy of the micro-batch reported during training has a positive correlation with the accuracy of the micro-batch stated at the given iteration. Iteratively generated averages do not represent running averages. The method splits the entire data set into several small groups while using momentum training and random gradient descent (SGDM). For each small batch, network gradients are computed during iteration. Every imaginable little impulse that might be felt has a time component. Even if the error is estimated for each image in the training dataset, the model is not changed until all training images have been examined.

## A. Training Progress Plot

1. **Training and Validation Losses**: This subplot shows the training and validation losses over epochs. The training loss is the error between the predicted class and the actual class for the training data. The validation loss is the error between the predicted class and the actual class for the validation data. The goal is to reduce both the training and validation losses as much as possible while avoiding overfitting.
2. **Training and Validation Accuracy**: This subplot shows the training and validation accuracy over epochs. With respect to the learning rate shown in this figure, the learning rate is typically decreased over time to help the model converge to a good solution.

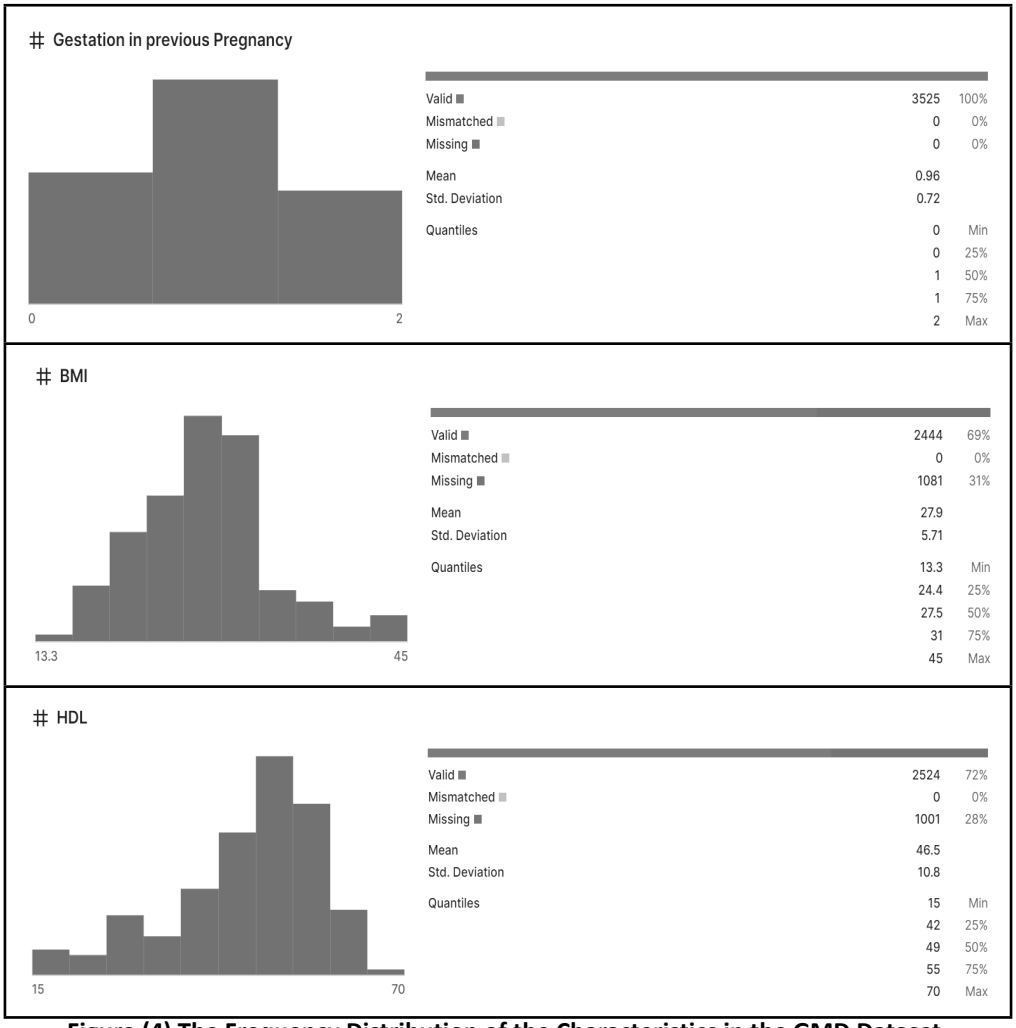


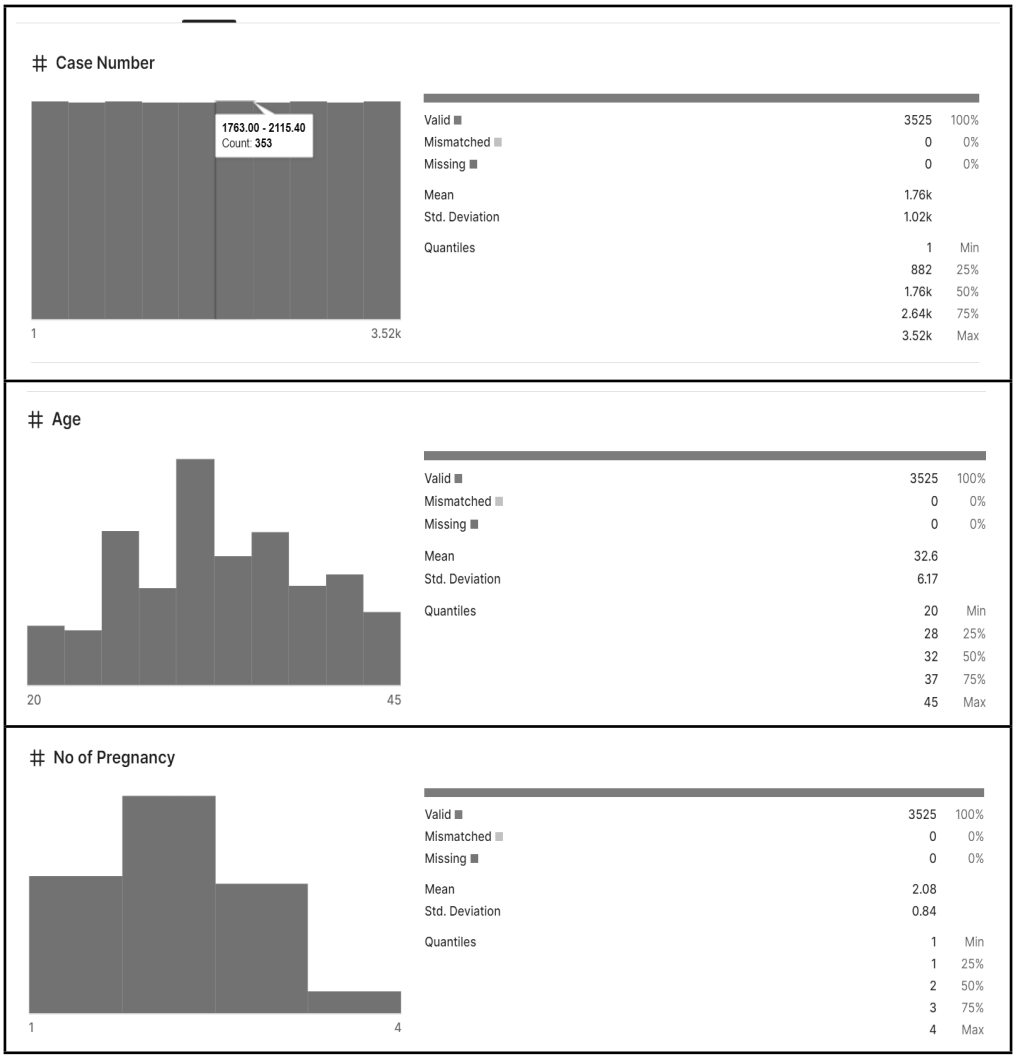

**Figure (4) The Frequency Distribution of the Characteristics in the GMD Dataset.**

## 3- Evaluating the Results of the Model

Use standard metrics to determine an item's performance value. The factors known as hyper-parameters have an impact on the network's architecture and training process. The learning rate affects how quickly network parameters may be modified. The learning process slows down

**Table (1) Data Set Description**

| Description | Value |
|---|---|
| Number of instances | 3525 |
| Number of features | 15 |
| Number of classes | 2 |
| Number of sample 0 | 2153 |
| Number of sample 1 | 1372 |



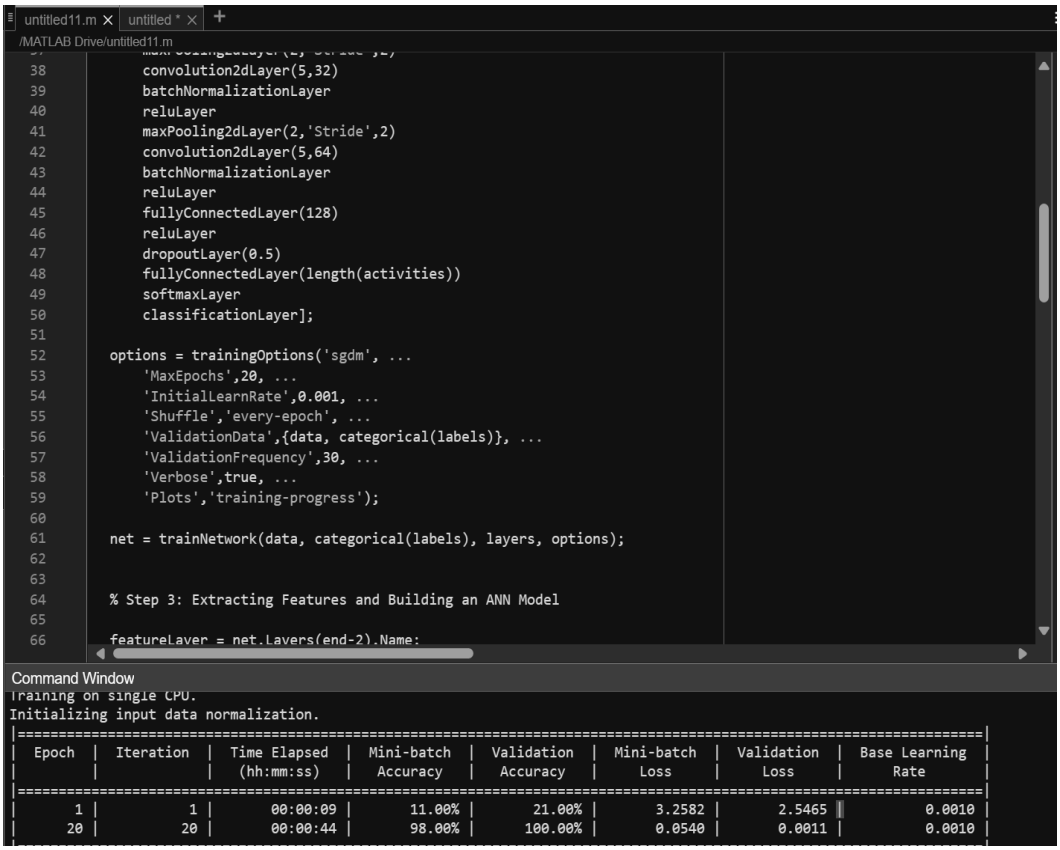



**Figure (8) Displays the MATLAB Program Screen.**

2. **Stander Dataset**: The GDM dataset that the researchers created was used to experimentally validate the ANN model that was presented. There are 15 characteristics present in a total of 3525 occurrences. The collection also includes a pair of class labels. In particular, class 0 comprises 2153 occurrences, whereas class 1 comprises 1372 instances. The dataset's relevant information is displayed in Tabel 1. The frequency distribution of the characteristics in the GMD dataset is displayed in Figure (9).

E. **Model Training**: An ANN model is trained using pre-processed data selected by features. This involves feeding input data through the network and adjusting the neurons' weights and biases using optimization techniques such as backpropagation. The training process aims to reduce the error of the model or the loss function to make the correct decision whether the pregnant woman has gestational diabetes or not. In this model, about 70 % of Dataset was trained and 30% of the system was tested.

## 5. Experimental Results

The effectiveness of the proposed approach was verified through extensive experiments using datasets collected from a group of pregnant women in Iraqi Kurdistan.

Evaluation metrics such as accuracy, false positive rates, and detection rates are used to evaluate the performance of a system. The results show the superiority of the artificial intelligence-based approach to detecting gestational diabetes, whether it is present or not, as shown below:

1. Computing platforms: In our experiments, we implemented the entire gestational diabetes risk detection in early pregnancy based on artificial neural network using Huawei PC, which has a 1st generation Intel(R) Core (TM) i7-1165G7 @ 2.80G processor. 2.80 GHz and 16 GB RAM. For training and testing learning models, we use a MATLAB system implementation. Figure (3) displays the MATLAB program screen.

tics are most helpful in forecasting the risk of gestational diabetes may be through statistical analysis, domain expertise, or unique engineering approaches.

D. **Model Architecture Design**: An ANN model is designed, specifying the number and type of layers, the number of neurons in each layer, and the activation functions to be used. The structure can vary according to the specific requirements and the complexity of the problem facing us in detecting whether a pregnant woman is infected or not as shown in Figure (7) represent of diagram aarchitecture of ANN in this project.

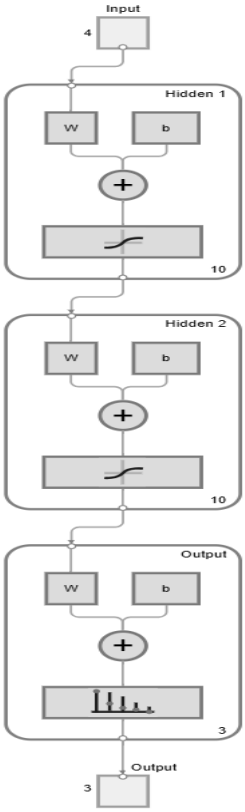



**Figure (7) Diagram Architecture of ANN in this Project**

A. **Data Collection**: Relevant data are collected from pregnant women, including demographic information, clinical characteristics, and laboratory test results. This data serves as a basis for training and testing the ANN model. In this research, the dataset was obtained from laboratories in Iraq and the Kurdistan Region, which collected information from pregnant women with and without diabetes, and training data for the models was collected from public and private laboratories in the Kurdistan Region of Iraq. The dataset included 3525 conditions and seven attributes. It can be accessed at *https://ieee-dataport.org/documents/gestational-diabetes*. A sample of gestational-diabetes dataset is shown in Figure (6).

| Case Number | Age | of Pregnain previous | | BMI | HDL | mily Histo ined pren ild or Birth | | | PCOS | Sys BP | Dia BP | OGTT | emoglobi entary Life? rediabete el(GDM /Non GDM) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 22 | 2 | 1 | | 55 | 0 | 0 | 0 | 0 | 102 | 69 | | 12 | 0 | 0 | 0 |
| 2 | 26 | 2 | 1 | | 53 | 0 | 0 | 0 | 0 | 101 | 63 | | 12.4 | 0 | 0 | 0 |
| 3 | 29 | 1 | 0 | | 50 | 0 | 0 | 0 | 0 | 118 | 79 | | 14.3 | 0 | 0 | 0 |
| 4 | 28 | 2 | 1 | | 51 | 0 | 0 | 0 | 0 | 99 | 70 | | 15 | 0 | 0 | 0 |
| 5 | 21 | 2 | 1 | | 52 | 0 | 0 | 0 | 0 | 116 | 65 | | 15 | 0 | 0 | 0 |
| 6 | 29 | 2 | 1 | | 51 | 0 | 0 | 0 | 0 | 98 | 63 | | 15.2 | 0 | 0 | 0 |
| 7 | 26 | 2 | 1 | | 51 | 0 | 0 | 0 | 0 | 94 | 68 | | 15 | 0 | 0 | 0 |
| 8 | 27 | 1 | 0 | | 52 | 0 | 0 | 0 | 0 | 116 | 63 | | 12 | 0 | 0 | 0 |
| 9 | 26 | 1 | 0 | | 57 | 0 | 0 | 0 | 0 | 108 | 62 | | 14 | 0 | 0 | 0 |
| 10 | 21 | 2 | 1 | | 52 | 0 | 0 | 0 | 0 | 98 | 78 | | 13 | 0 | 0 | 0 |
| 11 | 21 | 2 | 1 | | 56 | 0 | 0 | 0 | 0 | 100 | 76 | | 14 | 0 | 0 | 0 |
| 12 | 26 | 2 | 1 | | 50 | 0 | 0 | 0 | 0 | 110 | 68 | | 13 | 0 | 0 | 0 |
| 13 | 27 | 2 | 1 | | 55 | 0 | 0 | 0 | 0 | 105 | 61 | | 13.6 | 0 | 0 | 0 |
| 14 | 25 | 2 | 1 | | 58 | 0 | 0 | 0 | 0 | 106 | 80 | | 15 | 0 | 0 | 0 |
| 15 | 22 | 1 | 0 | | 53 | 0 | 0 | 0 | 0 | 109 | 61 | | 15.9 | 0 | 0 | 0 |

**Figure (6) Sample of Gestational-diabetes Dataset**

B. **Data Pre-processing**: To make sure the data is high-quality and appropriate for ANN modelling, it is pre-processed. In this stage, missing values are handled, the data are normalized or standardized, and categorical variables are coded if needed.

C. **Feature selection/extraction**: Relevant characteristics are chosen or extracted from the pre-processed data in this stage. The best way to ascertain which characteris-

The group of transfer functions that are employed to produce the intended result is referred to as the activation function. Although the activation function can take on various forms, it mostly refers to sets of linear or non-linear functions. Tan hyperbolic sigmoidal activation functions, Binary, and linear activation functions are a few of the often utilized sets of activation functions.

## 4.Methodology

The methodology for detecting gestational diabetes risk in early pregnancy based on artificial neural networks (ANNs) typically involves several steps, including data collection, preprocessing, model training, and evaluation. The following is an outline of the methodology as shown below in Figure (5):

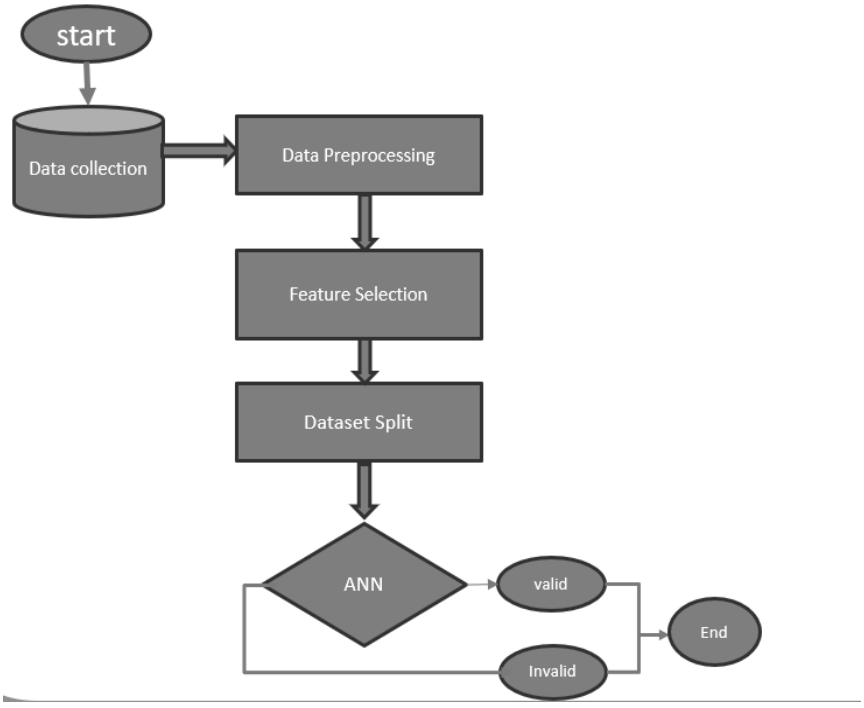



**Figure (5) Structure of Proposed Model of Gestational Diabetes Risk in Early Pregnancy on ANN**

An ANN's operation is explained in simpler terms by the previously described equations (1) and (2). In actual use, artificial neural networks (ANNs) may contain more complicated equations, several layers, elaborate structures, and a range of activation functions. But the underlying ideas of input, processing, and output do not change. Figure (4) display the artificial neural networks architecture of ANN.

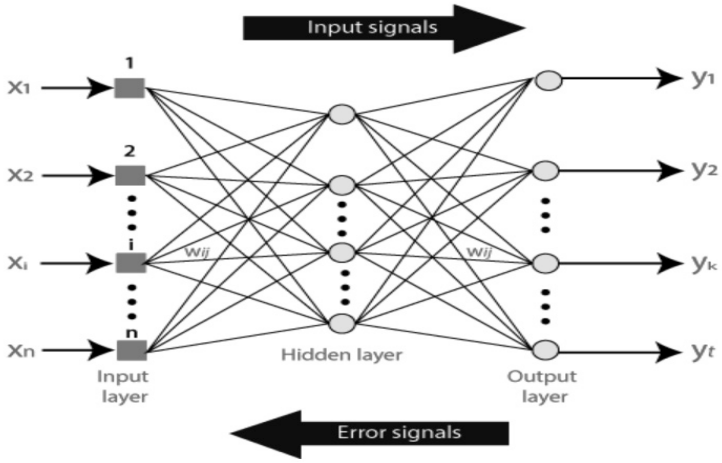



**Figure (4) Artificial Neural Networks Architecture**

Each input is then multiplied by the appropriate weights after that ( these weights are the details utilized by the artificial neural networks to solve a specific problem ). Generally speaking, these weights typically indicate how strongly the neurons inside the artificial neural network are connected to one another. Within the computing unit, each weighted input is compiled.

Bias is introduced to the output to make it non-zero or to anything else to scale up to the system's reaction if the weighted sum equals zero. Weight is equal to 1, and bias has the same input. In this case, the total weighted inputs may fall between 0 and positive infinity. Here, the sum of the weighted inputs is fed through the activation function, and a certain maximum value is benchmarked to maintain the response within the bounds of the intended value.

2.**Processing**: All during the processing stage, the input values are changed and sent throughout the network using a combination of weighted connections and activation functions..

a. **Weighted Connections**: Every neural connection, regardless of degree, has a certain mass. These weights determine the strength of the link and indicate the importance of the input. The following layer calculates the weighted sum of inputs for each neuron.. Mathematically a neuron j in layer L's weighted sum (z) may be computed as I:

$$z_j^L = \Sigma(w_{ij}^L * a_i^{(L-1)}) + b_j^L \quad \ldots(1)$$

Here, w_ij^L represents the weight between neuron i in layer L-1 and neuron j in layer L, a_i^(L-1) is the activation value of neuron i in layer L-1, and b_j^L is the bias of neuron j in layer L.

b. **Activation Functions**: The weighted sum is then passed through an activation function, which introduces non-linearity to the network. Common activation functions include sigmoid, ReLU, and tanh. The activation function (a) for a neuron j in layer L is calculated as:

$$a_j^L = f(z_j^L) \quad \ldots(2)$$

**Here, f represents the activation function.**

3.**Output**: The output layer of the ANN produces the final result based on the data that has been processed from the previous layers. The activation levels of the neurons in the output layer indicate the expected values or classifications.

Throughout the training phase, the ANN adjusts the weights and biases to minimize the difference between its intended and predicted outputs. This adjustment is accomplished using optimization techniques like gradient descent, which compute gradients and change the weights and biases accordingly.

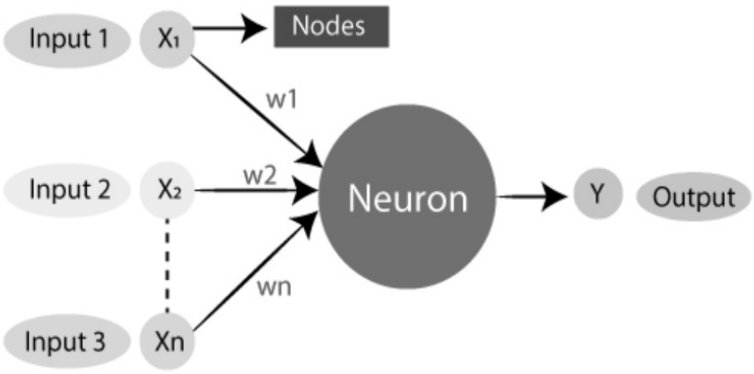



**Figure (2) Artificial Neural Network Diagram.**

Three layers make up an artificial neural network in its entirety. Figure (3) represents the layers of ANN:

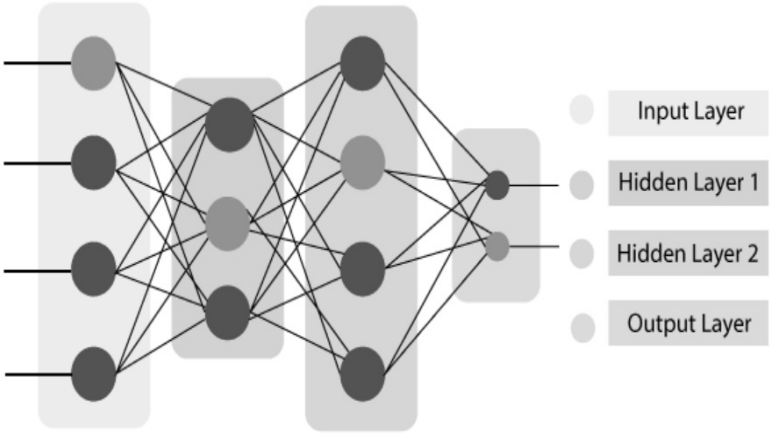



**Figure (3) The Layers of ANN**

1.**Input**: The input data, which can be either a vector or a matrix, is sent into the input layer of the neural network. Each input is given a numerical value, which is subsequently sent to the layer below.

models in clinical practice, as well as to test and optimize them on larger and more varied datasets.

## 3. Artificial Neural Networks (ANNs)

A branch of artificial intelligence that draws inspiration from biology and is based on brain modeling is known as artificial neural networks. Generally speaking, an artificial neural network is a computer network that is modeled after the biological neural networks that give the human brain its structure. Artificial neural networks have neurons that are connected to one another at different layers of the network, just as neurons in a real brain. We refer to these neurons as nodes. Figure (1) display the biological neural network.

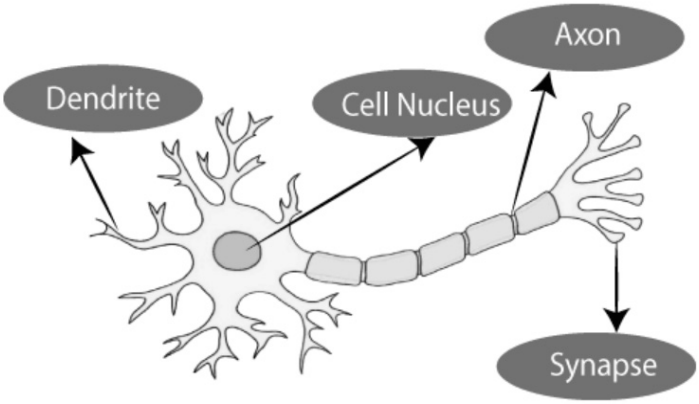



**Figure (1) Display the Biological Neural Network.**

In artificial neural networks, dendrites from biological neural networks stand in for inputs, cell nuclei for nodes, synapses for weights, and axes for outputs. Figure (2) shows the Artificial Neural Network Diagram.

It has been claimed that artificial intelligence (AI) can predict gestational diabetes mellitus (GDM) using medical information have been proposed (Watanabe, *et al*,2023). In (Wu., *et al.*, 2021) suggested Accurate methods for early gestational diabetes mellitus (GDM) (during the first trimester of pregnancy) prediction in Chinese and other populations are lacking.

Constructed by the authors (Malhotra, *et al.*, 2020) to predict GDM risk using factors such as age, BMI, family history of diabetes, and glucose tolerance test results. The methodology shown encouraging results in identifying women at risk of developing GDM, allowing early treatments, and improving monitoring. Based on maternal features, clinical data, and laboratory test results, an ANN model was developed to predict GDM risk. The approach identified women at high risk of developing GDM with excellent accuracy, allowing for prompt interventions and improved care as proposed by (Li, *et al.*, 2019). Another study used an ANN model to predict GDM risk using a mix of demographic, clinical, and biochemical variables (Wang, *et al.*, 2018). The approach performed well in identifying high-risk patients, allowing for early interventions to prevent or treat GDM. An ANN model was. Furthermore, an ANN model was used in a study by (Yildirim, *et al.*, 2017) to predict GDM risk based on clinical and demographic characteristics. The approach identified women at high risk of GDM with excellent accuracy, allowing for prompt interventions and individualized care.

Overall, these results demonstrate the ability of artificial neural networks to forecast the risk of gestational diabetes throughout the first trimester of pregnancy. ANNs improve prediction accuracy and allow customized therapy by integrating many risk factors and biomarkers. Further research is needed to ascertain the feasibility and effectiveness of the ANN

pregnant women. As input factors, maternal age, body mass index (BMI), diabetes family history, and glucose tolerance test results will be examined.

The model can estimate the risk of acquiring GDM by learning complicated patterns and correlations among the input variables using the power of ANNs. This can help healthcare practitioners identify high-risk patients and undertake early treatments such as lifestyle changes, dietary adjustments, and blood glucose monitoring.

Early identification of gestational diabetes has the potential to enhance maternal and fetal outcomes, minimize problems during pregnancy and childbirth, and improve long-term health for both mother and child. Early identification of at-risk patients can also result in more effective healthcare resource allocation and focused treatments.

The use of artificial neural networks in the early identification of gestational diabetes offers enormous promise for improving mother and fetal health outcomes. The ANN model can give early detection of patients at high risk of developing GDM by utilizing data from numerous risk factors and biomarkers, allowing for prompt interventions and individualized therapy. To confirm the model's dependability and usefulness in clinical practice, more study and validation of its performance on vast and diverse datasets are required.

## 2- Related Work

Several researches have looked at the uses of artificial neural networks (ANNs) for early pregnancy risk detection of gestational diabetes. This research has shown that ANNs have the ability to predict the possibility of developing GDM and help in early intervention:

## 1- Introduction

Gestational diabetes mellitus (GDM) is a frequent pregnancy condition characterized by high blood glucose levels. It is harmful to both the mother and the developing fetus (Chiefari, *et al.*, 2017). Early identification and management of GDM are critical for avoiding negative effects. Depending on the intended usage and mix of AI algorithms, diagnostic technology employing artificial intelligence (AI) for illness assessments has demonstrated performance comparable to that of physicians (Weinert, 2010). These outcomes are the consequence of the use of various distinct types of AI algorithms. Deep learning, for example, is excellent for unstructured data (such as photos or sound data) (Ding, *et al.*, 2012). Deep learning provides a wide range of training models for picture, natural language, and audio data. Grinstein *et al.*, on the other hand, revealed that they are inferior to decision tree-based models for tabular data (Sletner, *et al.*, 2017). This study examined other methodologies due to issues with the model's and results' interpretability. Artificial neural networks (ANNs) have gained popularity in recent years as a possible tool for risk identification and prediction in a variety of medical applications.

The purpose of this research is to investigate the usage of an artificial neural network model for early identification of gestational diabetes in early pregnancy. The algorithm tries to forecast the chance of acquiring GDM and give early treatments to at-risk patients by assessing numerous risk variables and biomarkers.

The proposed ANN model will be trained using a dataset that includes clinical and demographic data, as well as laboratory test results from

## المستخلص

يعد التنبؤ المبكر بمخاطر الإصابة بسكري الحمل (GDM) ذا أهمية خاصة لأنه قد يتيح تدخلات أكثر فعالية ويقلل الإصابة التراكمية للأم والجنين. الهدف من هذه الدراسة هو تطوير نماذج التعلم الآلي (ML)، للتنبؤ المبكر بـ GDM باستخدام المتغيرات المتاحة على نطاق واسع، وتسهيل التدخل المبكر، وإتاحة تطبيق نماذج التنبؤ في الأماكن التي لا يمكن فيها الوصول إلى اختبارات أكثر تعقيدًا.ز في هذه البحث استخدمت شبكة عصبية اصطناعية (ANN) للكشف عن خطر سكري الحمل. حيث تم استخدام مجموعة من داتاسيت عالمية ت لجمع البيانات السريرية والتجريبية من النساء الحوامل والمصابين بالسكري في كردستان العراق . حيث تتضمن مجموعة البيانات المستخدمة في هذه الدراسة سجلات من 3525 حالة حمل. تم تحسين اثني عشر نموذجًا مختلفًا بتعلم العميق ومعلماتها الفائقة لتحقيق أداء تنبؤ مبكر وعالي لـ GDM. تم استخدام طريقة زيادة البيانات في التدريب لتحسين نتائج التنبؤ حيث تم تدريب 70 % من البيانات وتم اختبار 30 %. حيث أجريت معالجة الاولية لهذة البيانات و إزيلت القيم المفقودة. وحددت الميزات ذات الصلة ، بعد ذلك استخدم نموذج ANN وتدريبه مع بنية AP مناسبة وتدريبه باستخدام مجموعة التدريب. قيم النموذج باستخدام مجموعة التحقق الصحية لتقييم أدائها في اكتشاف خطر الحمل. و أجري التحكم المفرط لتحسين أداء النموذج. أخيرًا ، نموذج ANN المحسن باستخدام مجموعة الاختبار لتقييم قدرته على التنبؤ بخطرسكري الحمل في الحمل المبكر. توفر نتائج هذه الدراسة نظرة ثاقبة على فعالية استخدام ANN للكشف عن المخاطر والمساهمة في تطوير الاستراتيجيات المبكرة بين دقة الحمل لمرض السكري ، مع وصول دقة النظام إلى 100%.


**الكلمات المفتاحية:سكر الحمل , الحمل , الشبكة العصبية الاصطناعية (ANN)، التعلم العميق.**

## Abstract

Early prediction of gestational diabetes mellitus (GDM) risk is particularly important because it may enable more effective interventions and reduce cumulative maternal and fetal injury. The aim of this study is to develop machine learning (ML) models for early prediction of GDM using widely available variables, facilitating early intervention, and enabling the application of prediction models in settings where more complex tests are not accessible.

In this paper, an artificial neural network (ANN) was used to detect the risk of gestational diabetes. A global data set was used to collect clinical and experimental data from pregnant women and people with diabetes in Iraqi Kurdistan. The data set used in this study includes records from 3,525 pregnancies. Twelve different deep learning models and their hyper-parameters are optimized to achieve early and high prediction performance for GDM. The data augmentation method was used in training to improve the prediction results, as 70% of the data was trained and 30% was tested. Preliminary processing of this data was performed and missing values were removed. I identified the relevant features, then used the ANN model and trained it with a suitable AP structure and trained it using the training set. The model was evaluated using a healthy validation set to evaluate its performance in detecting pregnancy risk. Over-control was conducted to improve the model performance. Finally, the improved ANN model using the test set to evaluate its ability to predict the risk of gestational diabetes in early pregnancy. The results of this study provide insight into the effectiveness of using ANN for risk detection and contribute to the development of early pregnancy-specific strategies for diabetes, with the system's accuracy reaching 100%.

**Keywords: Gestational Diabetes, Pregnancy; Artificial Neural Network (ANN) and Deep Learning.**

# Risk Detection of Gestational Diabetes in Early Pregnancy Depend on Artificial Neural Network

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# الكشف عن مخاطر سكري الحمل في الحمل المبكر بالاعتماد على الشبكة العصبية الاصطناعية

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However, since it's possible that there might be noise during transmission, we reduce this uncertainty by overlooking the possibility that this data would be needed to pre-process the image. Images were improved using a number of methods before deep learning. Eight levels were chosen to achieve the best results when the image was once again fed into the system from the CNN layers to retrieve the attributes. After that, CNN levels were used to classify the data with high accuracy by category. The system has undergone 70% training and 30% testing, and the results show that it has a 95.4762% accuracy rate with little room for error and misclassification error is 0.0452%.

**Table 3: Comparison with Related Work**

| Ref. | Method | Dataset | Accuracy |
|---|---|---|---|
| Ebell, M. H. *et al.*, | Decision trees, logistic regression, random forests, support vector machines | Open Access Series of Imaging Studies (OASIS) dataset | 88.88% |
| Karnik, S. *et al.*, | Sequential model, conv2D, maxPooling2D, dense layers | Kaggle dataset | 87.59% |
| Perluigi, M. *et al.*, | Support vector regression, tree regression, bagging-based ensemble regression, 3D convolutional neural network (CNN), and linear least square regression (LLSR) | 331 people's resting-state functional magnetic resonance imaging (rs-fMRI) scans | Mean balanced test accuracy: 85.27% |
| Our method | Using CNN and VGG16 | RMI alzahimer dataset | 95.4762% |

## 6- Conclusion

AI is being utilized more and more in image-based diagnostics, risk management, and illness detection. It still need a few technological and practical solutions to realize its full potential. We used CNN deep learning methods to construct a more accurate model, which has a little improvement in accuracy while addressing photo recognition challenges, considering the severity of the disease's spread in this study. It will, however, increase the difficulty of the model. Training will take longer, and there will be a higher chance of overfitting.

To simplify the model, more organizational elements need to be included. Here, we simply label the CNN as half if the patient has a mild nodule rather than mild, moderate, extremely mild, or non-in Demented in order to extract a feature from the CNN layer. There are other formulations and extraction techniques to research.

unnecessary when the dataset is class-balanced. In our case, as shown in the Figure (11) the F1-score is exactly matching the accuracy rate value which is normal for our balanced dataset.

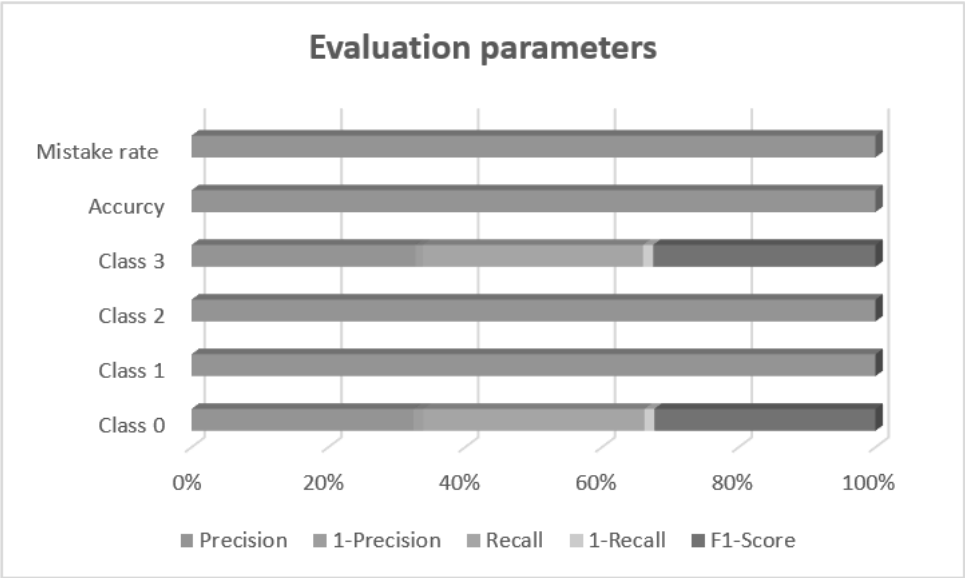



**Figure11. Evaluation Parameters**

## 3- Comparison with Related Work

In this paragraph, previous studies are compared with our work in terms of algorithms, data set, and accuracy ratio (Table 3).

| Training Set | | | | | |
|---|---|---|---|---|---|
| TARGET / OUTPUT | Class0 | Class1 | Class2 | Class3 | SUM |
| Class0 | 2007<br>23.8929% | 66<br>0.7857% | 13<br>0.1548% | 18<br>0.2143% | 2104<br>95.3897%<br>4.6103% |
| Class1 | 51<br>0.6071% | 2004<br>23.8571% | 53<br>0.6310% | 033<br>0.3929% | 2141<br>93.6011%<br>6.3989% |
| Class2 | 24<br>0.2857% | 17<br>0.2024% | 2003<br>23.8452% | 43<br>0.5119% | 2087<br>95.9751%<br>4.0249% |
| Class3 | 18<br>0.2143% | 13<br>0.1548% | 31<br>0.3690% | 2006<br>23.8810% | 2068<br>97.0019%<br>2.9981% |
| SUM | 2100<br>95.5714%<br>4.4286% | 2100<br>95.4286%<br>4.5714% | 2100<br>95.3810%<br>4.6190% | 2100<br>95.5238%<br>4.4762% | 8020 / 8400<br>95.4762%<br>4.5238% |

**Figure 10: Confusion Matrix**

## C. Confusion Matrix

As mentioned in the Figure (10), the images are distributed equally between the four classes and these classes are numbered from class 0 to class 3. Python also can include some simulations to visualize the performance of our model. One simulation is a confusion matrix that shows the number of correctly and incorrectly classified disease. Figure (10) shows the result of our simulation applied to validation images of each class, this matrix can help to identify which class are most easily confused and can be used to improve the performance of the model.

## D. Other evaluation metrics

other evaluation metrics could be important to evaluate our classification model, here, we will compute them to demonstrate that are

## B. Training Progress Plot

1. **Training and Validation Losses**: The subplot displays training and validation losses over epochs, aiming to minimize training and validation losses while avoiding overfitting, based on the error between predicted and actual classes.
2. **Training and Validation Accuracy**: The subplot displays training and validation accuracy over epochs, with a typically decreased learning rate to ensure a good solution convergence.

Figure (9) shows our proposed classification model is convergent, accurate, and decreasing in learning rate over epochs, indicating low training and validation losses.

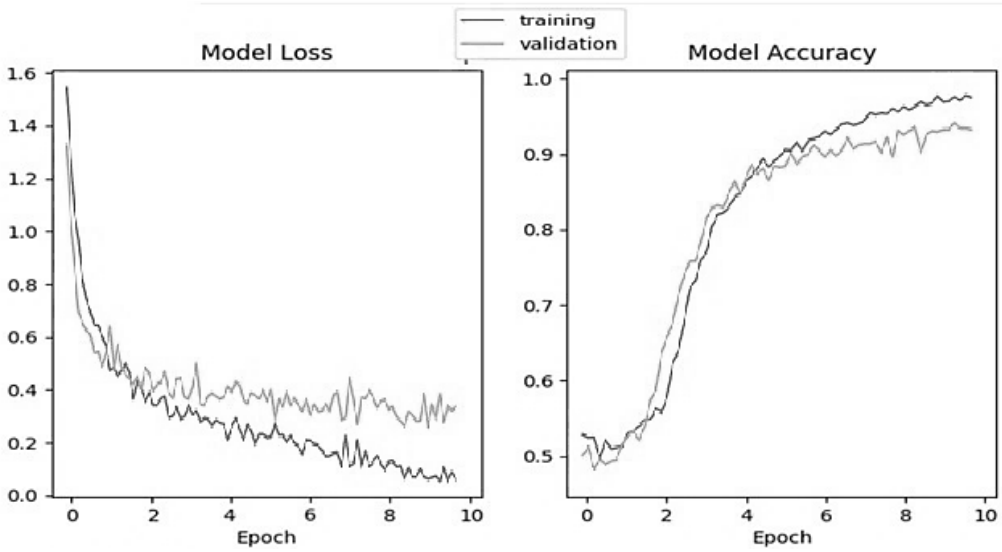



**Figure 9: Training Progress Plot**

because of the low rate of learning, but it finally converges. A faster pace of learning encourages learning even though it might not converge. Usually, it is suggested to take your time studying. The number of periods indicates how many times the entire training set is transmitted to the network during training. The accuracy of the micro-batch reported during training has a positive correlation with the accuracy of the micro-batch stated at the given iteration. Iteratively generated averages do not represent running averages. The method splits the entire data set into several small groups while using momentum training and random gradient descent (SGDM). For each small batch, network gradients are computed during iteration. Every imaginable little impulse that might be felt has a time component. Even if the error is estimated for each image in the training dataset, the model is not changed until all training images have been examined.

## A. Accuracy and Loss Metrics

Depending on the conditions at the time we train the model, the accuracy and loss in the validation data model may change. In general, accuracy should increase with age and loss should decrease. Validation loss keeps going down as validation accuracy starts to go up. Additionally, this is wonderful since it demonstrates how the model is evolving and performing as expected. Table (2) shows that 95.4% of Demented illnesses can be correctly identified.

**Table 2: Accuracy of Demented diseases**

| |
|---|
| Epoch 10 (final iteration of epoch) /10 (max of epoch)<br>8020/8400 [=] - 220s 11ms/step - loss: 0.0065 - accuracy: 0.954762% |

$$Recall\% = \frac{TP}{TP+FN} \times 100 \quad (9)$$

Recall is a useful metric for evaluating the performance of a classification system.

### D. F1-score

F1 score is another metric that indicate the accuracy of a model, which combine the recall rate and the precision rate of this model. The accuracy metric can be reliable only if the classes are balanced, which means that each class has the same number of samples, as in our case here. Real datasets are often imbalanced which makes this metric necessary.

The precision and the recall rate made a trade-off, for us ideally, we need to increase both recall and precision to classify perfectly the images. F1-score is the rate responsible of combining these two metrics, so maximizing F1-score leads to maximize both recall and precision rate. To calculate F1-score we use the harmonic means of both mentioned metrics, and we can use the following formula:

$$F1 - score = \frac{2 \times Recall \times Precision}{Recall + Precision} \quad (10)$$

## 2. Evaluation Results

Use standard metrics to determine an item's performance value. The factors known as hyper-parameters have an impact on the network's architecture and training process. The learning rate affects how quickly network parameters may be modified. The learning process slows down

$$Acc\% = \frac{TP+TN}{TP+TN+FP+FN} \times 100 \quad (7)$$

Accuracy is a useful metric for evaluating the overall performance of a classification system, but it can be misleading if the class distribution is imbalanced (e.g. if there are many more samples from one speaker than from another). In this case, it may be more useful to look at other metrics such as F1-score.

## B. Precision

This is the percentage of images that are correctly classified by the system with respect to the total number of images detected as normal, which indicate the correct "positive" predictions. Precision is a metric used to evaluate the performance of any classification system. To calculate the precision, we can use the following formula:

$$Precision\% = \frac{TP}{TP+FP} \times 100 \quad (8)$$

Precision is a useful metric for evaluating the overall performance of our classification network, but also it can be misleading if the class distribution is imbalanced

## C. Recall

This is the percentage of images that are correctly classified as normal with respect to the total number of images labelled as normal, which indicate the percentage of "positive" class correctly identified. Recall is a metric used to evaluate the performance of any classification system. To calculate recall, we can use the following formula:

### 8. Loss Function Layer

The loss function calculates the error of each trading epoch, crucial for weight update during backpropagation, illustrating the discrepancy between predicted output and real label.

## 5. Experimental Results

The MATLAB simulation on Alzheimer classifier demonstrates the effectiveness of CNN architecture for early detection of Alzheimer illnesses. The system can be trained and evaluated on a large dataset, achieving high accuracy in identifying the disease. This project explores deep learning's potential in biomedical applications, highlighting the importance of data pre-processing and feature extraction in developing effective Alzheimer classifying systems.

### 1. Evaluation Metrics

This section outlines the metrics used to evaluate the performance of a classification network, including accuracy, precision, recall, and F1-score. The parameters include True Positive (TP), True Negative (TN), False Positive (FP), and False Negative (FN). These metrics ensure the system accurately identifies diseases in images, ensuring accurate disease detection.

### A. Accuracy

This is the percentage of images that are correctly classified by the system. It is calculated as the number of correctly classified samples divided by the total number of samples. Accuracy is a common metric used to evaluate the performance of any classification network. To calculate accuracy, we can use the following formula:

## 6. Fully Connected Layer

A feature vector is a crucial input data from previous convolutional layers used in training for classification, allowing hidden layers to predict class likelihood. As shown in Figure (7).

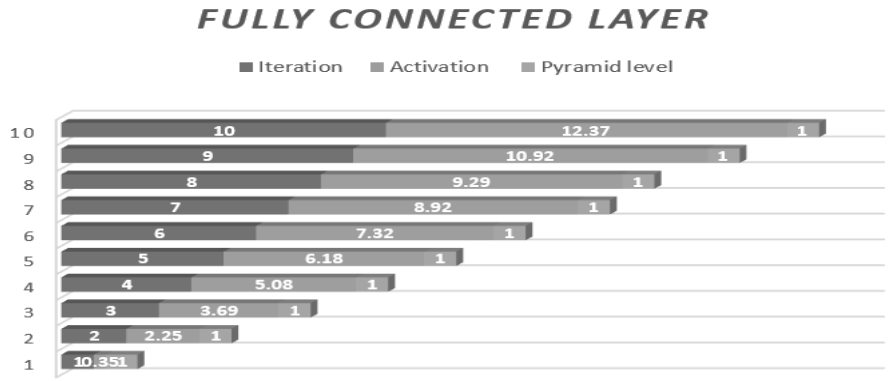



**Figure (7) FC Layer**

## 7. Softmax Layer

The Softmax layer assigns a probability value between 0 and 1, indicating a high likelihood for a candidate class while reducing the probability of other classes. As shown in Figure (8).

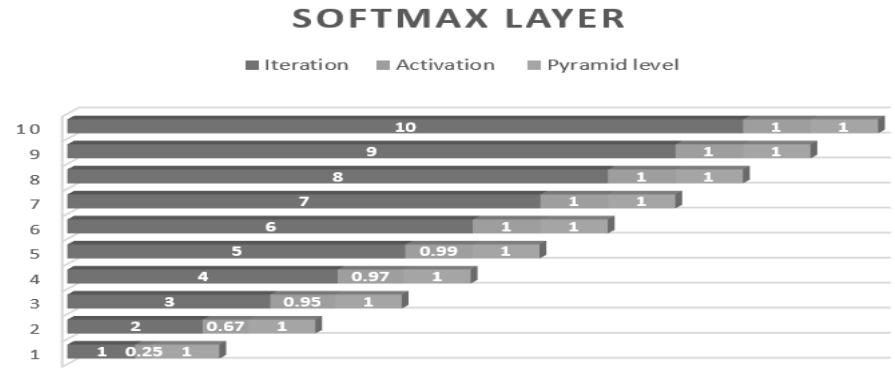



**Figure (8) Software Layer.**

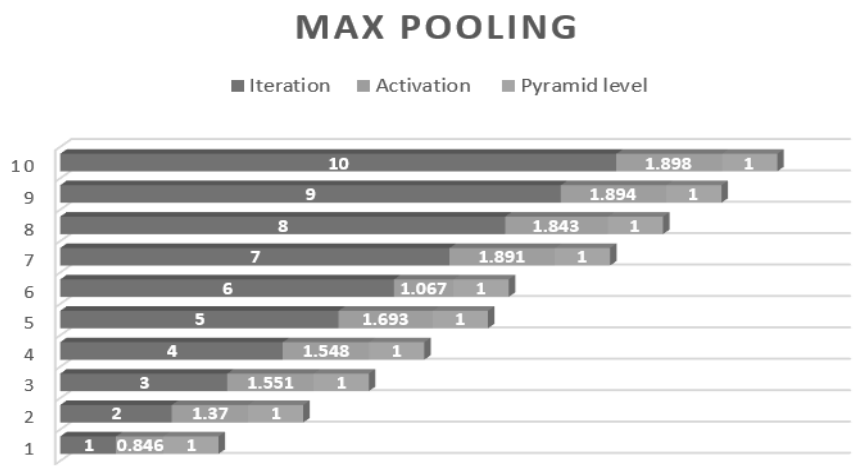



**Figure (5) Max Pooling Layer.**

## 5.RleU Layer

The layer removes extraneous elements from a feature map by overlaying a specified dimension mask, ensuring the largest value under the mask is the result.as shown in Figure (6).

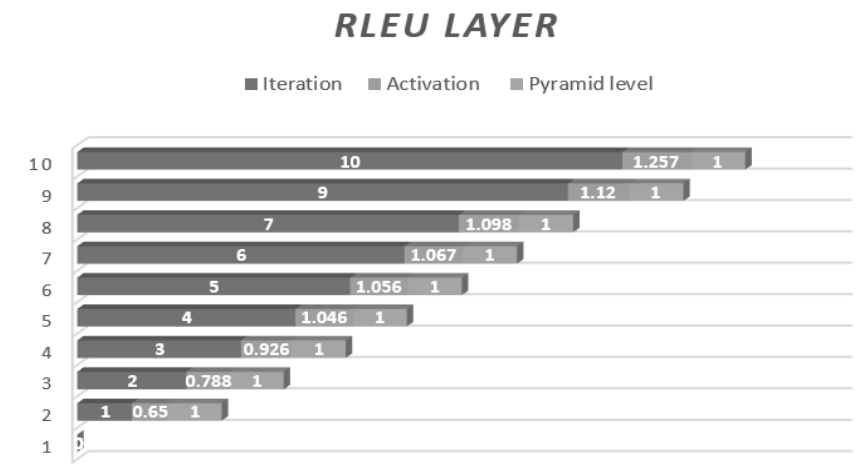



**Figure (6) RleU Layer**

## 3. Batch Normalization Layer (BN)

This layer reduces network initialization sensitivity by reducing channel numbers and normalizing activation before relocating input. It's used alongside convolutional and RleU layers.as shown in Figure (4).

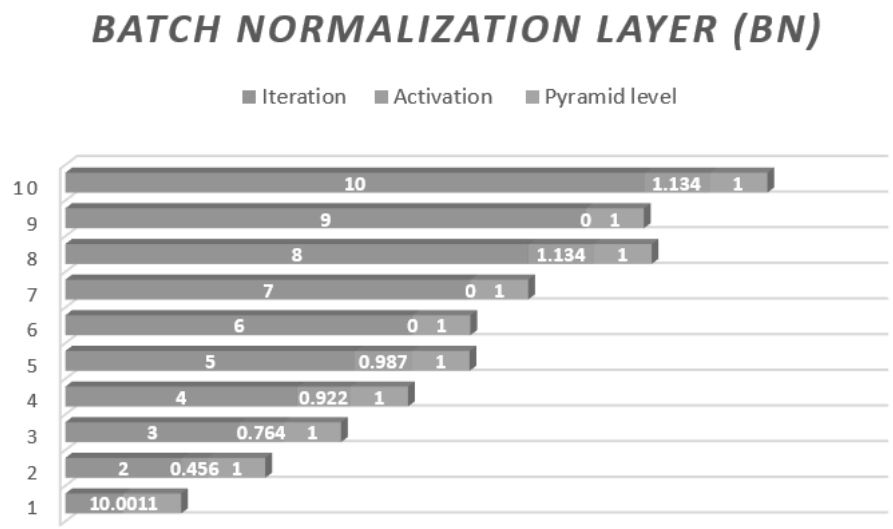



**Figure (4) Batch Normalization Layer.**

## 4. Max Pooling Layer

The layer removes unwanted features by applying a mask over the feature map, ensuring the largest value falls inside the mask at each stride. As shown in Figure (5).

## 4.VGG16 CNN Model

The system uses a VGG-16 convolutional neural network with 41 layers, including 16 learnable layers, 13 convolution layers, and 3 fully connected layers. It applies sliding filters, performs threshold operations, down-samples, and multiplies input by weight matrix and bias vector.

1. Input Layer

   The image dimensions are 28 x 28 x 1, with three colour channels, and no data shuffle is needed for the Demented disease layer due to the train network's initial processing.

2. Convolutional Layer

   The feature map is created through dot product multiplication and weight slide mask, which is randomly generated and adjusted through BN, Pooling, and RleU Layers. As shown in Figure (3).

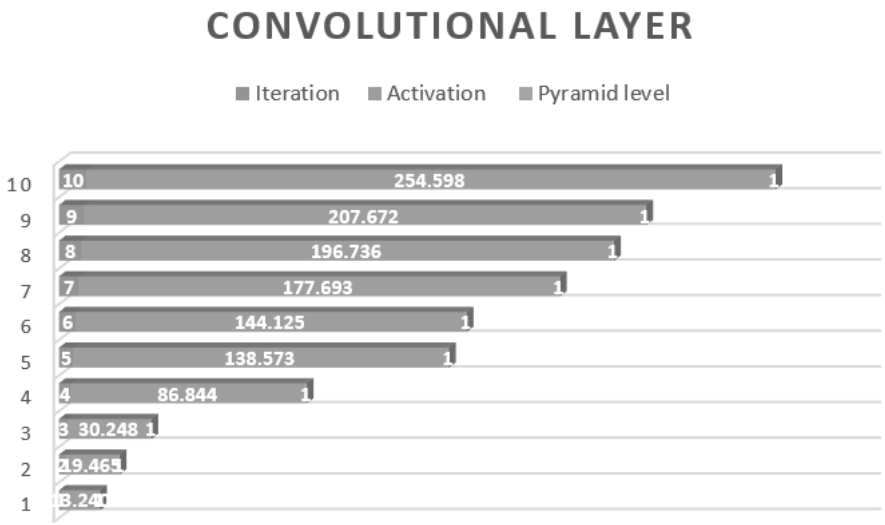
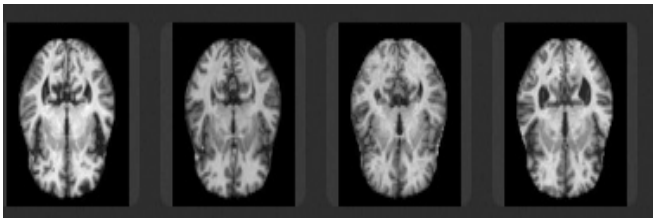



**Figure (3) Convolutional Layer**



Non Demented

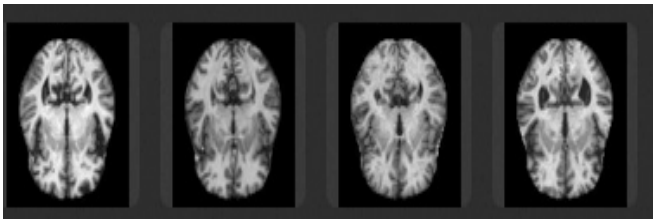


**Figure (2) Sample of MRIS Datasets of Demented Disease**

## .2 Data Augmentation

The augmented image data-store applies random transformations to images in the mini-batch of training data, without changing the actual number of images at each epoch. Random rotation, reflection, and translation are used.

## 3. Data Pre-processing

The images in the dataset need to be preprocessed before they can be used to train the network. This involves steps such as resizing the images, normalizing the pixel values, and removing noise.

**Resizing**: The images in the dataset need to be resized to a common size 28x28x1.

**Normalizing**: The pixel values in the images may need to be normalized. This means that the pixel values are all scaled to a range of 0 to 1.

**Removing noise**: The images in the dataset may contain noise, it will be removed using a Medem filter.

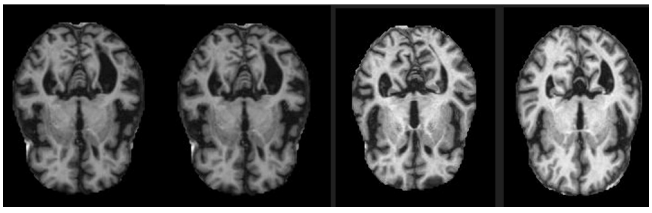
**Table (1) Alzheimers-dataset-4-class-of-images**

| Class Number | Class type | Total Images of Dataset | Training Images 70% | Validation Images 30% |
|---|---|---|---|---|
| Class 0 | Non-Demented | 7000 | 4900 | 2100 |
| Class 1 | Mild Demented | 7000 | 4900 | 2100 |
| Class 2 | Moderate Demented | 7000 | 4900 | 2100 |
| Class 3 | Very Mild Demented | 7000 | 4900 | 2100 |

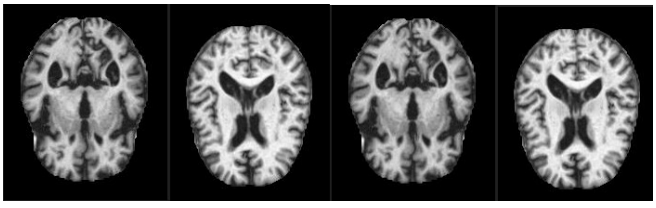
## 1- Standard Dataset

The data comprises MRI images from four classes in both training and testing sets: Mild Demented, Moderate Demented, Non Demented, and Very Mild Demented. The dataset aims to create a highly accurate model for predicting Alzheimer's stage, available at https://www.kaggle.com/datasets/tourist55/alzheimers-dataset-4-class-of-images. As shown in Figure (2).

Mild Demented



Moderate Demented



VeryMild Demented

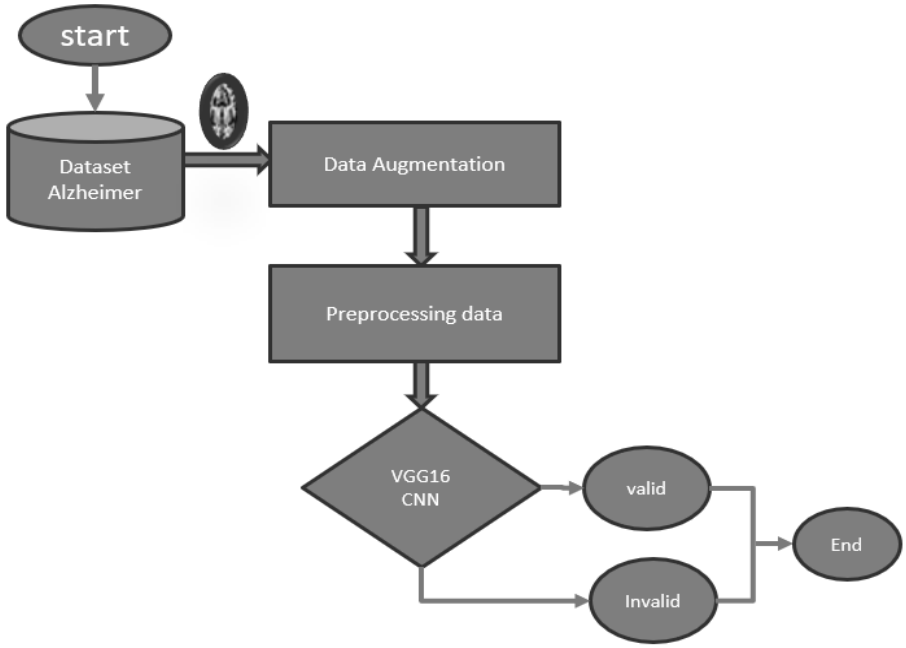



**Figure (1) Proposal Method**

## A. Data Collection

To start the process of creating an image classification network, the initial task is to gather a dataset of images that will be utilized for training the network. This step holds significant importance in the overall process. There are various methods to obtain data for image classification, and one approach is to utilize online resources. In this specific case, the dataset was obtained from the Kaggle Standard website and is referred to as "alzheimers-dataset-4-class-of-images". This dataset comprises four classes, with each class containing a total of 7000 labeled images. For the purpose of training and validation, the dataset will be split into 70% for training and 30% for validation. As shown in Table (1)

that the output of the lth layer is obtained by forwarding propagation. The model performs well on the training data but poorly on new data.

### e) Activation Function Layer

Neurons in a neural network have activating activities, which alter the received input to maintain values within a tolerable range. These functions are non-linear and constantly differentiable, allowing for efficient error back-propagation across the network. The nonlinearity of the neural network allows it to be used as a global approximation.

The neuron's interior:

- A neuron or the entire neural layer receives the activation function.
- The input values' weighted total is added.
- The weighted total of the input values is applied to the activation function, and the transformation happens.
- This altered value is passed on to the next tier (Liu, Ryan Wen, *et al.*,2023):

$$\text{sigmoid:} \quad f(x) = \frac{1}{1+e^{-z}}, \tag{4}$$

$$\tanh: \quad f(x) = \frac{e^{z} - e^{-z}}{e^{z} + e^{-z}}, \tag{5}$$

$$\text{ReLU:} \quad f(x) = \max(0, x), \tag{6}$$

## 4. the proposed method

MRI is the data set utilized in half of the process. An MRI dataset has images for mild, moderate, and severe Demented disease, whereas a dataset with medical records is utilized to predict dementia. The process for identifying An Demented patient using deep learning techniques is shown in Figure (1).

decreases the features' accuracy. Consequently, instead of removing each and every item, we provide an overview of all the data discovered when we aggregate a picture.

## c) Fully Connected Layer(FC)

This layer connects neurons between levels and also includes of weights and biases. These layers come before the output layer in the CNN architecture. The FC layer receives the input picture from the preceding layers and flattens it. To allow arithmetic function operations, more FC layers are stacked on top of the flat vector. The process of categorizing now begins.

## d) Dropout

The basic idea behind dropout is to continuously train on different networks, losing a portion of the neurons in the hidden layer each time, which weakens the connections between the neurons. The Dropout Strategy Is Included in the Calculation Method for Redirecting Diffusion from Equation (1) to Equation (2) and (3).

$$r^{(l-1)} \sim Bernolli(p)$$

$$x_j^l = f[\sum_{i \in M_j} (r^{(l-1)} * x_i^{l-1}) * W_{ij}^l + b_j^l] \quad (3)$$

When every feature is connected to the FC layer, overfitting occurs often in the training dataset. Equation (3) shows that each value in the vector (1) or− is a Bernoulli distribution with probability p to generate values of 0 and 1, meaning that each layer of the model blocks is part of the 1lix− input vector from the first layer l through the vector (1) LR−, which approximates the subnetwork model taken from the overall network model. This means

corners, and lines. XT-level layers are used to extract the extachigher level characteristics from the input picture. According to Balodi, *et al*., (2021), equation (2) displays the layer equation.

$$^{1}xt = \sigma ( a1+ * a^{0} ) \quad (2)$$

The set activations generated by the feature map are denoted by a1, the input activations by a0, the activation function by w, the bias by b, and the convolution process by *. The kernel's width and height are less than those of the input picture. As it advances over the picture, the kernel builds a feature map (convolve with). The outcome of multiplying the original picture by the kernel element is convolution.

## b) Pooling Layers

This layer reduces neural network instability and computational complexity (NN). The assembly method is often used by beginners who are unaware of its purpose. A comparison of three typical, daily assembly techniques is shown below.

The three types of aggregating operations that follow are:

Maximum pooling: The batch's maximum pixel value is stated.

establishes the minimum pixel value for the batch using min pooling.

Average pooling: An average is calculated between the batch's pixel values.

In this context, "batch" refers to a collection of pixels that match the filter's size, which is determined by the image's dimensions. A 9x9 filter was used in the example that follows. The result of the aggregation process is impacted by the variable value of the filter size. Consequently, the feature maps have a large number of convolutional layers. The pooling layer

the network for a single iteration inside an epoch. The batch size controls how many I/O pairs are shown on the network at any one time. Iterations are the number of batches required to finish a project in a single time frame (Zhang, *et al.*,2019).

## VI. Cost Function

This technique is used to provide network performance feedback. This is a deep learning-related trait that the network is attempting to eliminate. An optimizer is needed to reduce the functionality of the network cost. In this instance, the optimal option is the Adaptive Moment Estimation Optimizer, or ADAM Optimizer. Rather than using the conventional random gradient descent approach, ADAM is an optimization methodology that may be used to recursively update network weights depending on training data (Ahmadlou, *et al.*,2018).

## B. CNN Layers

A CNN is composed of many layers. The important levels are explained in the subsections that follow.:

## Convolution Layer

The convolution procedure learns the properties of the picture and extracts features while preserving the spatial relationship between the image's pixels by applying a filter (kernel) to the input data. The core of a convolutional neural network is the convolution layer. performs a wrap operation on the supplied picture. It's used to get the properties of the picture. The first convolution layer extracts low-level features like edges,

## III. Image Features

A picture's borders, lines, areas of interest, and other characteristics may reveal a lot about its content. They are used in a number of image analysis applications, including as matching, identification, and reconstruction, to characterize certain regions of an image (Mehmood, *et al.*,2021).

## IV. Zero Padding

To ensure that every convolution stage can preserve the original input size, zero padding is the technique of appending zeros to the input image's matrix. There are two different kinds of padding. The first, called genuine, claims that the convolutional layer is never padded at all and that, as a result, the input size is lost. The second kind is similar in that it uses padding to convolve the original input picture until it does. This results in the identical sizes for the input and output. In there is no padding. In short, our input's volume indicates how much padding our kernels need to handle the input matrices. We have two options for padding: either add one row or column on each side of zero matrices (zero padding) or remove the part of the picture that does not fit (valid padding) (Boualouache, *et al.*,2018).

## V. Batch Size, Iterations and Epoch

In machine learning, for example, batch sizes, iterations, and epochs all become important when working with enormous volumes of data. In order to get beyond this obstacle, we must divide the input into manageable chunks and feed it into our model in real time, modifying the neural network weights at the end of each step to better suit the data. An epoch is the period of time the network will keep evaluating data. The full dataset is used to train

## I. CNN Input layer

The input layer encompasses all of CNN's data. Typically, in an image processing neural network, the input is the pixel matrix of the picture. The dimensions of the grayscale picture can be used to determine the size of the input image (Ravi, *et al.*,2023).

## II. Convolution Operation

The convolutional layer extracts picture features, identifying basic visual elements like edges, lines, and corners. It generates feature activation maps by applying a convolution kernel to the preceding layer.The convolutional layer extracts picture features, identifying basic visual elements like edges, lines, and corners. It generates feature activation maps by applying a convolution kernel to the preceding layer.

$$X_j^l = f\left[\sum_{i \in M_j} (X_i^{l-1} * K_{ij}^l + b_j^l)\right], \quad (1)$$

The kernel, a scaled-down version of the original, is arranged in a specific order, modified during training to align with the neural network's weights, and convolution combines two functions.

The image's kernel moves from left to right, and the convolutional process starts in the upper-left corner. The kernel moves one item downhill and then turns back to the left when it reaches the upper-right corner of the picture. This operation is continued until the kernel reaches the input image's bottom-right corner. The feature map is the outcome of this method (Mahendran, *et al.*,2021). The stride variable controls how quickly the filter scans the picture. The filter will only move one pixel across the picture if the stride is set to one.

## A. Convolutional Neural Network (CNN)

Convolutional neural networks are a kind of deep learning that operates by extracting features from image and video data, building neural networks by allocating weights, and selecting and classifying images via filter transformations. CNN is the first tool that every data scientist will use to handle any image or video processing data. The transfer learning methodology is quite simple to use and adapt when using our layers. The most prominent use for CNNs, a particular kind of directed neural network, is in computer vision problems. CNN provides answers to a variety of AI and computer vision issues. Because at least one of the layers in convolution acts as a foundation step, the technology is known as "convolutional neural networks." The CNN is made up of several levels between the input and output layers. Layers include convolutional, pooling, and fully connected layers. Depending on the application, different CNN designs use different numbers and types of layers (Ebrahim, *et al.*,2020). CNN layers may have tens of thousands of filters that go through the input and look at every channel.

Sequential To extract more abstract characteristics, CNN layers are used. Beginning with edges and corners in the early levels, work your way up to whole faces and artifacts in the deeper layers. During training, the network learns which features need to be eliminated in order to provide a solution. Due to its flexibility in solving a wide range of computer vision issues, CNN does not need human labor or sophisticated expertise for feature building (Dubois, *et al.*,2020).

The following subsections describe several terminology and jargon related to CNN:

During the 1950s, when artificial intelligence was still in its infancy, researchers attempted to develop a system that could interpret visual input. The field that this research was conducted in later years grew to be known as computer vision. Computer vision took a quantum leap in 2012 when a group of academics from the University of Toronto developed an AI model that considerably surpassed the top picture recognition algorithms.

With an incredible accuracy rate of 85%, the artificial intelligence system known as AlexNet—named after its principal creator, Alex Krizhevsky—won the 2012 ImageNet computer vision competition. The runner-up received a commendable 74 percent on the exam. AlexNet used convolutional neural networks, a kind of neural network that mimics human vision. Since CNNs have become an essential component of many computer vision applications, they are now included in all online computer vision training courses. Let's now look into how CNNs function. Artificial neural networks (ANNs), a kind of machine learning called deep learning, are systems that use vast amounts of data to learn by modeling the structure of the human brain. For example, machine learning makes it possible for computers to grow and learn from their experiences without the need for human interaction. A deep learning algorithm will repeat a job and improve the result each time by making small tweaks, much as how it learns from experience. Deep learning neural networks are neural networks that include several (deep) layers for learning. Through deep learning, any issue that requires "thinking" may be taught to be solved. Through the utilization of large, unorganized, and interconnected data sets, deep learning empowers computers to address complex (Ebrahim, *et al.*,2020).

layers, conv2D, maxPooling2D, and a sequential model. A 4-class dataset has been utilized in this work to diagnose Demented disease, according to the Kaggle dataset. The Demented MRI dataset has been used to classify the disease as non-demented, moderately demented, mildly demented, and very mildly demented, in that order. have been presented (Perluigi, *et al.*,2024). Evaluate a state-of-the-art deep learning method for diagnosing Demented disease (AD) and collaboratively predict the MMSE scores of AD patients in South Korea. Using resting-state functional magnetic resonance imaging (rs-fMRI) scans of 331 people, we generated functional 3-dimensional (3-D) independent component spatial maps to be used as features in classification and regression tasks. A three-dimensional convolutional neural network (CNN) architecture was developed for the classification task. Support vector regression, bagging-based ensemble regression, tree regression employing group independent component analysis (gICA) features, and linear least square regression were the techniques employed to predict MMSE scores (LLSR). To improve MMSE regression performance, we employed feature optimization methods such support vector machine-based recursive feature reduction, least absolute shrinkage and selection operator, and so forth (SVM-RFE). The average balanced examination have been presented(Mattsson-Carlgren, *et al.*,2024)

## 3. Deep Learning

Because deep learning can handle large amounts of data, it has become a particularly important technology in the last several decades. Hidden layers have recently attracted attention in fields such as pattern recognition where traditional techniques have failed. Convolutional neural networks are a common kind of deep neural networks (CNN).

## 2. Literature Review

The variety of studies on Demented disease that have been utilized in this paragraph:

Because disease-modifying medications are most effective when begun early in the course of the illness, before permanent brain damage develops, early symptom identification, or "pre-detection," is crucial. Consequently, using automated techniques to predict AD symptoms from such data is crucial. The system was built using the Open Access Series of Imaging Studies (OASIS) dataset. The data was analysed and then used in many machine learning models. Support vector machines, random forests, logistic regression, and decision trees were employed in the prediction process. The SVM beats all other neural networks with an accuracy of 88.88, the only exception being a manually controlled neural network that needs a significantly longer training time. have been present (Ebell, *et al.*,2024) Diagnosed and classified using thick layers, conv2D, maxPooling2D, and a sequential model. A 4-class dataset has been utilized in this work to diagnose Demented disease, according to the Kaggle dataset. The Demented MRI dataset has been used to classify the disease as non-demented, moderately demented, mildly demented, and very mildly demented, in that order. Diagnosed and classified using thick layers, conv2D, maxPooling2D, and a sequential model. A 4-class dataset has been utilized in this work to diagnose Demented disease, according to the Kaggle dataset. The Demented MRI dataset has been used to classify the disease as non-demented, moderately demented, mildly demented, and very mildly demented, in that order have been presented (Karnik, *et al.*,2024). Diagnosed and classified using thick

Using image zoning methods is another way to diagnose Demented disease. For this, several image partitioning techniques are used, such as thresholding, clustering, machine learning, and deep learning. For image zoning and illness detection, statistical techniques are frequently employed because thresholding techniques like Otsu are incapable of learning . Even though these techniques might not work by themselves, they might work well in combination with other strategies. Although they can't learn, clustering techniques like k-means and fuzzy clustering are good in identifying and classifying zones (Rogeau, *et al.*,2024) Accurately calculating the right number of clusters is the difficult part since mistakes might happen if this is done incorrectly. If the cluster centers are not accurately established, another problem with clustering algorithms is the lack of accuracy in the clustering region. In order to overcome these obstacles, several research have optimized cluster center selection by using group intelligence and meta-heuristic algorithms. Although this enhances clustering techniques, uncertainty may lead to longer execution times and a decreased ability to consistently identify illness sites.

Deep learning techniques, on the other hand, have been effective in medical image zoning research. They are frequently utilized in this context because they provide great accuracy in data analysis. The problem with these approaches is that they rely on long-term learning for zoning. Using group intelligence techniques to improve learning can be a useful tactic to solve this (Tsoi, *et al*,2023) It is crucial to remember that machine learning techniques are more constrained than deep learning techniques, and they do not have an automated feature selection process (Akan, *et al.*,2024).

## 1- Introduction

A neurodegenerative condition that mostly affects the elderly is Demented disease. Timely intervention and efficient management of Demented disease depend on an early and precise diagnosis. Techniques utilizing artificial intelligence (AI) have demonstrated significant promise in aiding medical practitioners in the diagnosis of Demented disease. Through the application of AI algorithms and machine learning models, scientists are creating novel methods for identifying and forecasting the start of Demented disease in older adults (Arafa, *et al.*, 2024) One of the most prevalent causes of cognitive deterioration in the elderly is Demented disease. The stage between normal cognitive functioning and dementia known as mild cognitive impairment (MCI) has a yearly progression rate of 10 to 15 percent to Demented disease (Borchert, *et al.*,2023), Even though there isn't a conclusive medical diagnosis or therapy for MCI at this time, there are certain strategies that can assist delay its progression(Bucholc, *et al.*,2023). Impeding the disease's course requires an early and precise medical diagnosis (Lyall, *et al.*,2023)To evaluate maze function, several techniques have been developed, including as transcranial magnetic stimulation (TMS), near-infrared spectroscopy (NIRS), magnetoencephalography (MEG), electroencephalography (EEG), positron emission tomography (PET), and functional magnetic resonance imaging (fMRI) (Tsoi, *et al.*,2023) These methods aid in the diagnosis of brain tumors and problems in maze adaptations, as well as the identification of neural activity and disease's physiological impacts. While fMRI generally looks at maze performance without taking its structure into account, resting state fMRI (RS-fMRI) is especially helpful in evaluating the physiological consequences of the condition (Ford, *et al.*,2023).

## المستخلص

بالإضافة إلى الأعراض الأخرى المحتملة، يعد فقدان الذاكرة وضعفها من السمات المميزة لمرض الخرف أو مرض الزاهيمار (AD). على الرغم من أن مرض الخرف غير قابل للشفاء وله تأثير سلبي كبير على حياة المرضى، إلا أن التشخيص المبكر يمكن أن يساعد في بدء العلاج الصحيح ومنع حدوث تلف إضافي في الدماغ. على مر السنين، تم استخدام تقنيات التعلم الآلي لتصنيف مرض الزهايمر. ومع ذلك، فإن فعالية النتائج تعتمد على استخدام المصنفات متعددة الخطوات والميزات التي تم إنشاؤها يدويًا. بفضل التطورات الحديثة في التعلم العميق، يمكن الآن تصنيف الأنماط باستخدام المرحلة النهائية للشبكات العصبية.

من أجل تشخيص مرض الخرف مبكرًا، تم استخدام الشبكات العصبية التلافيفية (CNN، VGG16) بالتزامن مع التصوير بالرنين المغناطيسي لاستخراج الميزات من صور الأفراد المصابين بهذه الحالة وتصنيفهم. يركز هذا البحث على هذه العملية (التصوير بالرنين المغناطيسي). تم استخدام شرائح صور التصوير بالرنين المغناطيسي للمادة الرمادية والبيضاء كمدخلات للتصنيف. تم دمج مخرجات مصنفات التعلم العميق باستخدام تقنيات التعلم الجماعي لتعزيز التصنيف بعد العمليات التلافيفية. قمنا بتقييم مدى فائدة النهج الذي نتبعه في الكشف المبكر عن هذا المرض من خلال مجموعة من البيانات من مبادرة التصوير العصبي لمرض الخرف. كان معدل الدقة لدينا في تقييمات مرض الخرف هو 95.4762%.


**الكلمات المفتاحية: مرض الخرف، التعلم العميق، CNN، الذكاء الاصطناعي.**

## Abstract

— In addition to possible other symptoms, memory loss and impairment are the hallmarks of Demented or alzahimar disease (AD). Despite the fact that Demented disease is incurable and has a significant negative impact on patients' lives, an early diagnosis can help start the right treatment and prevent additional brain damage. Over the years, machine learning techniques have been used to classify AD; nevertheless, the efficacy of the results depends on the use of multi-step classifiers and manually created features. Thanks to recent advances in deep learning, patterns may now be classified using neural networks' final stage.

In order to diagnose Demented disease early, convolutional neural networks (CNN, VGG16) were utilized in conjunction with magnetic resonance imaging to extract features from images of individuals with the condition and classify them. This research focuses on this process (MRI). Gray and white matter MRI image slices were employed as inputs for categorization. The output of deep learning classifiers was combined using group learning techniques to enhance classification after convolutional operations. We assessed the usefulness of our approach in the early detection of this illness with a collection of data from the Demented Disease Neuroimaging Initiative. Our accuracy rate for Demented disease evaluations was 95.4762%.

**Keywords- Demented disease, Deep learning, CNN, AI.**

# Using Artificial Intelligence to Diagnose Demented in the Elderly

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# استخدام الذكاء الاصطناعي لتشخيص الخرف لدى كبار السن

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| Special Concrete | Ordinary Concrete |
|---|---|
| Costly | Cost-effective |
| High strength and durability under aggressive conditions | Low durability and strength |
| High technique | The formal method to produce the special concretes |
| Made from special admixtures and other materials | Made from natural resources |
| Used in constructing power plants, nuclear plants, and radiation protection structures. | Used in typical construction works. |
| Used less water/cement ratio and superplasticizer. | Used 0.4 to 0.55 water/cement ratio |

## Conclusions

The construction industry is increasingly recognizing the potential of special concretes due to their distinct characteristics. Nevertheless, due to the high cost of the mechanism, extensive research is required to facilitate its broader implementation. Specialized concrete materials are extensively utilized in developed countries, where cost is not a primary consideration. In the context of underdeveloped and developing countries, this factor holds significant importance. In the context of large industries, the primary concern for utilizing these products is their durability rather than their cost-effectiveness. In addition, it is prudent to utilize specialized variants of concrete that possess altered characteristics capable of mitigating the limitations inherent in conventional concrete. These types of structures would be advantageous in regions susceptible to earthquakes. Implementing specialized concrete could increase the safety of residential facilities due to its improved characteristics.

## 10- Polymer impregnated concretes

- Irrigation structures applications,
- Bridge decks surface impregnation,
- Underwater and marine applications,
- Structural members,
- Nuclear power plants
- Wastewater disposal works
- Ferro cement products impregnation
- Waterproofing of structures
- Industrial Use (https://www.engineeringenotes.com).

## 11- Self compacting concrete

- Repairing and retrofitting constructions
- Raft and pile foundations construction
- Drilled shafts
- Complex reinforcement distributions Structures
- Earth retaining systems construction
- Columns (Natsoulis,2019).

## 12- Green concrete

- construction of bridges
- widely used in the construction industry.
- building construction.
- It can be used in the construction of roads (Waghmere, *et al.*,2021).

**Table 1: Comparision of special and ordinary concretes**

The increased utilization of this substance has the potential to unveil numerous novel prospects in engineering, microbiology, and construction. In addition to cost savings, potential benefits of implementing the approach above include the ability to experiment with novel designs, enhanced structural durability, and long-term cost reduction (https://buildoft.com.au).

## 7- Colored concrete

For finishing exterior surfaces, flooring, window sill slabs, stair treads, and similar applications are used regarding decorative art and using stones in casting processes (https;//www.civilgiant.com).

## 8- Ferrocement concrete

- Implementation of planks as a substitute for expensive wooden planks in housing projects.,
- Construction of watercraft,
- Boxes of electrical and water meters Used in
- Rural areas for low-cost housing,
- Construction sewage utility hole covers,
- Some industrial and residential buildings (https://happho.com).

## 9- Glass fibre reinforced concrete

- Drainage and waterworks,
- Building renovation works,
- Tunnel lining panels and bridge,
- Architectural cladding
- Construction permanent formwork,
- Screens and acoustic barriers ( https://the constructor.org).

construction of various infrastructure projects such as bridges, hydropower structures, and pavements.

## 4- Sprayed concrete

Sprayed concrete has numerous applications and uses, such as constructing curved structures like domes, shell roofs, tunnel linings, and free-formed facilities like climbing walls and swimming pools. It is also utilized in underground construction, retaining walls, and piled wall facings. Additionally, sprayed concrete is frequently employed for the fire protection of steelwork and to strengthen and repair existing structures (ACI,2008).

## 5- Water resistant concrete

Waterproof concrete is highly suitable for underground applications that require impermeability and numerous expansive above-ground edifices that could profit from its ability to endure water. For instance:

- Underground parking,
- Flood-prone building areas/those with high rain levels,
- High water table areas,
- High-rise buildings,
- Basements(https;//totalconcrete.co.uk).

## 6- Self-healing bacterial concrete / Bioconcrete

Bio-concrete exhibits versatility in various contexts. The adaptable nature of Bacillus microorganisms renders them suitable for employment in various forms of infrastructure, such as buildings, tunnels, and bridges.

## 1- Light weight concrete

- Screeds and walls that need nailing to secure timber,
- Thickening and screeds for common use, particularly when they add weight to roofs, floors, and other structural members,
- Roof insulation for heat.
- Casting structural steel as a building covering or as a fire and corrosion-resistant material.
- External structures of small homes and surfaces rendered,
- Building partition and panel walls in frame structures,
- Water pipe insulation,
- General wall insulation
- Fixing bricks to accept joinery nails, primarily in residential or domestic-style buildings,
- Furthermore, it is currently employed in constructing reinforced concrete structures( https://theconstructor.org).

## 2- High workability concrete

- Inaccessible locations,
- Underwater applications,
- Over distances concrete pumping,
- Large flat areas (ACI,2008).

## 3- Ultra-high-strength concrete

Ultra-high-strength concrete has been widely utilized in civil engineering owing to its exceptional characteristics, including remarkable strength and excellent durability. High-performance concrete has been utilized in the

sand, and water, and adding chemical admixtures such as superplasticizer and mineral admixtures such as silica fume and fly ash.

### 12- Green concrete

Green concrete refers to concrete that has been recycled from environmentally safe sources. Green concrete is made using as many recycled resources as possible. The benefits of green concrete over traditional concrete were examined by Agarwal (Agerwal & Gerg, 2018). Using recycled aggregates and materials lessens the load on landfills and reduces aggregate waste. The net CO2 emission is therefore decreased. Recycling materials also significantly boosts the economy. Since it is environmentally benign, green concrete may be a crucial component of sustainable development. In green construction methods, green concrete is often employed.

The production of green concrete involves the utilization of waste materials to partially or entirely substitute cement, fine aggregate, or coarse aggregate. The utilized waste materials include recycled concrete aggregate, recycled demolition waste aggregate, glass aggregate, manufactured sand, blast furnace slag, and fly ash.

## Application of special types of concrete

The utilization of special concrete in construction enhances the durability of the structure in comparison to regular concrete, owing to the observance of specific conditions during the preparation process. Specialized concrete formulations are well-suited for severe weather conditions and can endure challenging environmental conditions. Special concretes exhibit low-heat properties. The following is a list of the applications of different special concrete types.

## 10- Polymer impregnated concrete

PIC (Polymer-impregnated concrete) refers to a type of precast and cured hydrated cement concrete subjected to impregnation with a low-viscosity monomer.. This composite material has undergone significant development and is known for its superior structural and durability properties, making it the most advanced. Notably, the essential enhancements to these properties have been achieved through PIC.

The study involved the production of concrete-polymer composites through the impregnation of sand-cement mortar with various polymers such as polystyrene, polyacrylonitrile and, polymethylmethacrylate, as well as copolymers, including styrene-methylmethacrylate, styrene-acrylonitrile, styrene-butyl methacrylate, styrene-butyl acrylate, methyl methacrylate-butyl acrylate, methyl methacrylate-ethyl acrylate, polystyrene crosslinked with divinyl benzene, and styrene-acrylonitrile crosslinked with divinyl benzene (Maiti & Kirtania,1986).

## 11- Self compacting concrete

Self-compacting concrete (SCC) is a novel type that eliminates the need for vibration during placement and compaction. The material can self-flow under its gravitational force, occupying the entire formwork and attaining complete compaction, even in densely packed reinforcement. The inception of SCC was initially introduced by Okamura in 1986, followed by the prototype's development by Ozawa at the University of Tokyo in 1988 ( Nagamoto & Ozawa,1997).

Self-compacting concrete is produced by mixing cement with aggregates of size (1–20) mm, well-graded cubical or rounded aggregates,

## 8- Ferrocement concrete

A hydraulic cement mortar-reinforced matrix with numerous layers of closely spaced, continuous, and comparatively thin wire mesh is characteristic of the reinforced concrete called ferro cement. According to ACI (2006), the mesh may be made from metal or other materials (ACI,2006).

Ferrocement is a construction methodology that involves the application of reinforced mortar or plaster (comprising cement or lime, water, and sand) over an "armature" consisting of woven, metal mesh, metal fibers, or expanded metal, and closely spaced thin steel rods like rebar.

## 9- Glass fibre reinforced concrete

GFRC is a variety of concrete that is reinforced with glass fibers. The item above is commonly referred to as "glass fiber reinforced concrete," or GRC, in British English to as "glass fiber reinforced concrete," or GRC, in British English. Glass fiber reinforced concrete (GFRC) finds its primary application in the construction of exterior building facade panels and as architectural precast concrete. Glass fibers (GF) were used as reinforcement for mortar and concrete in 1931(Gorski, *et al.*, 2018). The process of creating them involves the extraction of molten glass through spherical holes, followed by the formation of approximately 200–240 individual fibers through stranding, and ultimately culminating in the segmentation of these fibers into smaller portions (Zych, 2010) . Glass fiber, a byproduct of the glass manufacturing industry, is disposed of in substantial amounts. The utilization of said fibers has the potential to enhance the mechanical performance of concrete as well as streamline the management of industrial waste, as evidenced by previous research (Kumor & Baskar, 2014).

Bioconcrete is generated through the combination of concrete mixture with microorganisms. Due to the highly alkaline nature of concrete, the selection of bacteria to be added must adhere to specific criteria. The introduced microorganisms must possess the ability to endure the severe ecological circumstances inherent to concrete. Concrete can be fortified with diverse strains of aerobic bacteria, including Bacillus sphaericus, Bacillus pasteurii, Bacillus subtilis, and Escherichia coli.

## 7- Colored concrete

Concrete can be colored through two primary methods. The initial method involves the application of a dry pigment that is spread over the surface of the concrete after its placement. The second method consists of incorporating liquid or dry pigment into the concrete mixture before it is poured. The hardened properties of colored concrete are comparable to those of conventional concrete. From the 1970s onwards, color regained significance in the constructed environment using paints and other coating materials, resulting in the concealment of gray concrete surfaces (Tietz, 2008) .

Nonetheless, sealing provides tangible advantages by protecting against water damage and stains. Although not essential, applying a sealant to colored concrete can enhance its longevity and mitigate surface dusting.

Colored concrete is made by adding colored pigment to the concrete mixture. The main type of pigment used in coloring concrete is synthetic iron oxide. These chemical compounds are commonly used to add natural, earthy colors to concrete. New processes have allowed for more consistent synthetic oxides to serve as pigments, but the effect is similar.

## 5- Water resistant concrete

Concrete materials that exhibit water-resistant properties can prevent water penetration and other liquids, regardless of whether they are situated above or below the surface. These concretes with high density include cement replacements consisting of fine particles. Formerly, waterproof concrete had an external coating, integral mixing, and an external membrane. Additive materials are used in concrete to reduce the water absorption rate (Okene, *et al.*,2017).The composition under consideration is primarily comprised of four elements, namely Portland cement or Kaolin in the range of 30 to 40%, marble dust or silica sand in the range of 20 to 30%, lime in the range of 25 to 35%, and ground salt, alum stone, or calcium chloride in the range of 3 to 12%. The intended purpose of this composition is to provide waterproofing and sealing properties. The powder, which has a texture similar to talcum, is combined with water and utilized as a form of paint.

## 6- Self healing bacterial concrete / Bioconcrete

Bio-concrete can generate calcium carbonate (CaCO3) crystals that effectively seal cracks that appear on the surface. As cracks emerge in the concrete edifice, moisture infiltrates into the cracks. Upon exposure to water and oxygen, the dormant bacteria undergo activation. The present study investigates the utilization of diverse bacterial strains in the production of bio-concrete in comparison to conventional concrete. According to the experiment's findings, water infiltration into concrete after developing cracks triggers the reactivation of previously dormant bacteria through metabolically mediated calcium carbonate precipitation. This process ultimately enhances the strength of bio-concrete in comparison to conventional concrete, as documented in reference (Bashir, *et al.*, 2016).

concrete ingredients. To produce ultra-high-strength concrete by controlling the ingredients of concrete With an increase in cement content, reduce W/C by using a superplasticizer, and add the additive material such as silica fume to reach the high strength.

## 4- Sprayed concrete

Applying sprayed concrete involves using a nozzle to pump the concrete, which is then consolidated by the effect of subsequent sprayed particles. The process of wet-sprayed concrete consists of transferring pre-mixed concrete from a hopper to a nozzle, where it is combined with compressed air and an accelerator. Upon contact with the substrate, the wet mixture is sprayed and undergoes flash-setting. This diverges from the traditional method of applying concrete, wherein it is manually or mechanically pumped through a pipe and subsequently consolidated under the influence of gravity, often augmented by vibration or other compaction modes. According to Jolin, *et al.*,(2014), the placement technique facilitates the application of sprayed concrete in vertical or overhead areas, possesses irregular geometries, and requires minimal or no formwork.

The process of sprayed concrete involves the conveyance of a blend of aggregate and Portland cement through compressed air to the nozzle of a spray gun, where water is added. Subsequently, the wet mixture spreads on the designated surface and can be promptly carved or troweled with a trowel. The optimal ratio of cement to aggregate is contingent upon the specific construction methodology employed. The recommended weight ratio for cement to sand and stone in dry spraying is between 1:4 and 1:4.5. For wet spraying. Maintaining a weight ratio of 1:3.5 or 1:4.0 between cement, sand, and stone is recommended.

The European and UK standards for concrete, namely BS EN 206 and BS 8500, provide directives on the appropriate level of workability for various applications. Using cement replacement materials like fly ash can significantly enhance concrete mixes' handling and placement characteristics. In addition, the utilization of admixtures, specifically water reducers, and superplasticizers, has beneficial impacts on the workability of concrete while maintaining the integrity of its other properties (https://www.concretecentre.org). Several techniques can achieve concrete with enhanced workability, such as elevating the water-to-cement ratio, incorporating larger aggregate, and utilizing well-rounded and smooth aggregate instead of irregularly shaped aggregate, elevating the duration and temperature of the mixing process.

## 3- Ultra high strength concretes (UHSCs)

UHSCs are high-strength concrete (HSC) that have garnered attention as a potentially transformative material in the concrete industry. Implementing specialized production methods makes it feasible to produce concrete with a compressive strength exceeding 1000 kg/cm3. Portland cement, fine sand or quartz, silica fume, a water-reducing additive, and steel fibers are all listed as ingredients in this kind of concrete (Allena & Newtson, 2011) . The widespread accessibility of additives and admixtures like silica fume and water-reducing admixture makes establishing concrete factories across the globe a viable option for increasing the economic viability of ultra-high-strength concrete (UHSC) (Du, *et al.*, 2020 & Mousari, *et al.*,2019). Establishing an Ultimate Heat Sink System (UHSC) is a crucial safety measure for nuclear reactors. The production of ultra-high-strength concrete can be achieved by regulating

Subsequently, the utilization of lightweight concrete has been extensively disseminated in other nations, including the United States, Sweden, and the United Kingdom.

It is suggested that structural lightweight concrete is expected to demonstrate sufficient compressive strength and increased durability while retaining a low density (ACT,2004 and ACI,2009). The modulus of elasticity of lightweight concrete is relatively lower than that of conventional normal-weight concrete. The creep and shrinkage properties exhibited by lightweight concrete are slightly higher than those of ordinary concrete with equivalent grades. Therefore, it is imperative to consider this aspect while designing the structure (Topeu & Ugonoglu,2010).

There are three methods for the production of lightweight concrete. These techniques are:

a- Utilizing lightweight stones ( pumice, porcelanite, limestone).

b- Replacing fine aggregate with gravel of 20 mm maximum size.

c- Applying gas to the concrete to create “gas concrete.”

## 2- High workability concrete

High-workability Concrete is utilized in scenarios with constraints on the amount of vibration that can be applied, especially when a void filling is required. By utilizing an appropriate mix design, it is possible to attain concrete with high workability without causing any substantial effects on its mechanical characteristics, such as compressive strengths and shrinkage. The adequacy of the workability of newly mixed concrete is crucial for its intended use, as it directly affects the effectiveness of handling, placing, and compaction processes.

- Water-resistant concretes,
- Self-Healing bacterial concrete / bioconcrete,
- Colored concrete,
- Ferrocement concrete,
- Self-compacting concrete,
- Glass Fibre Reinforced Concrete, and
- Green concrete.

In addition, the current review looks at special concrete applications and the difference between ordinary and special concrete.

## Special types of concrete and Ingredients

In contemporary times, the evaluation criteria for construction materials have expanded beyond the conventional 28-day compressive strength, owing to the prevalence of concrete in the built environment. In addition to its physical strength and durability, concrete may possess other desirable properties relevant to a particular project. Below are the special types of concretes.

### 1- Light weight concrete

According to the BS EN 206-1 standard, lightweight concrete is characterized by a density range of 800 kg/m3 to 2000 kg/m3 when dense natural aggregates are substituted with lightweight aggregates, either partially or entirely. The utilization of pumice as an aggregate in construction dates back to the second century, when the Romans introduced this technique during the construction of the Pantheon (Samidi,1997). Pumice was the most prevalent type of aggregate employed during that specific year.

## Introduction

Concrete is a composite material composed of cement, sand, and coarse aggregate combined with water to form a microcontent. The structural integrity is contingent upon the characteristics of the concrete employed. Typically, the concrete produced on-site or through ready-mix concrete (RMC) is deemed appropriate for general construction applications within standard localities and environmental circumstances.

When specialized facilities such as power plants, offshore structures, docks, or aerodromes are required, a unique type of concrete possessing a specific set of properties is necessary. Each of these special structures is essential for survival in hostile environments, including but not limited to sulfate, chemical, acid, chloride, and other surface-related attacks. Special concrete refers to a type of concrete that is specifically designed to withstand particular aggressive conditions or situations. This objective can be achieved by modifying the fundamental constituents, the production methodology, or a fusion of both. The mixture proportion will deviate from conventional concrete and incorporate distinct constituents to endure the harshness for which it is designed.

The present review endeavors to examine various categories of specialized concrete, encompassing:

- High-workability concretes,
- Lightweight concretes,
- Sprayed concretes,
- Ultra-high-strength concretes,
- Polymer impregnated concretes,

## المستخلص

مصطلح "خاص" له أهمية متأصلة ويستخدم في هذا السياق للدلالة على السمات المميزة للخرسانة. يشير مصطلح "خاص" إلى القوة والمتانة والصلابة المعززة في الخرسانة. يتضمن إنتاج الخرسانة المتخصصة دمج مكونات متميزة عبر إجراءات محددة تتبع معايير محددة. المطلوب هو خرسانة متخصصة لبناء هياكل فريدة مثل محطات الطاقة والمباني البحرية والأرصفة والمطارات. كل من هذه الهياكل الفريدة ضرورية للبقاء في الظروف القاسية ، بما في ذلك تأثيرات الكبريتات والمواد الكيميائية والحمضية والكلوريد ، بالإضافة إلى المؤثرات الاخرى. الخرسانة هي مادة متعددة الاستخدامات تُظهر قوة ضغط جيدة ويمكن تصميمها لتلبية متطلبات محددة مثل الوزن الخفيف والكثافة العالية والحماية من الحرائق والوقاية من الإشعاع. ومع ذلك ، فإن المادة تتعرض للعديد من القيود ، مثل قوة الشد غير الكافية ، وقابلية نفاذية السائل ، وتآكل حديد التسليح ، والتعرض للتدهور الكيميائي ، والمتانة دون المستوى الأمثل. خضعت الخرسانة الأسمنتية لتعديلات مختلفة بمرور الوقت لمعالجة عيوبها. أحدثت التطورات في تكنولوجيا المواد والبناء تغييرات ملحوظة ، مما أدى إلى تحسين الوظائف وزيادة القدرة على تحمل التكاليف ، وبالتالي توسيع نطاق التطبيق. تطرقت المقالة الحالية الى 12 نوعًا مختلفًا من الخرسانة الخاصة وشرحت بشكل شامل كل نوع. كما تناولت المقالة الحالية التطبيق العملي لهذه الأنواع في البناء والتشييد. في نهاية المطاف ، من المستحسن استخدام متغيرات متخصصة للخرسانة التي خضعت لتحسينات لمعالجة قيود الخرسانة التقليدية. إن تنفيذ الهياكل المكونة من مواد خرسانية متخصصة من شأنه أن يؤدي إلى نتائج أفضل في المناطق المعرضة للنشاط الزلزالي.و يمكن أن يؤدي تنفيذ الخرسانة الخاصة إلى تعزيز سلامة المنشآت السكنية نظرًا لخصائصها الخاصة.


**الكلمات المفتاحية : الخرسانة الخاصة، الخرسانة خفيفة الوزن ، الخرسانة المسلحة بالالياف الزجاجية ، الخرسانة الخضراء و المقاومة العالية.**

## Abstract

The term “special” possesses inherent significance and is utilized in this context to denote the distinctive attributes characteristic of concrete. The term “special” connotes enhanced strength, durability, and solidity in concrete. The production of specialized concrete involves the incorporation of distinct components via specific procedures following specific criteria. Specialized concrete is required to construct unique structures such as power plants, offshore buildings, docks, and airports. Each of these unique structures is essential for survival in harsh conditions, including sulfate, chemical, acid, and chloride attacks, as well as other surface characteristics. Concrete is a versatile material that exhibits good compressive strength and can be tailored to meet specific requirements such as lightweight, high density, fire protection, and radiation shielding. However, the material exhibits several limitations, such as inadequate tensile strength, susceptibility to liquid permeation, reinforcement corrosion, vulnerability to chemical degradation, and suboptimal durability. Cement concrete has undergone various modifications over time to address its drawbacks. Advancements in material and construction technology have brought about notable changes, leading to enhanced functionality and increased affordability, thus expanding the scope of application. The current review delineated 12 different kinds of specialized concrete and comprehensively elucidated each type. The current review also addressed the practical implementation of these types in building and construction. Ultimately, it is advisable to employ specialized variants of concrete that have undergone modifications to address the limitations of traditional concrete. Implementing structures composed of specialized concrete material would yield superior outcomes in regions susceptible to seismic activity. Implementing specialized concrete can enhance the safety of residential facilities owing to its special characteristics.

**Keywords: Special concrete, Lightweight concrete, Glass fibre reinforced concrete,Green concret and High strength.**

# A Review:

# Special Types of Concrete Used in Structures

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# مقالة مرجعية:
# انواع الخرسانة الخاصة المستخدمة في المنشآت

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- A new generation of young architects in the twenty-first century is trying to confront many of the challenges that have emerged in consumer and capitalist civilization, in addition to environmental and technological challenges, which requires them to develop their work continuously to meet the problems of the changing world, in light of the givens of the present and in connection with the roots of the past to draw a better picture for the future.
- Environmental challenges constitute one of the most prominent aspects taken into consideration by young architects in the twenty-first century, which have been dealt with according to varying positions and approaches that reflect their multiple generational units in line with the economic and social requirements of this century, which require excellence and entrepreneurship within collective and individual practices, to include conservative young architects (traditional and cautious) and modern young architects (innovative and inventive), who seek to preserve and improve the environment within sustainable practices to form an image of a better future.
- The necessity of young architects today engaging in many development courses, to advance their skills and experience in a way that keeps pace with the rapid development of technology and the increasing environmental, social and economic challenges, within a trend that advances lifelong learning. They must also not be satisfied with the requirements of the present, meet the needs, and raise the ceiling of ambition to create Advanced and sophisticated architecture, which serves to form an imprint for their future generation.

balance for the sustainability of the colony, and proposing the idea of a circular economy, in addition to complete self-sufficiency in the colony's energy and internal resources, as shown in Figure (16) (Al-Sayyari, 2022), Thus, to be within the entrepreneurial generational unit of young modern architects inventor.

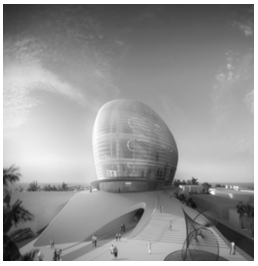

**Fig. 14: Convention Center, Kuwait, 2018, architect Melike Altinisik**

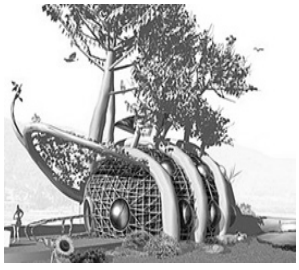

**Fig. 15: The Fab Tree Hab, by architect Mitchell Joachim (Joachim, 2017).**

**Fig. 16: Space Cities by architect Samer Al-Sayyari (Tretiack, 2021) https://digitalfutures. international/space-habitats/**

## 5- Conclusions and Recommendations

- The roles of young architects varied in shaping the future of architecture, to come in the form of positions and approaches that define the entrepreneurial generational units, both conservative and modern. Thus, conservatives extrapolate the future from the past within a traditional approach, in addition to extrapolating the future into the actual present within a Fabian approach, while the modern ones extrapolate the future from the present extending within an Adoptive, Imitative approach, along with both creating and colonizing the future through foresight through strategic planning within an innovative approach, and creating the invisible future through foresight imaginative projection within an inventive approach.

interconnected and stable and designed with computer technology (CNC). The interior walls are made of traditional clay and plaster. A method of weaving tree branches together to form a mesh composition or living screens was adopted, and the walls and ceiling are interspersed with pockets of soil and growing plants so that this building is sustainable in terms of recycling waste and using rainwater to improve the lifestyle to return the favor to nature instead of exploiting it. The assumed lifespan of the building is also longer than standard structures of those built with brick and concrete, as shown in Figure (15) (Joachim, 2017; https://www.archinode.com/), Thus, to be within the entrepreneurial generational unit of Young modern architects innovator.

- Architect Samer Al-Sayyari: He is an Egyptian architect who has won many local and international awards, including the French Jacques Rogery Foundation International Award for Innovation and Architecture in Space. He proposed the idea of designing space colonies and cities on the Moon and Mars to be a station for human expansion beyond the Earth's scope to discover space. The design ideas relied on combining the heritage of the past with the technology of the present. His design for a colony on the moon was inspired by traditional Arab oases and how ancient desert urban communities succeeded in surviving despite difficult climatic conditions. Beginnings are always similar to a new beginning for the human race in a new environment, and the moon oasis was redesigned using parametric design and 3D printing technology using robots, preparing the internal ecological and environmental

to interpret the universality of science and technology within a framework that includes the geography, history, and culture of the place, and this is what she adopted in the design for the Kfas Headquarters and Convention Center in Kuwait (2018). She considered sunlight, sea climate, and strong natural elements to influence the main character of the place, so liquid and natural forms of bubble-shaped design were adopted instead of solid geometric shapes and perpendicular shapes, taking into account the relationship between sunlight and the roofs of buildings within features such as color, texture, and perforations of foldable roofs, which create semantic links with sunlight, sea, water, nature, and wind, exceeding the flexibility of adapting to the requirements of construction and physics, as shown in Figure (14) (https://www.melikealtinisik.com/2-index/112-kfas-headquarters-convention-center/), Thus, to be within the entrepreneurial generational unit of young modern architects innovator.

- Architect Mitchell Joachim, an American architect and urban designer, born in 1972, relies in most of his projects on innovative ways to draw inspiration from living biological materials in both manufacturing and design. One of his most prominent works is (The Fab Tree Hab), which is a virtual ecological house developed at the Massachusetts Institute of Technology, with Javier Arbona and Lara Greeden, aiming to reduce the burden that humanity places on the environment and create traditional housing by planting living, breathing tree houses according to a renovation concept that takes a new architectural form. It is built by allowing local trees to grow on top of a plywood scaffold that is removable once the plants become

and even social challenges, which can be considered to have an impact on the future of architecture in general. Some of them will be reviewed to clarify this aspect, according to the following:

- Architect Anna Heringer: She is a German architect, born in 1977, and one of the advocates of sustainable architecture. In her projects, she relies on building using natural materials such as clay and bamboo. She has designed many prominent clay buildings, such as in the design of the METI School in Bangladesh, and the design of a guest house for the Center of alternative medicine treatment using materials within the site's assets and surroundings in Rosenheim, Germany, for which she won the Aga Khan Award for Architecture in 2007. Thus, to be within the entrepreneurial generational unit of young traditional conservative architects. Figures (12-13) illustrate these projects. (Anna-heringer,2008)

**Fig. 13: School of Handicrafts, 2007, Bangladesh, architect Anna Heringer**
**https://www.archdaily.com/51664/handmade-school-anna-heringer-eike-roswag**
**Fig. 12: Treatment Center for Alternative Medicine, Germany, 2008, architect Anna Heringer**
**https://www.asharqbusiness.com/article/2657**

- Architect Melike Altinisik, a Turkish architect who graduated from Istanbul Technical University in 2003 and worked in Zaha Hadid's office and established her office in Istanbul in 2006. In her designs, she seeks

**Fig. 9: The floating school in Makoko, Nigeria,2012,NLE Architects Group**
**https://www.archdaily.com/tag/nle-architects**

**Fig.10: Residential complex, China,2012, YIN Tegnestue Architects Group**
**https://www.archdaily.com/212214/klong-toey-community-lantern-tyin-tegnestue-architects**

**Fig. 11: Islamic Cultural Center, New York, 2013, architect Bora Koray (McKnigh, 2016).**

## 4-2 Individual Young Architectural Practices

They are young, individual architectural practices with trends that are compatible with the specifics of contemporary environmental, economic,

with its context and has changed its surroundings into a safe and pleasant area. Their design process involves healthy, detailed conversations with users to understand their problems and needs and to encourage community engagement. The architects believe in using locally sourced and reused materials that serve the dual purpose of being sustainable and creating a connection between the building and residents, as can be seen in Figure (10), to represent the entrepreneurial generational unit of Fabian young conservative architects.

- Buro Koray Duman Company: It is the company of the young Turkish architect Bora Koray Duman, born in 1978. He holds academic degrees in both Turkey and the United States. He has a diverse perspective in architecture, as he has a style in which he constantly challenges social and political traditions. His company won the title of Best Emerging Company at the A+ Awards for the year 2017 due to its future vision of the role of the architect, along with the desire to break the restrictions surrounding the profession. One of its most prominent works is the design of the highly transparent Islamic Cultural Center (2013) in New York, which aims to promote the coexistence of interfaith and cultural exchange in that it is open and welcoming and aims to change the image of Islam in the West from one of fear of the unknown to an amazingly enjoyable image and to create transparency from the outside to the inside by wrapping the building with a glass exterior and covering the interior areas not with walls, but with semi-transparent screens taking Islamic style, resembling a mashrabiya (McKnigh, 2016), as shown in Figure (11), to represent the entrepreneurial generational unit of innovator young modern architects.

project in Makoko, a flood-prone area in Nigeria, as well as the floating school in Venice, as both designs are appropriately adapted to local conditions and are easy to assemble, which usually takes (10) days as a maximum of four builders to assemble each of them, as shown in Figure (9), to represent the entrepreneurial generational unit of Fabian young conservative architects.

- YIN Tegnestue Architects Group: It is a group of Norwegian graduates, Andreas Jjersen and Jashar Hannstad. They created this company in 2008. Their goal was to provide realistic and immediate solutions for people living in poor and underdeveloped countries all over the world. They have life-changing projects in Thailand, Burma, Haiti, and Uganda. Community engagement is a key element of their design approach. As a result, local people actively contribute to the design and construction processes, adopting approaches to creatively reuse different objects in their structures. This strategy was evident in their use of recycling materials in the Klong Toey Community Lantern Complex, which is one of the largest and oldest slum housing located in Bangkok, a typical example of the efforts of young architects to address the contextual problem of unemployment, crime, and drug abuse, due to its design as a public playground. The building creates a visually open and narrow linear form that allows its residents to make iterations according to their requirements. The construction of the complex took approximately three weeks, during which the team of architects conducted workshops, interviews, and public meetings with the residents of the community. The project works in parallel

not follow traditional architectural design practice (Tan, 2015, p. 117). Many collective architectural practices emerged, including young emerging architectural companies or those individual practices with approaches that fit the specificity of contemporary challenges that were able to make a global impact through their work by seeking to change people's lives, not change the shape of the earth (Kathuria,2020).

Following the above, this research will review some of the architectural practices of each of the young architects aged (22-35 years) within the category of graduates and professionals who deal primarily with environmental and economic challenges in a way that is consistent with the scope of this research to determine the nature of the entrepreneurial generational units of each of them in shaping the future of architecture. It has been taken into account that these practices come from several countries in the world.

## 4-1 Young Architectural Practices for Startups

They are young, collective architectural practices with trends that are compatible with the specifics of contemporary environmental, economic, and even social challenges, which can be considered to have an impact on the future of architecture in general. Some of them will be reviewed to be clarified according to each of the following aspects (Kathuria, 2020):

- NLE Architects Group: It is a group of young architects led by Kunlé Adeyem aiming to improve social, economic, and environmental conditions through their work. The company has entrepreneurial projects in China, Korea, Italy, and Nigeria. Their main interest is to address problems resulting from climate change and rapid urban growth in coastal communities, including the floating school

and as a generalization of the ideas of curved, spiral, and spherical shapes, architectural electronic ideas, and comprehensive architectural ecology, as well as experiments in the trends of mobile, kinetic, and transformative architecture, and the design of interiors, furniture, and equipment in places that can change their functions within a short period. The development of ideas of "flexible architecture", the creation of sculptural architecture, and the use of effective materials, such as aluminum, plastic, and polymers, also emerged. In addition to measures to eliminate existing differences between the city and the village, and to propose ideas of infinity and continuity in architecture (Proskuryakovand Bohdanova, 2020, P.111).

These ideas are compatible with all the challenges facing architecture, and the attempt of the new generation of young architects to confront them within consumer and capitalist civilization. The environmental challenge emerges as the most necessary challenge, which requires young architects to look at the broader picture of the future of the planet in light of the need for a sustainable built environment, in addition to the difficulty of the young architectural practice of this century because it involves a lot of competition, with the presence of the institutional policies of the large major architectural offices, and the difficulties of working for young architects, as well as the impact of the forces of the economic crisis on the built environment, which made small offices search for new types of practices.

Therefore, many young architects from different geographical regions have started to form research-based groups, in which they interact with communities to create customized experimental design tools, organize exhibitions, run educational workshops, and many other different platforms to actively share architectural knowledge in various fields, so that, it does

| | | | |
|---|---|---|---|
| Innovator Young Architects | Creating and colonizing the future through foresight and long-range strategic planning | Flexible handling | With contemporary architectural ideas and values |
| | | | Contemporary architectural products |
| | | Discover new materials and techniques | |
| | | Developing current architectural design methods and approaches | |
| | | Innovation and redirection | New architectural ideas and values |
| | | | New architectural products, in whole or in part |
| | | | New design techniques and methods |
| | | Other | |
| | | Finding architectural products within the preferred possibility | Unfamiliar |
| | | | Uncommon |
| | | | Changing |
| | | | Hidden |
| | | | Other |
| Inventor Young Architects | Creating the invisible future by foresight long-range imaginative projection | Looking forward to new architectural ideas and values | |
| | | Creativity and creation of new architectural products | |
| | | Investigation | New building materials and techniques |
| | | | New design methods and techniques |
| | | Other | |
| | | Finding architectural products within the preferred potential | Utopian idealism |
| | | | Untested |
| | | | Unlimited |
| | | | The mysterious |
| | | | The unknown |
| | | | Other |

## 4- Case Studies

The research investigates the specificity of young architects in the 21st century, which was characterized by the emergence of many young architects' ideas that were considered future ideas for architecture, in terms of being a proposal for the ideas of cities and spatial suspended buildings,

| | | | | |
|---|---|---|---|---|
| Fabian Young Architects | Reading the future in the actual present by relying on emerging mid-range anticipatory | Relative adherence to previous general and specific architectural ideas and values | | |
| | | Imitation and resemblance to previous material products, in whole or in part | | |
| | | A relative adoption of previous design methods and techniques | | |
| | | Limited borrowing of contemporary general and specific architectural ideas and values | | |
| | | Partial integration of modern architectural design techniques and methods | | |
| | | Integrating ancient architectural works with modern ones | | |
| | | Other | | |
| | | Finding architectural products within the acceptable potential | Improving | For the familiar |
| | | | | For the experimenter |
| | | | Liberal | From actual reality |
| | | | | From the limited |
| | | | Unique | To be fit (suitable). |
| | | | | To achieve the present enjoyment |
| | | | Other | |
| Modern Young Architects | | | | |
| Adoptive/ Imitative Young Architects | Reading the future in the extended present by relying on mid- range prediction | Limited renewal of architectural products | | |
| | | imitating modern architectural styles and methods | | |
| | | Openness | On universal architectural ideas, styles, and values | |
| | | | On current global design styles and methods | |
| | | Flexibility and adaptation of current global products to suit the local context | | |
| | | Postponement | For future architectural ideas and values | |
| | | | For future methods and design techniques | |
| | | Other | | |
| | | Finding architectural products within the preferred possibility | Useful | |
| | | | Perfect | |
| | | | Rational and conscious | |
| | | | Other | |

Thus, these young architects are looking forward to new architectural ideas and values (that do not previously exist), inventing and creating new products through exploring new materials, building techniques, and new design methods to find ideal/utopian, untested, and unlimited architectural products that are mysterious and unknown within the preferred possibility.

Based on all of the above, young architects can be identified as entrepreneurial generational units that contribute to shaping the future of architecture, according to the aspects shown in Table (1).

**Table (1) Entrepreneurial Generational Units for Young Architects and Shaping the Future.**

<table>
<tr><td colspan="4">Conservative young architects</td></tr>
<tr><td rowspan="11">Traditional young architects</td><td rowspan="11">Reading the future in the past by relying on the prevailing short-range anticipatory</td><td colspan="2">Full commitment to the previous general and specific architectural ideas and values</td></tr>
<tr><td colspan="2">Repeating and copying previous material products, in whole or in part.</td></tr>
<tr><td colspan="2">Imitating previous design methods and techniques.</td></tr>
<tr><td colspan="2">Others</td></tr>
<tr><td rowspan="7">Finding architectural products within the acceptable possibility</td><td>Familiarity</td></tr>
<tr><td>The tried and tested</td></tr>
<tr><td>The real one</td></tr>
<tr><td>Actual realism</td></tr>
<tr><td>Near</td></tr>
<tr><td>Enough</td></tr>
<tr><td>Suitable</td></tr>
<tr><td>To achieve the present enjoyment</td></tr>
<tr><td>Other</td></tr>
</table>

For example, but not limited to, the Archigram group in London was formed by three young architects in the 1960s: Peter Cook, Warren Chalk, and Ron Herron, who had recently graduated from architecture schools with three more famous architects: Dennis Crompton, Michael Webb, and David Greene, and they were joined by Theo Crosby, who produced virtual projects as shown in Figure 8, to express its vision of the future at that time. It addressed many architectural issues, including anti-heroism, the promotion of consumerism, mass production, etc., as a reaction to modernist architecture. The group drew a very unique and dazzling, often comic-like vision of a glamorous future machine age. They were inspired by technology and created visions of highly flexible and mobile spaces or even city infrastructure that could move from one environment to another in response to climate change. The group shook the solid foundations of architectural modernism by boldly promoting their unconventional ideas, as playful, pop-inspired visions of a technocratic future dominated their projects, which was expressed through virtual designs (Salder, 2005).

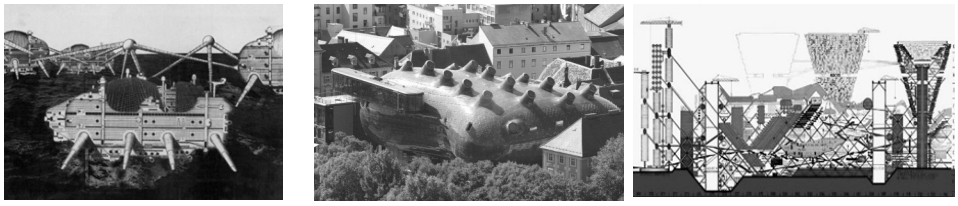

Fig. 8: Imaginative projects for future cities, Archigram
https://revistabifrontal.com/archigram-la-arquitectura-como-rebelion-nomada
Archigram

approach of making decisions and exploring anticipatory alternatives for a future that cannot be achieved in the present is not linked to repetitions and can be imagined according to specific events and information to overcome potential events and problems through inventing the new and not previously existing, seeking to find architectural products that are among the preferred possibilities.

The inventive level in architecture is associated with breaking away from the old, emphasizing the new, the strange, and the abnormal, with creating absolute and violent change. The inventive level refers to penetrating established laws, principles, or schools of thought to present new starting points and ideas, and thus lead to the emergence of completely and radically new principles, theories, or assumptions, which may cause a sharp and dramatic break with the present and the past according to inflection and turning points (Al-Qaraghuli, 2009).

The importance of deriving architectural form from non-temporal formal principles emerges beyond specific environments, civilizations, and designers, as some forms have a timeless aesthetic that transcends the special circumstances of the design problem, the designer's subjectivity, and the prevailing culture (Al-Qaraghuli, 2009). The importance of exchanging ideas among young people and guessing to anticipate how the world will look in the future by rethinking and rebuilding it could be motivated by the feelings and aspirations of young people for architecture, influenced by today and looking forward to tomorrow. These ideas carry speculation and offer promises that enable much improvement and refinement and prepare the scene of architecture that changes and responds to new and different ways of thinking. Young architects often question their inheritances and establish new values, new methods, and new forms of practice (Sterk, *et al.*, 2009).

of the conceptual ideas of the new trend as innovative and revolutionary in shaping the architectural appearance. Their projects in that period related mainly to industrial buildings, as it was a turning point in their work in building design. One of their projects in 1966, Computer Factory (Reliance Control), led to the establishment of high-tech trends (William, 1996).

Technological creativity for young architects lies in distinguishing the difference between imagination and creativity, which is the ability to achieve what you imagine. Creativity is distinguished from other forms of imagination. For an architect to be creative, he requires that he possess the origin of an idea, plan and study its feasibility, and the possibility of success if it is put into practice. This contradicts imagination as a superior mental process that has nothing to do with realistic or practical problems. The technology is considered an essential element in creativity for all projects related to construction and finding innovative solutions (Spiridonidis and Voyatzaki, 2010), as it achieves the innovative level in architectural products and it achieves everything that is unusual, uncommon, unfamiliar, and new (Al-Qaraghuli, 2009).

Thus, these young architects flexibly deal with ideas, architectural values, and contemporary products by discovering contemporary building materials and techniques that work to develop current design methods and techniques by innovating and redirecting new and previously unknown architectural design ideas, values, products, and methods to create desired products that are unfamiliar, not common, variable, and may be hidden within the preferred possibility.

### 3-2-2-3 Inventor Young Architects

In general, these young architects create a better, invisible future by anticipating long-range imaginative projection. They work according to the

alternatives for a better future to overcome potential events and problems through innovations that are characterized by creativity and lead to a transformation in the lifestyle to find architectural products that are within the preferred possibility.

New (young) architectural practices were able to challenge building standards and redefine specific levels of events through new roles for architects whose expertise goes beyond the traditional field of the profession and their pursuit of a proactive role through developing and acquiring new skills and establishing new connections so that the architecture profession moves with the times through insights and ideas critically into their added value to the construction industry and being open to taking on new tasks and responsibilities and changing existing tasks and responsibilities (Lieftink, 2018). The creativity in architecture represents a process of positive change, innovative advancement, and effective development that aims to organize the product. Therefore, change or new organization is a creative interaction, and in this way, the architect has created something new or added a new relationship to existence to be considered this type of engagement as "creative work" (Al-Qaraghuli, 2009). Creativity is characterized by the ability to perceive the world in new ways, find hidden patterns, establish links between seemingly unrelated phenomena, and find solutions (Meyer and Fourie, 2018).

For example, but not limited to, the two young architects Norman Foster and Richard Rogers, along with their wives, established Team 4 in 1964 in England. This young team created a new style of architecture based on advanced technology and became known as a company distinguished by its engineering designs inspired by technology. Norman Foster formulated part

The architect Hisham Munir is considered the pioneer of modernist architecture in Iraq, and his influence on Western architectural discourse is evident in its early stages, as it was dominated by the character of modernity with a global orientation (International Style), as in his design of the Ministry of Commerce building in 1965, which shows his influence by the Boston Municipal Building, as shown in the Figures (6-7) (Al Chalabi,2016)

Thus, this young architect attempts limited renewal of architectural products and imitates modern design methods and styles after being open to architectural ideas, values, and international design methods and styles. Most of the time, he postpones the adoption of other future ideas, values, and design methods to find useful, ideal, and rationally conscious products within the preferred possibility.

Fig. 6: Boston Municipality 1963, in Massachusetts / USA, Architects Office: Kallman, McKinnell, and Knowles.

Fig7 .: Iraqi Ministry of Commerce Building 1965, by architect Hisham Munir

https://elaph.com/Web/Culture/2011/5/656803.html

### 3-2-2-2 Innovator Architectural Young

In general, these young architects create and colonize a better future through foresight and proactive long-range strategic planning. They work according to the approach of making decisions and exploring expected

architecture in terms of architectural ideas and methods, which appeared in his work, as he participated in designing and supervising the construction of the Iraqi Pavilion in 1937 with the French architects Albert Laprade and Léon Bazin.

The building brought back to life one of the Seven Wonders of the World, which is the Hanging Gardens of Babylon. The main mass mimics the shapes of the buildings of Iraqi civilization city in terms of its cubic shape and gradation. The entrance is guarded by two winged lions, and in the hall of honor stands a miniature model of the city of Babylon in its middle, all the way to the courtyard surrounded by columns, in the middle of which there is a statue of Charlemagne as a reminder on receiving a gift that was the first watch made in history, and it was one of the masterpieces of technical products that were invented in Iraq at that time. As for his design of the Olympic Club in Baghdad (1939), the building's design responds to the principle (less is more) proposed by Mies van de Roo in modernist architecture, as the building is considered an important synthesis between European models with a kind of adaptation to the local context, especially in terms of taking into account the climatic conditions. The front façade with its blocky curvature constitutes a distinctive urban element closely related to the shape of the square, as shown in Figures (4-5) (Al Chalabi,2016).

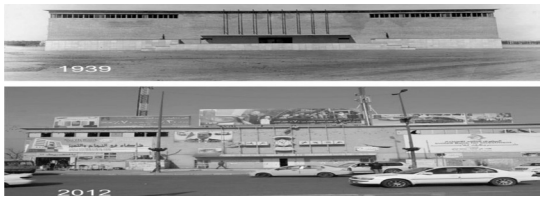


**Fig.** 4 **: Olympic Club 1939, Baghdad (architect Ahmed Mukhtar).**

Fig5 .: The 1937 Iraqi Exhibition at Expo Paris 1937 (Ahmed Mukhtar and others).

trends that may sometimes reach innovation. This category can be classified into the following:

### 3-2-2-1 Adoptive/Imitative Architectural young

This architect reads the future in the extended present through medium-range forecasting, and works according to a systematic analysis of the present data of successful innovations that have already begun and are happening to others and have not reached us till now, but will arrive later, to be adopted and imitated to formulate what the future will look like to find architectural products within the preferred possibility.

The modernist influence on Iraqi architecture in the first half of the twentieth century is one of the most prominent examples that illustrate the generally adopted and interactive position, which will be clarified, but not limited to, as many architects (including young architects) adopted the modernist approach as a frame of reference that refuses to look at heritage as thought, which was reflected in many architectural works, as the idea of modernity prevailed and had a strong resonance with the emergence of the industrial revolution and its new secretions in architectural communities, as they called for the necessity of liberation from historical patterns and stopping their repetition and reproduction, with the aim of finding solutions for new functions that historical patterns cannot accommodate and calling for investing in the machine, openness to universal ideas and values, flexibility, adaptation to them within limited innovation, and the adoption of modern design methods, as in the works of the young architect Ahmed Mukhtar Ibrahim, who is considered one of the makers of Iraqi architecture in the thirties. He was distinguished by his style and was strongly influenced by the products of European architecture and modernist

(Lieftink, 2018). For example, the group (The New York Five), which consisted of five young architects at the time: Peter Eisenman, Michael Graves, Charles Gwathmey, John Hejduk, and Richard Meier, borrowed the works of the modernist architect Le Corbusier while making some improving additions, as this was evident in their design of several architectural works, as can be seen in Figures (1-3) (Kwon, *et al.*, 2016).

Fig.1: Eisenman House 1967
Peter Eisenman

Fig. 2: Smith House 1966
Richard Meier

Fig. 3: Gwathmey House,1966
Charles Gwathmey

https://www.nytimes.com/2009/08/24/arts/design/24five.html

Thus, these young architects make a relative commitment to previous architectural ideas and values (general and specific ones) and emulate and resemble previous material products, partially or completely, as well as a relative commitment to previous design methods and techniques, in addition to the partial integration of what is contemporary to create improved, liberated, and unique architectural products within the acceptable potential.

### 3-2-2 Modern Young Architects

The modern is everything that existed after it did not exist, and in most cases, it is the opposite of the old. Thus, modern young architects seek everything new and contemporary at the level of ideas, values, material products, and design methods, within interactive, adaptive, and innovative

Mamluk and Ottoman eras, which contributed to the construction of many architectural products in a way that reflects the cultural heritage. According to Hassan Fathi, instead of the feeling that human behavior is governed by architectural space, it is rather a call for harmony and integration between nature and industry, for technology to be subordinate to social traditions and meet human needs. He was more interested in building communities than constructing buildings, and he was a pioneer in providing models of buildings that respect the traditions of places and take into account all aspects of life (Steele, 2008).

Thus, this young architect fully adheres to previous architectural ideas and values (general and specific ones) and replicates or even copies physical architectural products in whole or in part, as well as imitating previous design methods and techniques to create products that, although familiar, tried, and true, are appropriate, sufficient, and currently enjoyable within the possible acceptable.

### 3-2-1-2 Fabian Young Architects

These young architects read the future in the actual present through the emerging expectations within the medium range, and work according to the data of both the past and the present, to draw and formulate a future based on somewhat new aspects resulting from repetitions to find architectural products within the acceptable possibility.

Young architects imitate senior architects and pioneers (star architects) in that values, ideas, concepts, and products are shared, analyzed, adapted, changed, and made relevant to new contexts and problems. That is, they imitate and borrow successful products and methods created by others

### 3-2-1 Conservative Young Architects

The term conservative refers to everyone who adheres to traditions and inherited social and political values, and as such they are committed to a traditional nature, whether at the level of ideas and values or the level of material products and design methods. Even their desire for development is limited by a cautious approach in most cases. This category of Architects can be classified into the following:

#### 3-2-1-1 Traditional Young Architects

This young architect reads the future in the past through prevailing anticipatory, which are used in daily life and as required by a need in the short range, considering that history repeats itself in recurring phenomena to find architectural products that are within the acceptable possibility.

Architects try to adopt the traditional roles of architecture and accomplish the tasks and responsibilities associated with production, to be consistent with the way of work that they were accustomed to in the past, to provide positive results following previous projects, even if this weakens the value of new experiences (Lieftink, 2018). Architects also adopt the traditional design language, whether in restoration or the design of new buildings, as traditions have proven of great importance in dealing with cities of a historical nature, Hassan Fathi's style is considered, in its beginnings, influenced by the global trend due to his education, but soon his approach began to be influenced by local architectural details, such as elements, building materials, methods, and construction. He combined traditional structural elements, which he derived from the sources of Nubian rural architecture built with bricks and mud, and from ancient houses and palaces in Cairo, in both the

### 3-2 The Role of Young Architects in Shaping the Future of Architecture

In general, the future of architecture is dealt with as being material products that reflect values and ideas by adopting techniques and methods for design. Architectural ideas and values in terms of the general intellectual content, including ideas, concepts, dialectics, schools of thought, theories, studies ...etc., and related to the thought of the individual (the designer), on the one hand, interacting with the environment, cultural, civilizational, and social environment, on the other hand, so that this content has a fundamental role in the architectural vision, and the special architectural ideas and values in terms of the intellectual content of the designer's personality, linked to his different previous works and opinions. (Al-Qaraghuli, 2009).

Design methods also refer to a set of procedures, techniques, or auxiliary tools that designers use in the design process. They may be traditional, such as drawing and manual design, modern ones that combine traditional and new methods, or contemporary ones by adopting advanced technologies such as virtual and augmented reality and artificial intelligence, so that the architectural products will include all the material products that reflect the system of public and private architectural ideas and values that were created as a result of architectural design and composition.

Young architects contribute to shaping the future of architecture in that they are entrepreneurial generational units following Manheim's propositions within generational theory and the Clarence Danhof model for entrepreneurs, in a way that reflects their multiple positions and, trends, which can be clarified in each of the following:

Based on what Mannheim proposed in terms of the similar chronological ages of the generation along with the mind of the generation, as well as the classification of the biological ages of young people in general, it is possible to determine the age phases of young architects according to both chronological and cognitive age to include both young architects students of biological age of (17-21 years), the early graduate (22-24 years), and the adult-professional graduate (25-35 years), with various cognitive ages linked to different experiences and knowledge. The adolescence stage has been neglected for young people (14-17 years) because it is outside the academic field of architecture.

On the other hand, young architects are characterized by the traits and characteristics of young people in general, being affected by all social, historical, economic, and other factors, with a focus on environmental and technological factors that constitute a large number of factors and are considered challenges. (Hendry, 2015) (Adedapo, *et al.*, 2017), so that they can contribute to building the present and establishing the future through their endeavor to redefine architectural work with new methods that respect the historical and cultural context, but may go beyond the traditional and establish innovative architectural works that contribute to improving society and may lead to building a new identity (Williams, 2018) (Proskuryakov and Bohdanova, 2020), and according to the relationship with senior expert architects, as this relationship is formed at the academic and professional levels through guidance, exchange of opinions and ideas, training, and working with multiple generations in a way that serves the provision of support and empowerment for young architects, which is reflected in the field of teaching, learning, professional practice, and even in the multiple programs and plans provided by institutions and organizations. (Boyle, *et al.*, 2016).

identified and a theoretical framework can be built by organizing knowledge for both architectural studies and proposals and applied practices, according to what was presented regarding young and shaping the future from outside the field of architecture according to each of the following:

### 3-1 General Aspects of the Concept of Young Architects

Young architects represent an integrated, multi-faceted phenomenon that contributes to the formation of architectural production and establishes a better future, as they are an age group that refers beyond the biological age of young people in general, and is determined according to professional experience to include the emerging young architect, the novice, and the practitioner compared to senior architects as experts (Adedapo, *et al.*, 2017), and the possibility of classifying them according to the stages they go through within the academic field so that architecture students are the emerging young group that is under supervision of senior architects to teach them architectural knowledge according to methods that work to develop awareness of their strengths and build their architectural personality with the help of new technologies. The category of young architects includes recent graduates and their capabilities to create innovative architecture that respects the challenges of the era, including environmental design (Spiridonidis, Voyatzaki, 2010). Architectural knowledge varies between the skills and experiences of the architect, including academic experience, life experiences, craftsmanship, acquired experiences, interests, hobbies, and even his movements and travels, in addition to the architect's self-reference in terms of his previous products and opinions (Al-Qaraghuli, 2009).

technology and methods that others have invented, so he faces fewer risks, but he contributes to the growth of the culture of projects and entrepreneurship and provides ample employment opportunities for youth, hence he is treated as a factor for economic development.

- Fabian: He imitates other innovations only if he is certain that not doing so may harm his business. He is very skeptical in his approach to adopting or innovating new technology in his organization. He is not adaptable to the changing environment. He prefers to remain in the current business using old production techniques, but he adopts new technology only when he realizes that not adopting it will lead to a significant loss.
- Drone: He is committed to the character of traditional businesses, machines, or traditional work systems, where he feels comfortable with old production technology even though the environment and society have undergone major changes.

## 3- Theoretical Framework: Young Architects and Shaping the Future of Architecture

The importance of young architects building the present of architecture and establishing its future is highlighted in light of the multiple social, economic, environmental, and technological challenges it faces, and following the behaviors of confronting the surrounding circumstances, making decisions, and assuming multiple roles, to advance and improve the reality of both society and the environment, in addition to developing business and enhancing practice. Professional aspects of this topic can be

innovation and intellectual and practical development to be compatible with new requirements and circumstances, and may reach the point of radical intellectual change, thus renewing the relational perspective of generations and society. Each generation also includes multiple generational units with different intellectual and social responses to the same historical stimulus. They may be conservative or progressive liberal so that one generation includes more than one generational unit in a way that reflects the multiple positions within that generation (Mannheim,1972).

On the other hand, the theoretical frameworks for entrepreneurship explain many aspects related to promoting reforms and development in both business and production patterns, which reach the point of revolutionizing under changing conditions and requirements, and which are closely linked to the youth category in many areas of life and what is known as entrepreneurs in terms of their ability to find innovative ideas and multiple positions to deal with the present and the future, within specific classifications The Clarence Danhof model classification highlights entrepreneurs at the level of readiness to find innovative ideas to include all of the following (Skoshi and Majdal, 2019,).

- Innovator: He is interested in collecting information and providing new groups of production factors that are characterized by creativity. He presents new ideas, technology, product, or markets, or creates new organizations, in a way that achieves a transformation in the lifestyle.
- Adoptive/Imitative: He is the imitator because he adopts the successful innovation presented by other innovative entrepreneurs, so he establishes his project in the same way. He also imitates the

find the ideal, conscious, and rational achievements of the preferred possible (Woodman, 2011).

- Futuristic young: It is based on reading the future, through foresight and over long ranges relying on both strategic planning to colonize the future in ranges of innovation, discovery, flexible dealing, redirection, and development, to find the achievements of the preferred possibility (variable, hidden, uncertain, and unknown), in addition to adopting the imaginative projection of the invisible future, in ranges of exploration, aspiration, and creativity to find the achievements of the preferred possibility (imaginary, utopian, untried, mysterious, unknown, and unlimited) (Woodman, 2011) (Carabelli and Lyon, 2016) (United Nations, 2021).

## 2-4 Theoretical Frameworks Related to Young and Shaping the Future

There are many theories and theoretical frameworks related to the concept of young and the specificity of their relationship in shaping the future in general. Perhaps the most prominent of them is Mannheim's theory of generations, in which he explained many aspects related to generations, especially youth, from the standpoint of sociology. The theory indicates that a generation is a group of individuals of similar ages within the same social, cultural, and historical context, and sharing the same experiences and formative skills, according to what is called the mind of the generation, which is determined by age and cognitive, and the position of the generation within the social, cultural and historical context reflects the continuous generational chain through interaction and friction between elder and youth and the intermediate generation between them, which contributes to

## 2-3 The Role of Young in Shaping the Future

Multiple studies and proposals have determined the position of young people on shaping the future, according to their general trends regarding the past, present, and future, as they are either traditional conservative or liberal youth, contemporary modern young, or futuristic young, according to each of the following:

- Traditional conservative young: It is based on reading the future in the past in short ranges through the prevailing expectation and adopting repetition, total commitment, and even analogy and imitation within the total reliance on previous values, ideas, and methods, to find possible achievements that are acceptable in terms of being familiar, tried, and true within the actual reality that is close, sufficient, and appropriate, and that achieves present pleasure (Fawcett, 2020).
- Liberal conservative young: It is based on reading the future in the actual present through emerging expectations in the medium range, with relative reliance on previous values, ideas, and methods, in addition to limited reliance on everything that exists in the present, and relies on analogy, imitation, improvement, liberation, uniqueness, and skepticism, to find acceptable potential achievements. It is familiar, experienced from actual reality, and sufficient, limited, and appropriate to achieve current enjoyment (Fawcett,2020).
- Contemporary modern young: It is based on reading the future in the extended present, through prediction at a medium range, in terms of postponement, openness, flexibility, and adaptation, to

Human civilizations throughout history have been concerned with the future, the possibilities of imagining and shaping it, and attempts to reveal it, which varied in terms of their anticipatory and prediction orientations, from ancient civilizations to the multiple orientations of the twentieth and twenty-first centuries, which were concerned with participation and planning for the future, so that the formation of the future is based on both anticipatory, prediction and foresight which is, in reality, the specific propositions of each of them. They are intertwined in their general aspects in terms of their capabilities in both reading and creating the future. However, it is possible, by relying on the aspects indicated by the conventional definitions of the future, to determine the specificity of each of these concepts within the levels of shaping the future and as follows:

- Reading the future through mainstream/emerging anticipatory and/or prediction (Ace, 2018) (Jamal, 2003) (Al-Rawi, 2021), in terms of the future being in the past (history repeating itself) and the future being the present (perspective-visible) and with direct, short, and medium ranges, relying on exploratory- intuitive methods to reach future achievements within the possible (acceptable and preferred), and the acceptable possibility.
- Creating the future through foresight (Al-Hindawi, *et al.*, 2017) (Rossel, 2011) as it is an invisible future in the medium and long ranges and by adopting various targeting methods based on strategic planning and imaginative projection that may reach the stage of colonizing the future and reaching future achievements within the preferred possibility and preferred potential.

Mukhtar, 2008) (Abu Al-Azm, 2013) (https://www.oxfordlearnersdictionaries.com) (https://www.merriam-webster.com).

- The future is a time that follows the present and is, from a philosophical point of view, independent of place and generally ranges between being real and not real, existing and not existing eternally (Yadri, 2018). From a physical point of view, it is linked to a place within space-time, in terms of the future being in the past (history repeats itself), the present visible future, it has either already begun but has not reached us yet or what happens to others and its impact reaches us later, and the invisible future that can be imagined through specific events and information (Goudarzi, 2007) (Hindawi, *et al.*, 2017), within immediate, short, medium, and long periods (Belmuden, 2013).
- The future is revealed as logical structures and imaginings of that time that can be imagined from the data of the present through exploratory (Intuitive) or targeted (Normative) methods, or both within feedback model, which expresses human events and achievements that may be within the possible and probable to a basic degree, each of them could be acceptable or preferred, to include the acceptable possibility, the preferred possibility, the acceptable possibility, and the preferred possibility of all those achievements, and what is related to the needs of the generations (Sharara, *et al.*, 2006) (Al-Naimi, 2012) (Al-Rawi, 2021).
- The future is linked to several concepts, the most prominent of which are planning, construction, reform, renaissance, renewal, liberation, and so on (Gamal, 2003).

growth, on the one hand, and mental-intellectual development, on the other hand, within the stage of testing roles and identities in society, to include both adolescence (14-17 years), young youth (17-20 years), early young (21-24 years), and adult young (25-35) years, which is characterized by traits of strength and energy in addition to revolutionary and emotional traits, and by multiple characteristics, most notably creativity, interaction, development, and transformation, which enable them to face many challenges that constitute factors affecting them as a whole, such as economic, social, cultural, political, environmental, and other factors, according to the relationship with ancestors/elders and multiple generations, which is based on support, empowerment, and development. (Tami, 2019) (Al-Omar, 2022) (Erikson and Erik, 1977).

## 2 -2 Shaping the Future

Today, early thinking about what will come in the future has become more important than ever due to the accelerating pace of technological and social changes, so the past, present, and future are a cycle that is repeated every day. What was present becomes the past, as the future is no longer an imaginary image of a reality that has not yet been achieved, but an understanding of the possibilities of the present. Therefore, studying and understanding the future is studying the principles upon which the perception of the future is based in any field of human knowledge (Bastawisi, 2007).

Linguistically, the concept of the future refers to the time that follows the present. It is a time that has not yet arrived, but its arrival is inevitable. It expresses a set of tomorrow's events that can be imagined according to the data of the present in a manner related to the needs of generations (Ahmed

role as generational units in shaping the future of architecture. Secondly, reviewing a group of contemporary study cases. Third, determining a set of conclusions and recommendations.

## 2- Young and Shaping the Future / Outside the Field of Architecture:

In general, it is the responsibility of young people to build the present and establish the future in terms of behaviors that confront the surrounding circumstances, make decisions, and assume multiple roles, to develop business and improve society following their interaction with social, economic, environmental, and technological challenges. Aspects of this topic can be identified in the following:

### 2-1 Introducing the Concept of Young

Linguistically, the concept of youth refers to the age group or stage that represents the period that goes beyond childhood, and the realization of puberty and has not reached the age of manhood. It is the early stage of existence, the stage of development, an intermediate transitional stage (crossroads), for a specific period, and is characterized by a group of traits and characteristics such as novelty, young, sharpness, activity, freshness, youthfulness, vigor, growth, movement, dynamism, ability, motivation, presence, strength, advancement, heat, and they are responsible for decision-making and behaviors in confronting the surrounding circumstances (Ibrahim, 2004) (Al-Fayrouzabadi, 2005) (https://www.merriam-webster.com/dictionary/young).

Technically, young has been defined as an age group with biological, psychological, and social stages, linked to both organic and physiological

consistent with the continuous change in the construction industry, as well as the multiple levels of challenges faced by young architects, represented by economic and health disturbances, the rapid technological development, and cultural change, which determines the task of young architects to rely on the past and try to control the future according to a building process that lies at the heart of the human condition (Dickinson, 2021), and in a way that enables young architectural practices to be invested with new realistic and optimistic visions with joint independence for a basic dual material, structural, intellectual, and cultural production that responds in a rational and coherent way to the motives and needs of contemporary society. (New generation,2020)

It is clear from the above that interest in the youth group has increased in various fields of life, including architecture, in a manner consistent with the pursuit of investing their potential and energies in building the present and shaping a better future following the overall challenges that abound in the current reality. Even though architectural studies and proposals touch on many aspects and dimensions related to young architects and shaping the future of architecture, they did not provide a clear and comprehensive objective vision, which constituted an incentive for this research. Youth and shaping the future in general were addressed from outside the field of architecture, first, to enrich the knowledge deficiency within the field of architecture, by introducing both the concepts of youth and the future to determine the role of youth in shaping the future according to a set of theoretical frameworks, to build the theoretical framework for young architects and shape the future of architecture in terms of identifying the general aspects of the concept of young architects and their entrepreneurship

It should be noted that the future of architecture is not guaranteed and each architectural generation needs to be formed in the image of advanced cultures, societies, and markets. The importance of the young generation of architects is highlighted in creating architecture that is linked to the culture of the place and reflects the values and traditions of the local community to enhance the role of architecture as a common visual culture, by adopting architectural styles and methods combine traditional methods that represent approaches agreed upon over time for form and content with advanced technological methods to enhance cultural familiarity, the human experience, and collective memory in accordance with a constructive ethical approach to the future of architecture that takes into account continuity and preservation of urban and environmental heritage, in addition to renewal within civic participation (Polyzoides, 2007), which necessitates exchanging ideas with young people, and guessing and anticipating how the world will look in the future by rethinking and rebuilding it, motivated by the youth's sense and ambitions for architecture, influenced by today's circumstances and looking forward to tomorrow. In addition to young architects' constant questioning about their inheritance, these ideas carry a set of speculations and offer promises to improve a lot, refine and prepare the scene of architecture that changes and responds to new and different ways of thinking, so that young architects thus establish new values, methods, and forms of practice, and formulate architectural discourse following technological, social and environmental visions, starting from the smallest technical process to its highest intellectual levels (Sterk, 2009), in addition to interest in continuing the relationship between young people and adults in terms of the role of architecture schools in educating and training young architects in a manner

of this emerging industry within a future vision based on a qualitative reading of products with the potential to express multiple values through positions or approaches available to architects at any age, including young people (Phineas, 2015). Young architects live in a changing reality, so they struggle to survive. This did not prevent them from moving forward with enthusiasm, as they broke the constraints of the architecture industry and many young archit*ects emerged, bringing new winds to the traditional architectural culture (Chen and Dai, 2020,), to highlight the importance of young architects understanding continuous change, which requires meeting human needs through creativity and innovation, and it is among the most difficult tasks of architecture, which requires that young architects have artistic talent and compositional skills, and possess imagination and taste to be able to create unique products capable of making a difference (Wagner,1990).

At present, several questions arise about what are the important challenges of the future that architects, especially young people, face, and the nature of the important future, as there are many factors affecting young architects in terms of economic and technological factors, the most prominent of which are the paths through which young architects define their roles. Some of them adopt the traditional approach in adopting previous architectural ideas, methods and styles. Some of them adopt a flexible approach that combines tradition with everything new. Some adopt an approach that goes beyond the traditional by developing methods that move with time to create innovative architectural products that achieve Openness and renewal, as well as the importance of enhancing knowledge and skills and adopting modern technological means within the entrepreneurial path (Lieftink, *et al.*, 2018).

## 1- Introduction

Youth represent human wealth, an important resource, a pivotal tool for development and the workforce, creative production capacity, and the target goal of development programs and plans. They are also considered the standard by which the degree of success, achievement, or failure of any development experience is measured). Youth embody the future, as a committed representative with qualities such as hope, the possibility of remaking decisions, or starting in a better situation, in a way that contributes to transforming or advancing society (Bartels, *et al.*, 2015).

It should be noted that the United Nations has paid attention to the youth category since the sixties of the last century. The United Nations General Assembly, in its resolution 2037 (D-20), issued a declaration on the participation of youth as representatives of peace, mutual respect, and understanding among peoples. Many countries have also placed youth issues on their agenda of priorities as a group targeted by economic and social policies. They issued national reports on human development and youth as an important energy in the labor (United Nations Report, 2018) (Rezij, 2017), in addition to recognizing the civil, political, economic, social, and cultural rights of young people and the importance of enabling young people to acquire the knowledge, attitudes, skills, and behaviors necessary to reach adulthood (Kimberly, 2008).

This applies to the field of architecture, as architecture is changing fast, with a rhythm similar to what is happening in fashion, in addition to being characterized by dynamic and viral participation, which has required architects in general, and emerging ones in particular, to bear the social consequences

## المستخلص

يعد الشباب عماد الامم وسر نهضتها، وبناة حضارتها وخط الدفاع عنها، والمشاركين الاساسين في عمليات التخطيط الاساسية، ووكلاء التغيير لبناء عالم يتناسب مع تطلعات الاجيال القادمة، وينطبق ذلك على حقل العمارة من حيث اهمية المعماريين الشباب في تشكيلها وبما يتوافق مع التحديات التي تواجهها، والتي تفرض التفاعل باسلوب يتناسب مع المتطلبات والاحتياجات المستحدثة.

يقوم هذا البحث على اعتبار ان المعماريين الشباب ظاهرة متكاملة تسهم في تشكيل النتاج المعماري على وفق معطيات الحاضر وحتى الماضي وبما يؤسس لمستقبل افضل من خلال دورهم الريادي، وقد تطرقت العديد من الدراسات والطروحات المعمارية الى عدة جوانب ترتبط بهذا الموضوع الا انها لم تستطيع ان تقدم رؤية معرفية واضحة وشاملة مما شكل حافزا لقيام هذا البحث، من حيث سعيه لتقديم المعرفة الاكثر شمولية ووضوح للدور الريادي الذي يقوم به المعماريون الشباب في تشكيل مستقبل العمارة، بالعموم، ومايرتبط والفترة المعاصرة، على وجه الخصوص، وقد استوجب تحقيق هذا الهدف اعتماد المنهج الوصفي في تحليل المعرفة السابقة من داخل وخارج حقل العمارة والخاصة بالشباب والمستقبل والعلاقة فيما بينهما، لبناء اطار نظري يمكن من خلاله تقصي دور المعماريون الشباب في الفترة المعاصرة والتي تشهد العديد من التحديات والتحولات المختلفة، من خلال استعراض عدد من الحالات الدراسية.


**الكلمات المفتاحية: الشباب، المستقبل، المعماريون الشباب، الوحدات الجيلية والريادة**

## Abstract

Youth are the pillar of nations and the secret of their renaissance, the builders of their civilization and the line of defense, the main participants in basic planning processes, and the agents of change to build a world that is compatible with the aspirations of future generations. This applies to the field of architecture in terms of the importance of young architects in shaping it under the challenges it faces, which impose interaction in a manner commensurate with the emerging requirements and needs. This research is based on the consideration that young architects are an integrated phenomenon that contributes to shaping architectural production according to the data of the present and even the past, in a way that establishes a better future through their entrepreneurship role. Many architectural studies and proposals have touched on several aspects related to this topic, but they were not able to provide a clear and comprehensive knowledge vision., which constituted an incentive to conduct this research, in terms of its endeavor to provide the most comprehensive and clear knowledge of the entrepreneurship role played by young architects in shaping the future of architecture, in general, and what is related to the contemporary period, in particular. Achieving this goal necessitated adopting the descriptive approach in analyzing previous knowledge from inside and outside the field of architecture regarding young and the future and the relationship between them, to build a theoretical framework through which the role of young architects can be investigated in the contemporary period, which is witnessing many different challenges and transformations through reviewing several case studies.

**Keywords: Young, Future, Young architects, Generational units and Entrepreneurship**

# The Role of Young Architects as Entrepreneurship Generational Units in Shaping the Future of Architecture

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# دور المعماريين الشباب كوحدات جيلية ريادية في تشكيل مستقبل العمارة

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percentage to increase the compressive strength, while a higher percentage may cause a reduction of it. Additionally, the increase in compressive strength of only cement concrete is more than the concrete containing silica fume or metakaolin to replace a part of cement.

5. The tensile and flexural strength, ductility, and toughness improve with increasing the basalt fiber content. However, the higher content may cause the fibers to lose their forms due to their flexibility. Generally, the higher the content of basalt fiber, up to 1.5 %, the higher the tensile and flexural strength. Beyond 1.5 %, the increment of strength may be lower.
6. The presence of basalt fiber in reinforced concrete beams delays the appearance of cracks, increases the number of micro cracks, and increases the beam's ability to bear loads.
7. In UHPC, the ratio of silica fume to cement affects the proper proportion of basalt fiber to increase the strength. Basalt fiber acts by confining the concrete internally.
8. The shorter the fiber length, the lower the content and the better the effect. The (6-24) mm fiber length is suggested to be the best length to use in various types of concrete that enhance the mechanical properties.
9. The increment in compressive and tensile strength for a lower w/c ratio is higher than that for a higher w/c ratio. Also, the increment in compressive strength of BFRC at 7 days is higher than that at 28 days.

## Conclusions

This paper introduces a review of the impact of the incorporation of basalt fibers into various types of concrete on the mechanical properties, toughness, and ductility. The following conclusions can be suggested:

1. A small content of basalt fibers can increase the concrete tensile and flexural strength better than a high amount of steel fibers. The optimum proportion of basalt fibers varies according to the concrete ingredients and depends on some factors, such as fiber length, w/c ratio, and the age of the concrete. However, the valuable percentage of basalt fibers is smaller than that of steel fibers. Basalt fiber also resists abrasion and chemicals, while steel fibers corrode over time when it is in contact with water.
2. Basalt fibers can be manufactured in various forms: chopped filaments, minibars, and flat bundles with lengths between (6-50) mm.
3. The concrete workability decreases with increasing basalt fiber content, and the flow-ability of the mixture is slightly dropped when fiber length increases. However, adding basalt fiber to concrete can minimize drying shrinkage, size, and quantity of voids inside the concrete matrix.
4. Adding a small proportion of basalt fiber to concrete mix, up to 0.5 %, can increase the compressive strength, provided that an appropriate mixing method is used that prevents fibers from balling into the internal structure of the concrete. However, a volume fraction between (0.3-0.5)% is considered the best

## B. Water-to-cement Ratio of Concrete

Another factor can influence the enhancement of the concrete strength upon adding basalt fibers. That factor is the water-to-cement (w/c) ratio. According to Algin, *et al.*, (2020), who investigated the impact of basalt fibers on the workability and mechanical characteristics of two w/c ratios, the workability dropped when basalt fiber dosage increased. However, a slight enhancement appeared in compressive strength when the basalt fiber percentage rose from 0% to 0.8 %. At 0.8 % fiber content, the compressive strength increment was 16 % and 10 % for a w/c ratio of 0.59 and 0.47, respectively. Tensile strength was also raised by 34 % and 26 % for the same w/c ratios.

## C. The Age of Concrete

The age of BFRC affects concrete strength. Meyyappan and Carmished (2020) investigated the impact of basalt fiber on concrete strength at 7 and 28 days. The authors added 0.5 %, 1.0 %, 1.5 %, 2.0 %, 2.5 %, and 3.0 % basalt fiber to normal-strength concrete. Their results showed that compressive strength increased on the seventh day by 54 - 65 % compared to 28-day compressive strength for equal percentages of the fiber. At 1.0 % basalt fiber, the compressive strength increased to 11.45 %, whereas at 3.0 % basalt fiber, compressive strength declined by 33.87 %.

High, *et al.*, (2015) stated that 1.78 kg/m3 basalt fibers increased the strength of ordinary concrete in compression at 3 days by 5.5 %, at 7 days by 14 %, and at 28 days by 6.0 %.

increasing the fiber length. For instance, the flow ability decreased from 80 % for the mixture with a fiber length of 6 mm to 70 % for the one with a 30 mm fiber length. Upon adding basalt fiber to the mortar, a slight decrease in bulk density occurred, which referred to increasing the voids due to the balling of the flexible fibers. The results indicated that raising the basalt fiber volume fraction increased tensile strength, and 1.25 % gave the most increment. The compression strength increased up to 1.0 % fiber content. However, over 1.0 %, the compression strength began to weaken.

Sun, *et al.*, (2019) investigated the effects of basalt fiber length and content on the mechanical properties of concrete. Two fiber lengths were adopted: 6 mm and 12 mm. Besides, six fiber volume fractions were incorporated into mixtures: 0.0 %, 0.1 %, 0.2 %, 0.3 %, 0.4 %, and 0.5 %. Test results showed that the BFRC with 6 mm length fiber and 0.3% percentage provided the highest compressive strength, followed by 0.4 % with the same length. For concrete with a fiber length of 12 mm, the content of 0.3 % fiber was awarded the best compressive strength of the group. However, 0.4 % and 0.5 % of 12 mm length caused a drop in the compressive strength. Generally, the 6 mm fiber length awarded higher strength than the counterpart with a 12 mm length having the same volume fraction of basalt fiber. Concrete with fibers of 12 mm long caused dropping tensile strength for all volume fractions used, whereas 0.3 % and 0.4 % provided the most increment in tensile strength for 6 mm length. The 0.5% fiber content of both 6 mm and 12 mm provided the highest flexural strength. It was suggested by most authors that the mechanical properties of different types of concrete were significantly enhanced upon adding basalt fibers of a length between 12 mm and 24 mm at a volume fraction between 0.1 % - 0.5 %.

distribution in all orientations contribute to delay crack initiation in the matrix and obstruct their propagation, which significantly enhances the strength (Jabbar, Hamood and Mohammed, 2021a; Jabbar, Mohammed and Hamood, 2022). Thus, basalt fibers work on the internal confining of concrete.

Generally, it seems that incorporating basalt fibers into various types of concrete can improve the strength in compression, tension, and flexure. Boosting the concrete strength can ultimately lead to higher bearing capacity for structural elements.

## Factors Affecting Concrete Strength Related to Basalt Fibers

### A. Fiber Length

The length of the fiber also has an impact on concrete strength (Elshafie and Whittleston, 2015). It was displayed that the best proportion of 12 mm long basalt fiber was 4 kg/m3, whereas 36 mm long was 8 kg/m3 to arrive at approximately equal 28-day compressive strength (Wang *et al.*, 2019). Therefore, the shorter the fiber length, the lower the content and the better the effect. Qin *et al*. (2018) discussed the impact of chopped basalt fibers on magnesium phosphate cement mixture. Four lengths of micro basalt fiber were tested: 6 mm, 12 mm, 20 mm, and 30 mm, and six volume fractions were adopted in their experimental works: 0.00 %, 0.25 %, 0.50 %, 0.75 %, 1.00 %, and 1.5 %. The findings clarified that adding the fibers to the mixture obviously dropped the mortar flow ability compared to the mortar without fibers. This influence may be interpreted as the filaments with large surface area required to adsorb a portion of cement paste water to wrap around. On the other hand, the flow ability of mortar was slightly dropped upon

## Impact of Basalt Fibers on Ultra-high Performance Concrete

Liu *et al*. (2019) found that adding micro basalt fibers into ultra-high performance concrete (UHPC) can significantly improve the strength. The study showed that increasing basalt fiber content from 0.15 % to 0.3 % could enhance flexure strength by about 22 % and compressive strength by 10 % adding a silica fume to the mix at 20 % of cement content. However, when adding the silica fume at 40 % of cement content, raising the fiber content from 0.15 % to 0.3% did not influence the flexural strength but decreased the compressive strength. The results also showed that the best compressive strength could be attained when the fine aggregate proportion equals the binder content, the silica fume/cement proportion is 0.3, and the basalt fiber content is 0.15 % at a w/cm of 0.18, leading to the highest compressive strength of 120 MPa (Liu, *et al*., 2019).

Jabbar, *et al*., (2021a) studied the influence of chopped basalt fibers incorporated into UHPC. The authors used three proportions; 0.5, 1.0, and 1.5 %. The results showed that 0.5 % and 1.0 % fiber proportion raised compressive strength by 44 % and 51 %, respectively, while 1.5 % increased the compressive strength lower than the two other percentages by 41 %.

It is noticed by Jabbar, *et al*., (2021) that blending basalt fibers with UHPC matrix minimized autogenous shrinkage and reduced the size and amount of voids. Furthermore, adding basalt fibers to the matrix could improve the toughness and ductility (Jabbar, Mohammed and Hamood, 2022). Also, the multiple basalt micro-fibers at every percentage and their

%, 0.1 %, 0.2 %, 0.3 %, and 0.5 %). The results indicated that there was a slight reduction in the compressive strength upon increasing basalt fiber over 0.3 %. The decrease was 12 % when adding 0.5 % basalt fibers. However, 0.3 % of fiber raised the compressive strength more than the other percentages. Also, 0.3 % enhanced tensile strength more than other percentages. The increment was about 13 % over the no-fibrous concrete.

Ayub, *et al*., (2014) investigated the influence of chopped basalt fibers on the compressive and tensile strength and elastic modulus of high-performance concrete. Three volume fractions of fiber were incorporated into three different mixtures. The first mixture included 1 %, 2 %, and 3 % basalt fiber with ordinary cement only. The second and third mixtures contained equal percentages of basalt fibers, besides 10% silica fume or 10 % metakaolin as a partial replacement for cement. Other constituents were the same in all mixtures. The results showed that 1 % and 2 % provide better compressive strength in all mixes, while 3 % caused a drop. For plain concrete, the 1 % and 2 % raised compressive strength by 2.3 % and 3.2 %, respectively. In the silica fume concrete, the 1 % and 2 % enhanced compressive strength by 0.54 % and 1.82 %, respectively. In metakaolin concrete, the 1 % and 2 % raised compressive strength by 1.58 % and 1.62 %, respectively. Therefore, adding silica fume or metakaolin to the concrete significantly increased the compressive strength. Adding 3 % basalt fiber raised tensile strength higher than 1 % and 2 %. However, the three proportions boosted the tensile strength. Further, adding metakaolin to concrete could raise compressive strength higher than silica fume, whereas vice versa arose for tensile strength.

Jalasutram, *et al.*, (2016) studied the effect of adding chopped basalt fibers of 12.7 mm length at a volume fraction ranging between (0-2) % on the mechanical properties of ordinary concrete. The findings illustrated that the compressive strength slightly decreased upon adding basalt fibers compared to conventional concrete. However, the defeat pattern was altered from brittle to ductile in compression. The tensile strength was enhanced by about 15 % at a 2 % volume fraction of basalt fiber above the non-fibrous concrete. The highest increment occurred in flexural strength, which was 75 % at 2 % basalt fiber content. Furthermore, flexural toughness was improved by about three times of ordinary concrete.

Dilbas and Cakir (2020) suggested that the 0.25 % basalt fiber content provided the best increase in compressive strength, whereas 1.0 % volume fraction awarded the highest tensile strength. Hirde and Shelar (2017) stated that the ultimate improvement in compressive strength occurred at a 3 % volume fraction of basalt fiber. However, the 4 % provided the best increment in tensile strength, which arrived at 33.6 % above non-fibrous concrete. Iyer, *et al.*, (2015) stated that 18 kg/m3 of basalt fibers awarded the best improvement in compressive and flexural strengths.

## Impact of Basalt Fibers on High-strength and High-performance Concrete

Some researchers have explored the impact of basalt fibers on high-performance concrete (HPC), and it looks like they can enhance the strength of conventional concrete. Tamadhir and Borhan (2013) inspected the effect of adding a small volume fraction of chopped basalt fibers on high-strength concrete of about 60 MPa. The basalt fiber volume fractions adopted were (0

splitting tensile strength improved for all fiber content. The 1.5 % basalt fiber content awarded higher increments in the tensile and flexural strengths. The increments were 22.58 % and 57 %, respectively.

According to the mentioned results, blending basalt fiber within a concrete matrix with a small percentage enhances the compressive strength more than the large volume fractions. On the other hand, the high content of basalt fibers improves tensile and flexural strength more than compressive strength, which may drop.

Al-Kharabsheh, *et al.*, (2022), in a comprehensive review, stated that the slump dropped when basalt fiber content increased; therefore, the authors proposed applying a superplasticizer to adjust workability. However, the strength of compression and tension was greatly enhanced, and failure patterns transferred from brittle to ductile upon blending basalt fiber with concrete matrix. Kirthika and Singh (2018) stated that 0.75 % highly increased strength in tension, while 0.5 % showed the highest compressive strength. Jia, *et al.*, (2021) claimed that 0.2 % basalt fiber provided the best tension strength from the three-volume fraction of 0.1 %, 0.2 %, and 0.3 %. Also, compressive strength was slightly improved upon adding the fibers up to 0.2 %. However, a 0.3 % basalt fiber volume fraction causes a decrease in the compressive strength.

Furthermore, some researchers claimed that basalt fibers have no significant impact on compressive strength. The investigators attributed that to lowering workability when basalt fibers are added to the mix due to the vast surface area of the filaments and proposed applying a plasticizer admixture to modify the concrete workability (Afroz, Patnaikuni and Venkatesan, 2017).

Krassowska and Kosior (2019) investigated the impact of chopped basalt fiber proportion and steel stirrups on the reinforced concrete beams' behavior. Two weights of 50 mm fiber length were used: 2.5 kg/m$^3$ and 5 kg/m$^3$ incorporated into a concrete mix. The authors found that the addition of basalt fibers increased compressive strength by 4.76 % and 0.99 % and tensile strength by 10.06 % and 16.39 %, respectively. Also, fibrous beams were not quickly fractured. The defeat pattern of beams varied according to the stirrups amount and fiber quantity. Multiple oblique cracks with a shallower width were noticed in fiber-reinforced concrete beams. Beams free of fibers failed rapidly due to brittle cracking. Basalt fibers showed the tendency to transform the shear forces in compression after cracking to plain concrete. The beam section remained carrying the load after the initiation of the crack. When the loading reached the ultimate state in basalt fiber reinforced concrete beams, no sign of failure due to concrete crushing occurred. The presence of fibers permitted the growth of multiple diagonal cracks, and then one crack at least widened before shear failure. Ramesh and Eswari (2020) searched the impress of basalt fibers on the mechanical properties of normal concrete of 25 MPa compressive strength. Five volume fractions were adopted in the work: 0.0 %, 0.5 %, 1.0 %, 1.5 %, and 2.0 %. The slump decreased with increasing fiber content; therefore, a superplasticizer dosage was increased to modify the workability. The authors illustrated that a slight increase in compressive strength occurred up to 1.5 % of fiber, while 2.0 % of basalt fiber reduced compressive strength. They attributed the decrease in compressive strength at 2.0 % fiber content to the higher fiber volume fraction in the mix, which might have caused the fiber turning and accumulating to decrease the compressive strength. The

while 1.0% lowered it by 12 %. They concluded that using basalt fiber leads to decreasing compressive strength of concrete. They attributed that when the fiber content increased, the probability of balling these fibers together and leaving voids in the matrix was higher, which led to more porosity and reduced strength.

Abdulhadi (2014) studied the impact of chopped basalt fiber on conventional concrete of 36 MPa compressive strength. Five volume fractions were added to an identical concrete mix: 0.0 %, 0.3 %, 0.6 %, 0.9 %, and 1.2 %. The authors found that 0.3 % and 0.6 % raised splitting tensile strength by 2.7 % and 23.1 %, while 0.9 % and 1.2 % decreased it by 11.2 % and 19.7 %, respectively. On the other hand, the compressive strength was decreased for all volume fractions. Revade and Dharane (2015) studied the impact of basalt fibers at three proportions, as a percentage of the weight of cement, on the concrete properties. The results showed increasing compressive strength by 13 %, 12 %, and 10 %, upon adding the fibers at 1.0%, 1.5%, and 2.0 % into the concrete mix. However, the tensile strength was raised by 11 %, 17 %, and 21 % forthe same fibers' percentages. Galishnikova, *et al*., (2019) surveyed the influence of chopped basalt fibers on the resistance of plastic deformation of lightweight concrete. The results showed that the concrete resistance to the deformation relies on the content of the fiber, its length, and its diameter. Increasing fiber content raised the concrete resistance to deformation. However, adding basalt fiber to the concrete mix can expand toughness and enhance the stiffness of the structural elements. Basalt fiber can readily disseminate in the concrete mixture without segregation, but the fibers often twist because of flexibility. However, the authors showed that the fiberpercentage affects the ductility.

## Impact of Basalt Fibers on Ordinary Concrete

Adding basalt fiber to a concrete matrix can reduce drying shrinkage and the size and amount of voids in the concrete microstructure (Jabbar, Hamood, and Mohammed, 2021), (Lam and Hung, 2021). Also, it could enhance toughness and ductility (Jabbar, Mohammed, and Hamood, 2022), (Jabbar, Hamood, and Mohammed, 2021b). Incorporating chopped basalt fiber into the concrete mix can be beneficial when added at a volume range of 0.3-0.5 %. It can increase the strength of concrete, but when used above 0.5 %, it can be detrimental to the strength (Tumadhir and Borhan, 2013), (Dilbas and Çakır, 2020). However, some studies have found that adding 0.1 % is the optimum dose. It's significant to carefully evaluate the amount of chopped basalt fiber added to provide the most useful effects for concrete strength (Vajje and Krishna, 2013). Therefore, the optimal dosage of basalt fibers varies according to the concrete components. Nevertheless, the beneficial proportion of basalt fibers was smaller than that of steel fibers. It was stated that utilizing 12 kg/m3 of chopped basalt fibers can improve the concrete flexural strength at the identical rate of raising flexural strength by adding 40 kg/m3 of steel fibers (Galen and Russia, 2009).

El-Din, *et al.*, (2016) mentioned that incorporating 18 kg/m3 of basalt fiber into a concrete mix improved compressive strength by about 15 % above non-fibrous concrete. Dias and Thaumaturgo (2005) studied the effect of applying 0.5 % and 1% of basalt fiber on normal-strength concrete. The authors found that there was a 26.4 % and 3.9 % reduction in compressive strength upon incorporating 1 % and 0.5 % basalt fiber into the mix, respectively. However, 0.5% basalt fibers raised tensile strength by 8%,

Branston, *et al.*, (2016) studied the influence of two types of manufactured basalt fibers. There were flat bundles and minibars. A flat bundle with two various lengths of chopped fibers, 36 mm, and 50 mm, was shaped as a flat bundle. The flat bundles of basalt fiber are about 0.6 mm wide and made of 16 µm diameter filaments. The minibar applied in the study was an epoxy-based resin reinforced with 17 µm diameter basalt filaments. The minibar was 43 mm long and about 0.65 mm in diameter. The minibars were more rigid than the flat bundles. The findings showed that adding basalt fibers raised the first-crack loading of concrete subjected to flexural force but had no significant effect when subjected to impact loading. For flexural loading, the first-crack strength increased with rising fiber content. The strength enhancement was higher upon using longer fibers, 50 mm, than that with a 36 mm flat bundle. A dosage of 12 kg/m3 of 50 mm flat bundle led to a first-crack strength approximately equal to that of concrete with steel fiber of 40 kg/m3. However, fiber content over 12 kg/m3 and 40 kg/m3 of flat bundles and minibars led to mixing issues due to fiber curling and caused difficulty in handling, pouring, and consolidating fresh concrete.

**Chopped basalt fiber** **Minibar basalt fiber** **Basalt fiber rebars**

**Figure 2. Types of Manufactured Basalt Fibers**

**Table 2. Chemical Components of Chopped Basalt Fibers (Elshekh, *et al.*, 2014)**

| Component | Percentage |
|---|---|
| $SiO_2$ | 51.65 |
| $AL_2O_3$ | 15.58 |
| $Fe_2O_3$ | 3.97 |
| FeO | 6.15 |
| CaO | 9.35 |
| MgO | 6.10 |
| $K_2O$ | 1.43 |
| $Na_2O$ | 2.05 |
| $TIO_2$ | 1.33 |
| Other oxides | 2.39 |
| Reactivity | Inert, it does not participate in chemical reactions |

## Type of Basalt Fibers Products

Basalt fibers can come in various forms and dimensions, depending on their planned usage. These fibers can be found in chopped form, as filaments, or even as minibars made from fine filaments glued together with epoxy-based resin. Their lengths range from 5 to 100 mm, giving them versatile applications. Also, they manufactured basalt rebar to use in reinforcing the concrete. Figure 2 shows the types of basalt fiber products.

El-Gelani, *et al.*, (2018) investigated the effect of two types of basalt fibers on normal-strength concrete properties. Chopped basalt fiber and pre-soaked in epoxy resin basalt fibers as minibars were added to the mix at a total weight of 1.8 kg/m3. The results showed the equal mixture of both types of fibers awarded the highest increment in 28-day compressive strength by 28 %, whereas adding chopped fiber alone raised compressive strength by only 5.6 %. For flexural strength, both minibar and chopped basalt fiber enhanced the strength by 17% over no fibrous concrete.

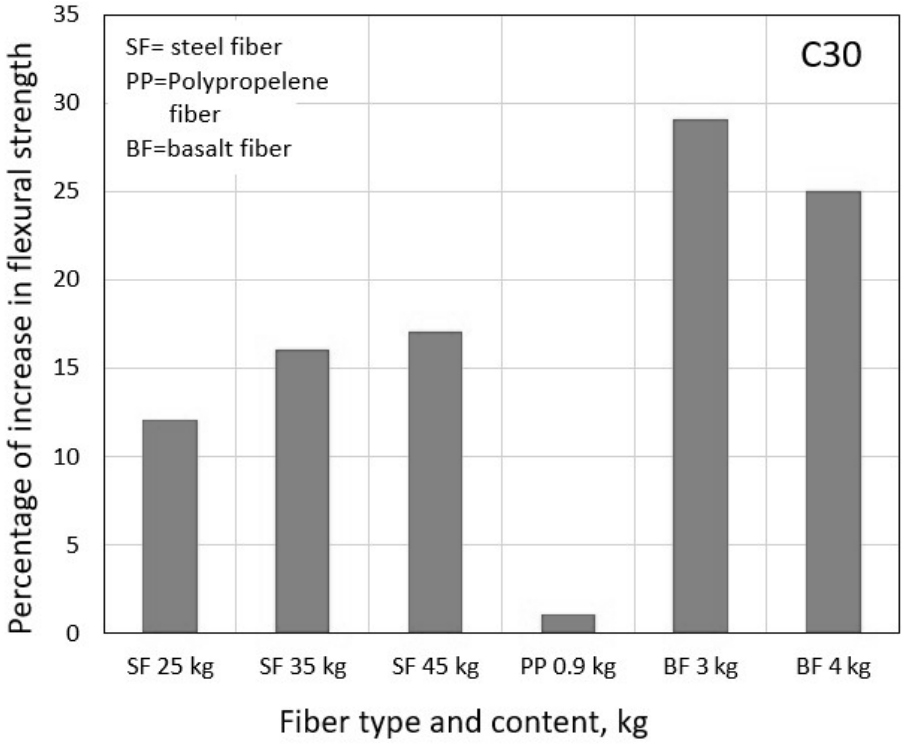


**Figure 1. A comparison between the effect of steel, polypropylene, and basalt fibers on 30 MPa concrete**

**Table 1. Physical Characteristics of Basalt Fibers (Chiao, 1980), (Spool, 2018), (Galen LLC Russia, 2009)**

| Property | Description |
|---|---|
| Appearance | Short filament |
| Color | Medium brown to olive |
| Specific gravity | 2.7 – 2.8 |
| Filament diameter, µm | 6 – 21 |
| Modulus of elasticity, GPa | 80-93 |
| Strain at break | 0.0315 – 0.032 |
| Moisture content,% | 0.4-12 |
| Tensile strength, MPa | 4800 – 2800 |

Numerous investigations explored the influence of blending basalt fibers within concrete on its mechanical properties. Various proportions as volume fractions or cement content percentages, were incorporated into the concrete matrix to demonstrate their effect and decide the most suitable content. Each investigator decided the optimal proportion according to the added volume fraction during the experiments where they differed from one to another (Xianggang, *et al.*, 2018), (Xinzhong, *et al.*, 2017).

## Physical and Chemical Properties of Basalt Fibers

Basalt fibers are a new type of natural fibers that possess remarkable features. Their chemical composition is similar to that of glass fibers, but they have higher strength. That makes them an excellent candidate for utilization in concrete mixtures, as they can boost some mechanical properties. It consists of around 50% silicates to provide higher strength and better resistance to acid, alkali, and salt attacks (Chiao, 1980), (Deák and Czigány, 2009), (Li, *et al.*, 2018), (Hirde and Shelar, 2017), (Xinzhong, Chuanxi and Wei, 2016). The physical properties and chemical composition of basalt fiber are illustrated in Tables 1 and 2, respectively. These features make it a promising material for incorporating into concrete mixes to improve some mechanical properties. One of the forms in which basalt fiber is used is chopped fiber. Chopped basalt fiber is a micro-filament of 16-18 µm diameter and varying lengths (Branston *et al.*, 2016). According to experts, the specific gravity of basalt fiber is about 2.8, with a tensile strength ranging between 2800-4800 MPa. The modulus of elasticity ranges between 80-93 GPa, and it has a strain at failure of (0.0315) mm/mm (Branston, *et al.*, 2016). Basalt fiber density is approximately 2800 kg/m3. Its effects on concrete properties have been discussed in various research studies.

to concrete can boost tensile strength and toughness; however, steel fibers suffer from corrosion when they come in contact with moisture in concrete (Wang, *et al.*, 2019). Glass fiber can improve concrete toughness, but its resistance declines over time when they tough the alkali medium (Shaikh, 2013). Although carbon fibers give hardness and high strength when used in concrete, they are expensive (Alabduljabbar, *et al.*, 2020). Basalt fibers have proper chemical resilience, elevated tensile strength, corrosion resistance, and no environmental consequences (Spool, 2018), (Galen LLC Russia, 2009), (Jamshaid, 2017), (Xianggang, Yahong and Junna, 2020). Therefore, it is significant to inspect their influence on the mechanical characteristics of concrete. Furthermore, adding 45 kg of steel fiber to ordinary concrete of 30 MPa compressive strength can raise the flexural strength by 17%, whereas adding 3 kg of basalt fiber to the same concrete can increase the flexural strength by 29%, as illustrated in Figure 1.

Basalt is a fascinating type of rock created through the rapid cooling of magma or lava from volcanos (Ramadevi, Chithra, and Rajesh, 2017). It can be found in various regions around the world where volcanos are active, and its appearance can vary depending on the source, cooling rate of the rock, and exposure to weathering. It is impressive to think about such fiery substances to transform into something so different and unique (Branston, *et al.*, 2016).

Fine-quality fibers can be extracted from basalt rock through a method that involves heat treatment. This process is similar to glass fiber production but at a much higher temperature. Additionally, basalt rebar can be manufactured today. These basalt products have a thermal coefficient that is very similar to concrete (Branston, *et al.*, 2016).

## Introduction

Concrete is an incredibly versatile and reliable substance that is widely applied in different construction projects. Whether building a contemporary skyscraper, constructing a bridge or tunnel, or spreading a footing for a large steel and concrete structure, concrete is the mere choice for engineers and builders. Its strength, durability, and ease of usage make it an ideal selection for extended construction applications. Furthermore, with a wide range of different types and availability of compositions, it is easy to find the perfect concrete mix for any structure (Shaikh, 2013). Concrete is quite strong when it comes to being compressed. However, it is pretty weak when it comes to being in tension. That is because concrete has very little tensile strength, which means it cannot resist forces that try to pull it apart, and it is much more prone to cracking or breaking under tension. Therefore, it is commonly reinforced with steel bars or mesh to compensate for the weak tensile strength. On the other hand, concrete failure is also sudden, which is a dangerous failure. These defects boosted scientists and manufacturers to discover how to develop concrete tensile strength and fracture properties. The efforts led to the production of fiber-reinforced concrete (FRC). Incorporating fibers into a concrete matrix enhances the tensile characteristics to a considerable extent and compression to a lower degree. Also, they change the fracture from brittle to ductile (Hannawi, *et al.*, 2016), (Papakonstantinou, 2020).

Different kinds of fibers were utilized in concrete and afford multiple improvements. Therefore, some categories of fiber-reinforced concrete (FRC) that have various effects on self-regulating characteristics and application attributes were realized (Chiao, 1980). For illustration, counting steel fibers

## المستخلص

يستعرض هذا البحث تأثير مزج ألياف البازلت مع الخرسانة على الخواص الميكانيكية، الليونة، والمتانة. بناءً على المكونات الخرسانية، يمكن أن تختلف النسبة المثالية لألياف البازلت والتي تتأثر بعوامل مثل طول الألياف ونسبة الماء للإسمنت والعمر. تكون نسبة ألياف البازلت المفيدة أقل من نسبة ألياف الفولاذ. حتى مع وجود نسبة قليلة من ألياف البازلت، فإنها يمكن ان تحسن قوة الشد والانثناء للخرسانة بشكل أكثر فعالية من الكمية الأكبر من ألياف الفولاذ. مع زيادة كمية ألياف البازلت، تقل قابلية تشغيل الخليط. بالإضافة إلى ذلك، قد تنخفض قابلية التدفق قليلاً مع زيادة طول الألياف. يمكن أن تؤدي إضافة ألياف البازلت إلى الخرسانة إلى تقليل انكماش الجفاف وحجم وكمية الفراغات داخل نسيج الخرساني. تعتبر النسبة بين (0.3 – 0.5) % هي النسبة الأفضل لزيادة قوة الضغط، بينما النسبة الأعلى قد تقللها. ويمكن تحسين قوة الشد والانحناء والصلابة والمتانة عن طريق زيادة محتوى الألياف. ومع ذلك، قد يؤدي المحتوى العالي إلى فقدان الألياف لأشكالها بسبب مرونتها. بشكل عام، كلما زاد محتوى الألياف البازلتية، حتى 1.5 %، زادت قوة الشد والانثناء. وفيما يتجاوز 1.5 %، قد تكون الزيادة أقل. وجود الألياف البازلتية في العتبات يؤخر ظهور التشققات ويزيد من قدرة تحمل العتبات. كما انه كلما كان طول الألياف أقصر وقل المحتوى كان التأثير أفضل. يعتبر الطول (6–24) ملم هو الطول الأمثل للاستخدام في الخرسانة حيث يعزز الخواص الميكانيكية. الزيادة في مقاومة الخرسانة لنسبة الماء الى الاسمنت القليلة تكون أعلى من نسبة الماء للإسمنت الأعلى.


**الكلمات المفتاحية: الخرسانة المسلحة بألياف البازلت، مقاومة الانضغاط، مقاومة الشد، مقاومة الانحناء، الليونة**

## Abstract

This paper reviews effecting of blending basalt fibers into concrete on mechanical properties, ductility, and toughness. Based on concrete components, the perfect basalt fiber percentage can differ and is influenced by factors like fiber length, w/c ratio, and age. The beneficial basalt fibers percentage is lower than that of steel fibers. Even with a low concentration of basalt fibers, concrete tensile and flexural strength can be improved more effectively than a higher amount of steel fibers. As the amount of basalt fiber increases, the mix workability decreases. Additionally, the flow ability may drop slightly as the length of the fibers increases. Adding basalt fiber to concrete can minimize drying shrinkage, size, and quantity of voids inside the concrete matrix. A content between (0.3 - 0.5) % is the best ratio to increase the compressive strength, while a higher percentage may reduce it. The tensile, flexural strength, stiffness, and toughness can improve by increasing the fiber content. However, higher content may cause the fibers to lose their forms due to flexibility. Generally, the higher the basalt fiber content, up to 1.5 %, the higher the tensile and flexural strength. Beyond 1.5 %, the increment may be lower. The presence of basalt fiber in beams delays the appearance of cracks and increases the beam's load capacity. The shorter the fiber length, the lower the content and the better the effect. The (6-24) mm is the best length to use in concrete that enhances mechanical properties. The increment in strength for a lower w/c ratio is higher than that for a higher one.

**Keywords: Basalt fiber reinforced concrete, Compressive strength, Tensile strength, Flexural strength, Ductility.**

# Impact of Merging Basalt Fibers with Various Types of Concrete and the Factors Affecting Them: A Review

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