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Transforming Interior Design Education through Generative Artificial Intelligence (AI) Trend

تحول تعليم التصميم الداخلي من خلال اتجاه الذكاء الاصطناعي التوليدي

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Research Abstract:

Generative Artificial Intelligence (AI) transformed Interior Design Education nowadays in different sectors of design. AI tools can analyze and predict Interior Designs through different design programs powered by AI Algorithms. Interior designs generated from AI programs can be formed and applied in different design styles including traditional styles and new trends in contemporary design fields based on the database structured in AI Programs. In this research a methodology is applied and predicted as a way of transforming interior design education by using Artificial Intelligence (AI) as a trend applied in different Interior design sectors.

Keywords: Artificial Intelligence (AI) - Interior Design – Concept Formation

ملخص البحث:

لقد أحدث الذكاء الاصطناعي التوليدي (AI) تحولًا في تعليم التصميم الداخلي في الوقت الحاضر في قطاعات مختلفة بالفنون. حيث يمكن لأدوات الذكاء الاصطناعي تحليل التصميمات الداخلية والتنبؤ بها من خلال برامج تصميم مختلفة مدعومة بخوارزميات الذكاء الاصطناعي. يمكن تشكيل التصميمات الداخلية الناتجة عن برامج الذكاء الاصطناعي وتطبيقها في أنماط تصميم مختلفة بما في ذلك الأنماط التقليدية والاتجاهات الجديدة في مجالات التصميم المعاصر وذلك بناءً على قاعدة البيانات المبنية في برامج الذكاء الاصطناعي. في هذا البحث يتم تطبيق المنهجية والتنبؤ بها كوسيلة لتحويل تعليم التصميم الداخلي باستخدام الذكاء الاصطناعي (AI) كاتجاه مطبق في قطاعات التصميم الداخلي المختلفة.

الكلمات المفتاحية: الذكاء الاصطناعي (AI) - التصميم الداخلي – تشكل الفكرة

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Research Problem:

-Absence of Design courses in Interior Design Education which is characterized by the blending of interdisciplinary studies between the Interior Design and Generative Artificial Intelligence (AI) as a new trend in design.

Research Aims:

-Investigating the role of Artificial Intelligence (AI) in interior design and how it can affect the design education process.
-Exploring different ways of Interior Design Education using Artificial Intelligence (AI) Trend.
-Proposing a Methodology of Learning Interior Design blended with Generative AI software programs.

Generative Artificial Intelligence (AI) and Interior Design:

Artificial Intelligence (AI) in Interior design is a simulation of what the human brain can think, analyze and react towards Interior design issues. It is considered as a revolutionizing Trend in the way the designer can think and predict new futuristic approaches of design trends using Artificial Intelligence (AI) Programs. Nowadays in interior design; Artificial Intelligence (AI) Programs is used in converting Text written (Prompt) to Image presented in 3D Modelling interior design; rendered in a very high-quality file which can be used in the design implementation in the real world.

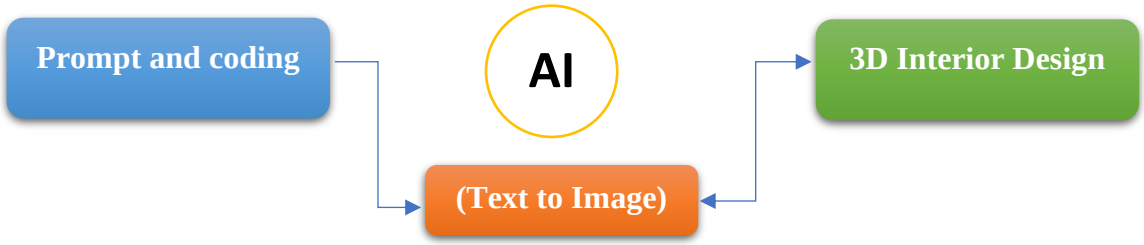

Fig 1. Illustrates generation of Interior Designs using Artificial Intelligence (AI). By Researcher

1. Artificial Intelligence (AI):

The term Artificial Intelligence (AI) was stated by the scientist John McCarthy in 1956. He defined AI as: **The science and engineering of making intelligent machines.** (Lateef, 2023) Many scientists defined Artificial Intelligence (AI) also as a study of how to make computers and system do things like human being associated with intelligence. (Gupta & Mangla, 2020) Artificial Intelligence is considered as a branch of Computer science which can represent knowledge in terms of Text, Image, symbols nowadays that simulate the human intelligence, behavior, understanding, Learning and problem solving…etc.

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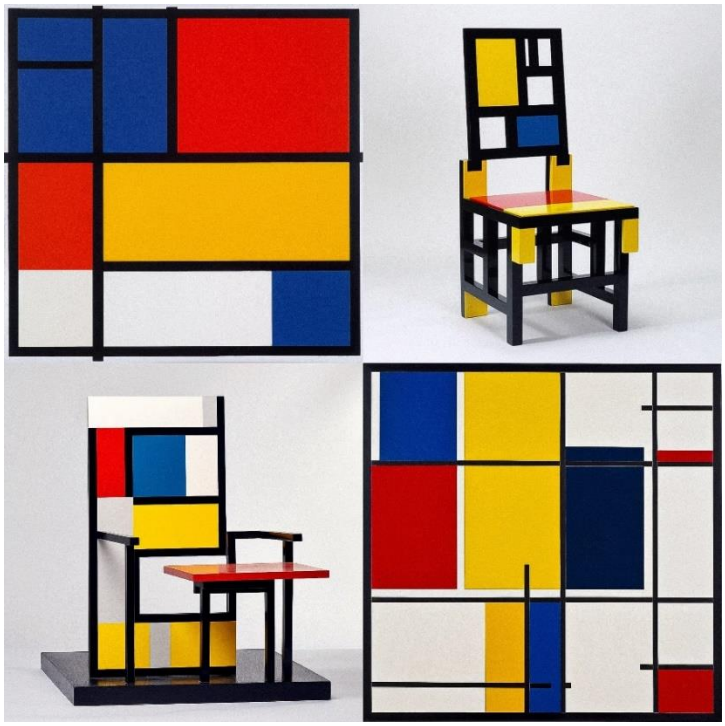

Fig 2. Illustrates furniture design of chair inspired from DeStijl movement using Mid Journey AI program (Guide, 2023) . Retrieved from: https://midlibrary.io/styles/de-stijl (1-9-2023)

1.1 Types of Learning Artificial Intelligence (AI):

Artificial Intelligence subdivided into 3 main types:

1. **Artificial Narrow Intelligence (ANI):** It is called weak AI. In this type the machine is responsible to do a narrowly defined set of tasks without having the ability to think such as the self-driving car.
2. **Artificial General Intelligence (AGI):** It is called strong AI. In this type the machine possesses the ability to think and create as a simulation of what the human brain can do.
3. **Artificial Super Intelligence (ASI):** It is the type in which the capability of machines and computers surpass humans in the way of thinking and analysis as the science fiction movies. (Lateef, 2023)

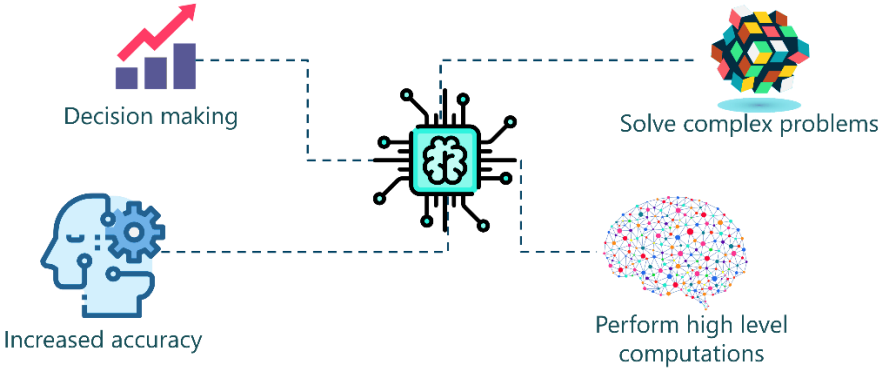

Fig 3. Illustrates the AI Characteristics.
Retrieved from: https://www.edureka.co/blog/types-of-artificial-intelligence/ (9-7-2023)

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1.2 Components of Artificial Intelligence (AI):

Table 1. illustrates Artificial Intelligence (AI) system that is subdivided into 4 main components (Gupta & Mangla, 2020):

1. Learning	2.AI Programming Language	3.Knowledge Representation	4.Problem Solving	5.AI Hardware
- This component characterized by adding Knowledge or refining the previous knowledge in the AI base system. - It includes Learning and critical methods with problem generators.	- **LISP (List Processing)** **PROLOG:** a symbolic processing language that represents information in lists and manipulates lists to derive information. **- (Programming in Logic):** Prolog uses the syntax of predicate logic to perform symbolic, logical computations.	-This component depends on the quality of Information the AI database system possess.	-It depends on the way the AI System can solve problems in an Intelligent way which simulates the human way of thinking.	-Numeric computations occupy a substantial chunk of the processing time, followed by symbolic processing.

1.3 Artificial Intelligence (AI) Search in Programs:

AI systems are characterized by the ability of problem solving based on the database acquired in the AI Programs. Search is considered the first step in Problem solving in all fields including Interior Design and Computer science thus to obtain the solutions of the problems. The search space in AI Programs is considered to be **a search tree**. The search tree is designed to have the roots in the Top and the leaves at the Bottom (Hopgood, 2022). The data base of the AI system characterized by the presence of many alternatives to be tested before using one of them. **The following example illustrate the Interior design of a house using AI Program Search Tree.**

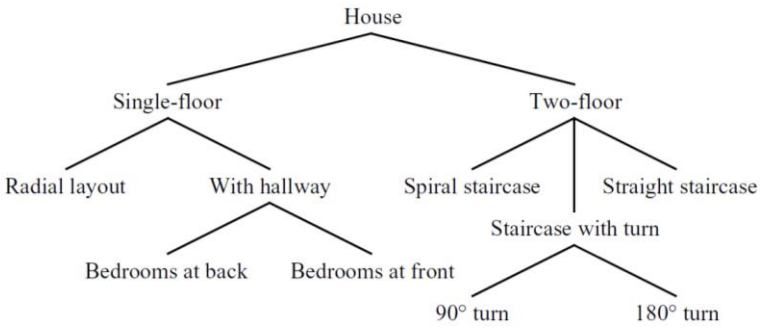

Fig 4. A search Tree for House Designs (Hopgood, 2022)

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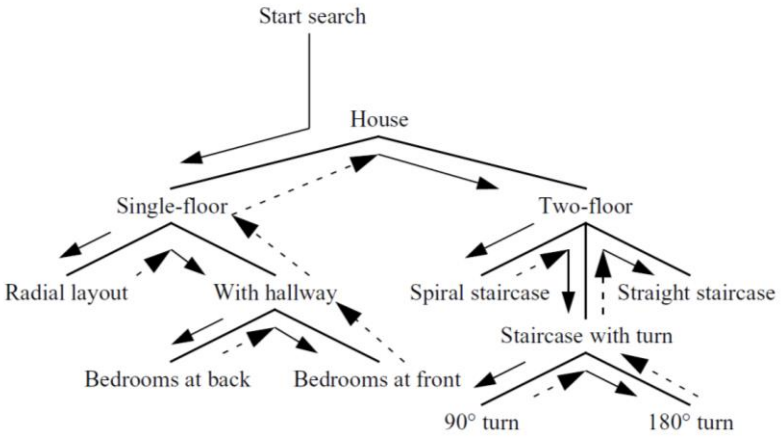

Fig 5. Depth-first search (the broken arrows indicate back tracking) (Hopgood, 2022)

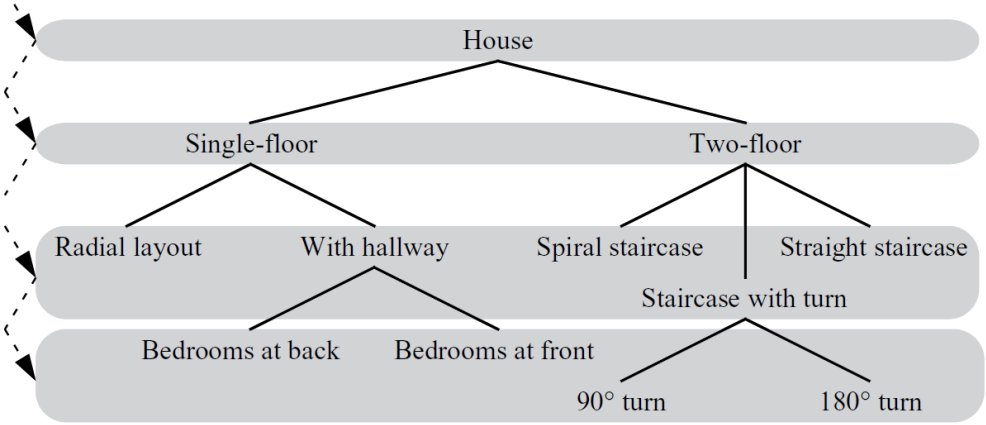

Fig 6. Breadth-first search (Hopgood, 2022)

2. Concept Generation of Design:

This is the stage in which new creative ideas and characterized by being applied ideas and not only analytical. The goal at this stage is to create the largest number of ideas characterized by originality and innovation, and it is a result of both Brain Storming and Creative thinking.

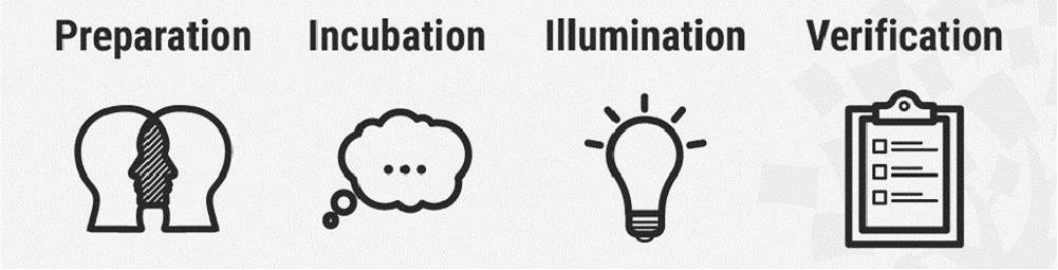

Fig 7. Illustrates the 4 stages of Creativity. Retrieved from: https://www.interaction-design.org/literature/article/what-are-the-stages-of-creativity (5-9-2023)

1. **Preparation:** Gather information about a certain issue. It is characterized by doing research and analysis to find solutions about the design problems to get the best Ideas. In this stage we use different ideation methods to understand the problems and find a proper Interior design space. (Interaction Design Foundation , 2023)

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2. **Incubation:** It is the step in which the ideas interact in the subconscious and the designer focuses on the problem in the conscious to find new ways to bring the ideas together.
3. **Illumination:** It is the stage in which the ideas and solutions comes out and characterized by being illuminated by the conscious mind.
4. **Verification:** The stage of applying and evaluating the ideas to be implemented.

3. Concept Formation of Interior Design:

The process of forming the idea varies according to the creative ability of the interior designer who performs it within the design process, the creative ability here is associated with each of the intellectual stages that are inside the human mind and the phases that are related to the designer's "Brain Storming" aspects, which also may be Sensual and subconscious feelings of the designer. As a result of each designer mind (vision, perception, and feeling) and the senses of the designer; produces the creative ability of visual imagination of the interior design.

Fig 8. illustrates idea of sketch of Berlin Philharmonie designed by Hans Scharoun in Berlin- Germany in 1963. Retrieved from: https://berlinerphilharmonie.wordpress.com/2015/02/01/the-plan/ (11-9-2023)

Fig 9. illustrates the interior design of Berlin Philharmonie designed by Hans Scharoun in Berlin- Germany in 1963 as a result of studying sound acoustics. Retrieved from: https://berlinerphilharmonie.files.wordpress.com/2015/02/img_1977.jpg (11-9-2023)

4. Concept formation of Blending Interior Design with Artificial Intelligence (AI) using Midjourney 5.2 Software (Applied case study by Researcher):

Midjourney is an independent research lab exploring new mediums of thought and expanding the imaginative powers of the human species. (About Midjourney, 2023)

It is an AI online website specified in generating Images from Text written. The researcher used Midjourney in generating Interior Designs and Furniture using the Imagine command.

-The **/imagine** command generates a unique image from a short text description **(known as a Prompt).** https://docs.midjourney.com/docs/quick-start (7-9-2023)

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Fig 10. Illustrates bird wing as a source of inspiration. Retrieved from: https://www.pinterest.com/pin/580612576937715208/ (7-9-2023)

Fig 11. Illustrates chair design inspired from the wing of a flying bird in the arm of the chair. (By Researcher using MID JOURNEY AI Software)

-Furniture designs from Parametric Design

MID JOURNEY: AI Program: /Imagine. PROMPT. Parametric chair inspired from bird wing, white background, with shadows on floors, daylight, realistic photo, perspective camera

Fig 12. Illustrates chair design inspired from Parametric Design Concept. (By Researcher using MID JOURNEY AI Software)

Fig 13. Illustrates chair design inspired from Parametric Design Concept. (By Researcher using MID JOURNEY AI Software)

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MID JOURNEY: AI Program: /Imagine. PROMPT. Chair in Mondrian style, realistic photo, in interior space with Mondrian painting on walls.

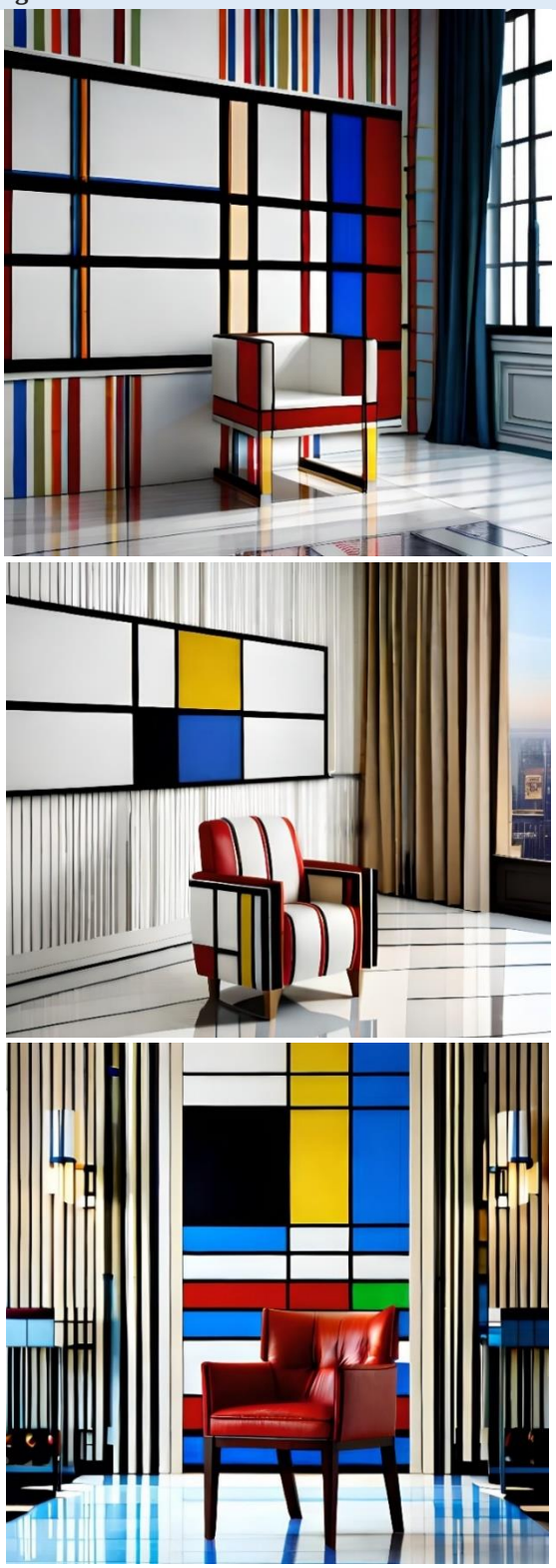

Fig 14.15.16. Illustrate A chair in Interior design inspired from Mondrian Style. The designs characterized by different wall treatments using Mondrian style, based on the data base of the MID JOURNEY AI Program. (By Researcher using MID JOURNEY AI Software)

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MID JOURNEY: AI Program: /Imagine. PROMPT. Interior design of residential villa, sustainable wood material on flooring, spiral stair in the center, comfy arm chairs, warm light

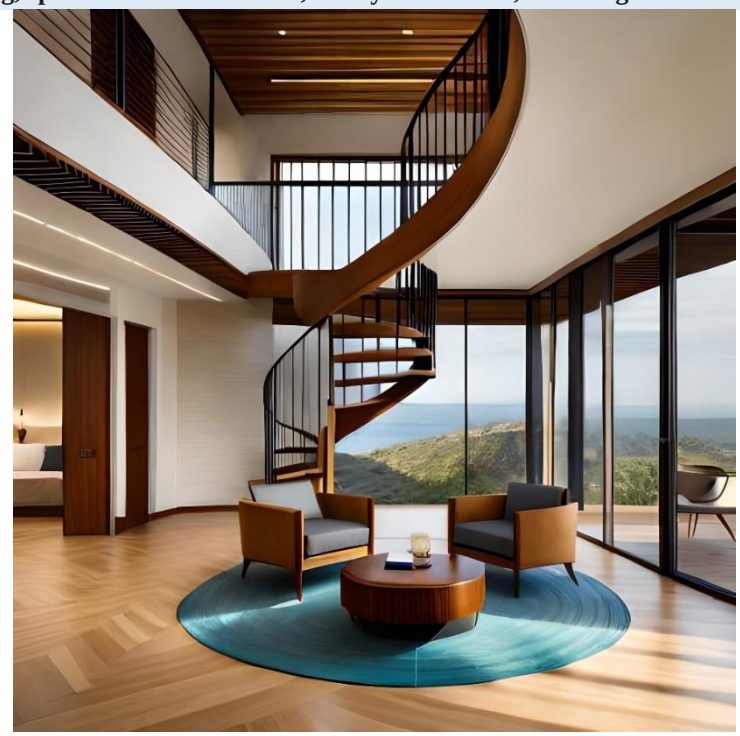

Fig 17.18. Illustrate Interior design of Residential space inside a villa with a cylindrical staircase. The Interiors characterized by the presence of sustainable materials such as wood treatments in Walls, Floors and stairs. The designs also characterized by the connection by the inside and outside of the villa.
(By Researcher using MID JOURNEY AI Software)

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MID JOURNEY: AI Program: /Imagine. PROMPT. Interior design of residential villa, sustainable wood material on flooring, comfy arm chairs, warm light

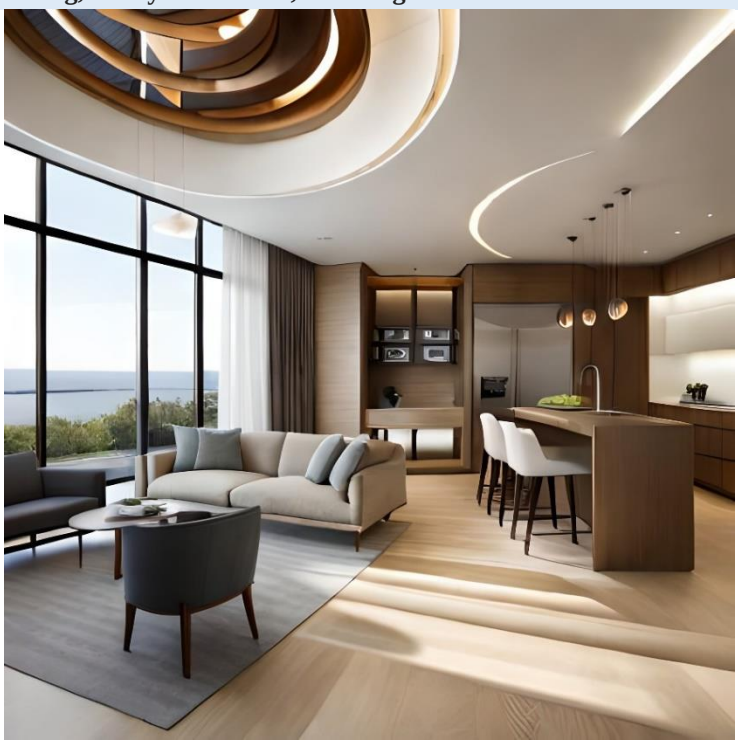

Fig 19. 20. Illustrate Interior design of Residential space inside a villa with sustainable materials in the wall treatments using wall claddings, and wooden floors.
(By Researcher using MID JOURNEY AI Software)

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MID JOURNEY: AI Program. /Imagine. PROMPT. minimalism interior space of villa, curved stair in the center, white and grey and blue colors, large window, warm lights

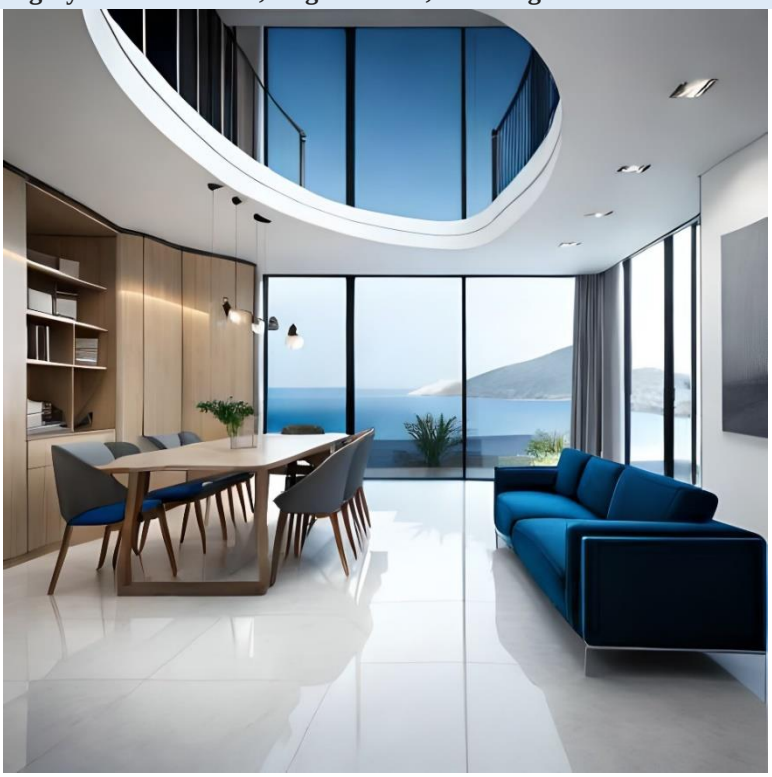

Fig 21.22. Illustrate Interior Design of villa with curved stairs and characterized by the presence of shades of blue color with grey in minimalistic scene. (By Researcher using MID JOURNEY AI Software)

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Fig 23.24. Illustrate Interior design of a curved stairs in the center of a villa. The photos generated with the same previous prompt in a minimalistic interior space. (By Researcher using MID JOURNEY AI Software)

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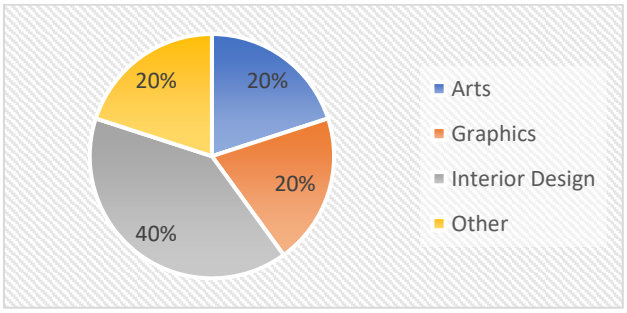
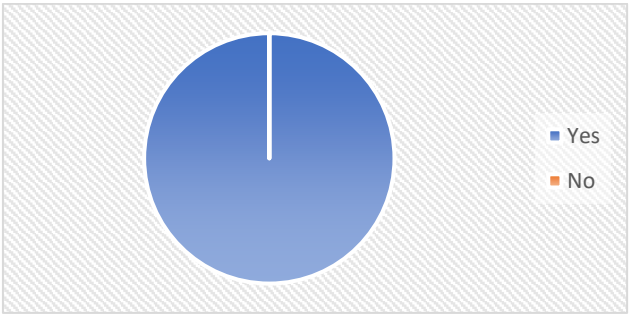
5. Survey about using AI in Interior Design:

The Researcher made a survey about using AI programs, It is a list of questions aimed for extracting and gather information about the students and graduates of Arts and Design and their point of view of learning AI programs and Text Scripting and Coding during Interior Design Education.

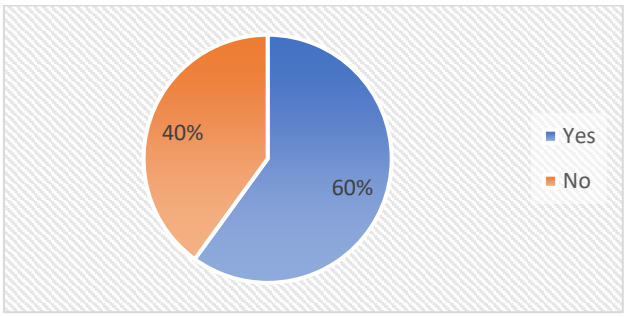
1. What is your major?



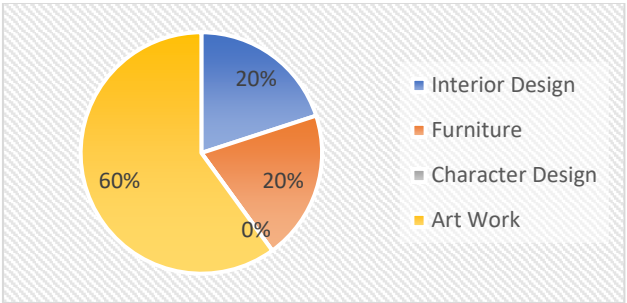
2. Did you ever know about AI Programs?



3. Do you use AI Programs in Design, Text Scripting?



4. What are the designs you tried using AI Programs?



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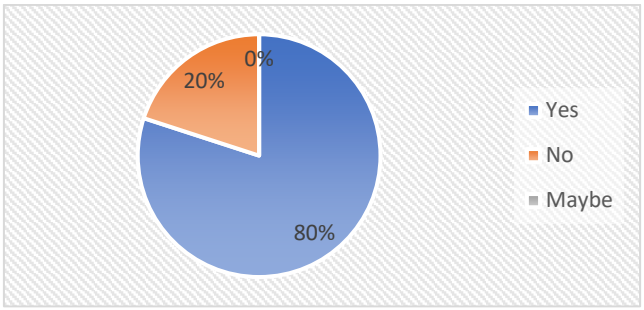
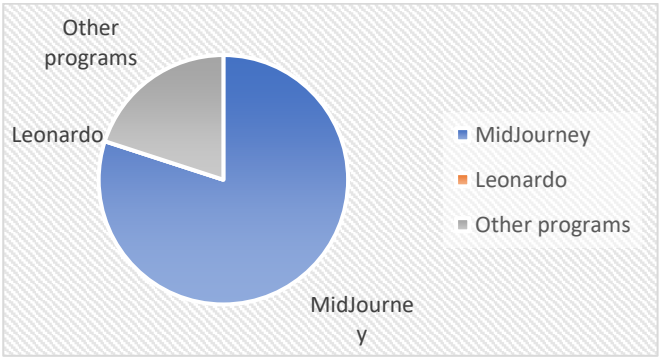
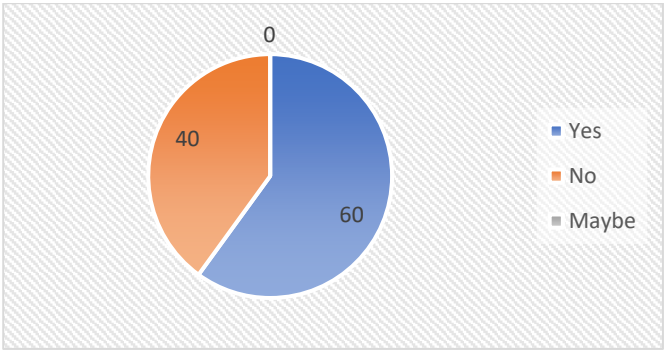
5. Do you agree in blending Interior Design with Computer Science in Design Courses?



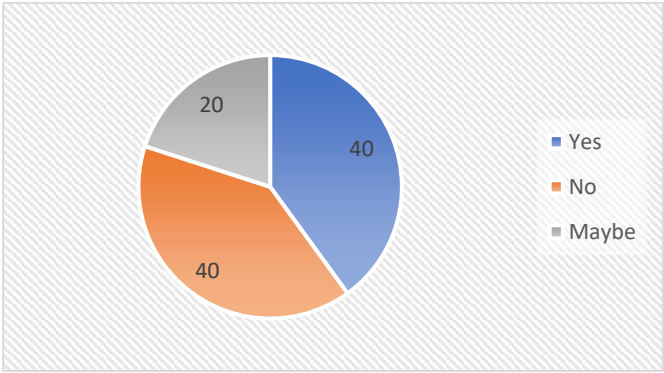
6- What are the AI Programs you used it before?



7- Do you agree in learning Coding and Text Script in the first year of studying design?



8- Do you agree in implementing Interior Designs from AI Programs in the real world?



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9- Write down your point of view about this AI Design generated from MIDJOURNEY.

Fig 25. Illustrates living area generated by Midjourney (AI).
Retrieved from: https://80.lv/articles/fantastic-interiors-created-with-midjourney/ (2-9-2023)

From the previous survey the researcher concluded applying the AI Technology through learning Interior design as a way of blending Computer science with Interior design education to support the interdisciplinary studies.

6. Methodology of Learning Interior Design with Artificial Intelligence (AI):

Artificial Intelligence (AI) is considered a revolutionizing technology in learning interior design. It transforms the way of learning and interacting in life as a result of the explosion of the data nowadays. According to the World Economic Forum's Future of Jobs report, AI and machine learning specialists top the list of fast-growing jobs over the next five years. (Artificial Intelligence (AI), 2023).

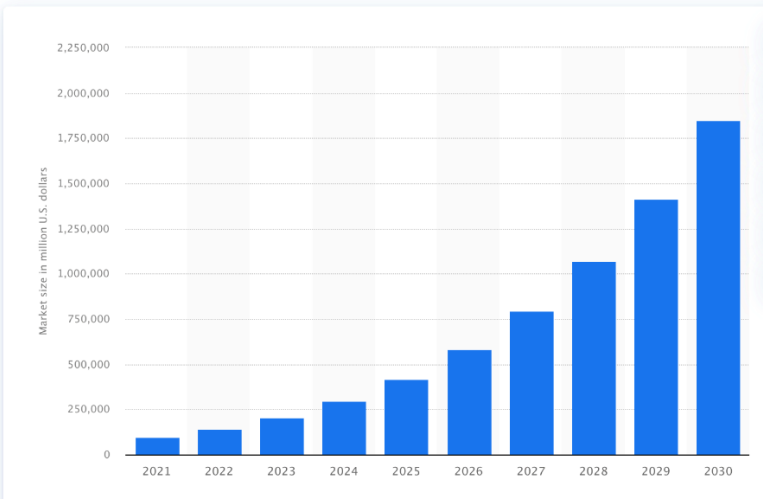

Fig 26. Illustrates AI Market size growth within 2021 to 2030.
Retrieved from: https://www.statista.com/statistics/1365145/artificial-intelligence-market-size/ (8-9-2023)

According to what is mentioned previously about the emergence of AI Technology in Jobs, the researcher designed a learning methodology in learning Interior Design with Artificial Intelligence (AI), as AI is expected a strong growth in Interior Designers jobs in the coming decades. The methodology is characterized by a set of lectures including Learning Interior Design, Coding and Text writing, also AI Programs which generates interior designs.

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Table 2. illustrates Methodology of Learning Interior Design with Artificial Intelligence (AI):

Lectures	**Program Calendar**
Lecture 1	Schematic Design of Interior Design
Lecture 2	Space Planning (Furniture Design – Lighting)
Lecture 3	HVAC Systems
Lecture 4	Learning Coding Language (Introduction to Computer Science)
Lecture 5	Data Processing
Lecture 6	Elevations and Sections using AI Sketches and Trials of Design
Lecture 7	3D Perspectives using AI Sketches and Trials of Design
Lecture 8	Blending AI Sketches and 3D Manual Designs
Lecture 9	Submission of Project
Lecture 10	Evaluation – Final Student's Exhibition

Research Findings:

- Signifying the relationship between generative artificial intelligence (AI) and Interior design through the data base in the AI Software which generates Interior design scenes based on the Arts and Design culture.
- Achieving a methodology of Learning Interior Design with Artificial Intelligence (AI) which may be studied in the applied and creative arts faculties as a result of the survey done by the researcher to support the interior designer's jobs by 2030.

Recommendations:

- The researcher recommends the collaboration between the Interior Designers and the Computer science engineers to upgrade the database of the AI Programs of the architecture and Interior designs of the local Environments all over the world to enrich the output of the AI Technology.

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- Quiz URL: https://docs.google.com/forms/d/1Jws9GgCUblCZs8AVZiq-_0TXiXk5q2KvGcot5mBbxEQ/edit
- https://midlibrary.io/styles/de-stijl (1-9-2023)
- https://www.edureka.co/blog/types-of-artificial-intelligence/ (9-7-2023)
- https://www.interaction-design.org/literature/article/what-are-the-stages-of-creativity (5-9-2023)
- https://berlinerphilharmonie.wordpress.com/2015/02/01/the-plan/ (11-9-2023)
- https://berlinerphilharmonie.files.wordpress.com/2015/02/img_1977.jpg (11-9-2023)
- https://docs.midjourney.com/docs/quick-start (7-9-2023)
- https://www.pinterest.com/pin/580612576937715208/ (7-9-2023)
- https://www.statista.com/statistics/1365145/artificial-intelligence-market-size/ (8-9-2023)
- https://80.lv/articles/fantastic-interiors-created-with-midjourney/ (2-9-2023)