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REPLACING ARCHITECTS AND URBAN DESIGNERS WITH AI APPLICATIONS TO REACH MORE AESTHETIC DESIGNS

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Abstract

Original scientific paper

Artificial intelligence (AI), one of the most advanced technologies available today, is quickly changing our lives. It has only been in the last few years that the general public has had access to a multitude of new artificial intelligence technologies that enable anyone to work with it and produce literature and art at a speed and quality never before imaginable. AI is also increasingly transforming the domains of urban planning and design. Its integration into various fields facilitates the resolution of complex issues and raises the efficiency of planning and design processes. Despite being mentioned, there has also been much controversy around this situation. Indeed, AI design has a few well-known and noteworthy advantages, such as rapid and inexpensive data analysis. However, to what extent can AI produce aesthetically appealing designs? To create more aesthetically pleasing designs, this research aims to examine the usability of the designs produced by artificial intelligence utilizing concept data rather than the designs of architects and designers. It is evident from this that, AI can never fully grasp the human creativity, intuitive thinking, and cultural sensitivity that form the soul of architecture and design; true innovation and meaningful design can only emerge from the dynamic collaboration between the power of technology and the vision of architects and designers.

Keywords: *AI-generated design, technology, design, aesthetic, architecture and urban planning.*

DAHA ESTETİK TASARIMLARA ULAŞMAK İÇİN MİMARLARI VE KENTSEL TASARIMCILARI YAPAY ZEKA UYGULAMALARIYLA DEĞİŞTİRMEK

Özet

Orijinal bilimsel makale

Günümüzdeki en yeni teknolojilerden biri olan yapay zeka (YZ), hayatımızı hızlı bir şekilde değiştirmektedir. Daha önce hiç hayal edilemeyen bir hız ve kalitede edebiyat ve sanat üretimini sağlayan çok sayıda yeni yapay zeka teknolojisine erişimi, ancak son birkaç yılda gerçekleşmiştir. YZ ayrıca şehir planlama ve tasarım alanlarında daha fazla değişimleri sağlamaktadır. Çeşitli alanlara entegrasyonu, tasarım ve planlama süreçlerinin verimliliğini artmakta ve karmaşık sorunların çözümünü kolaylaştırmaktadır. Bu konu çok sayıda tartışmayıda beraberinde getirmektedir. YZ tasarımının, hızlı ve ekonomik veri analizi gibi birçok tanınmış ve önemli avantajı sağlamaktadır. Ancak YZ ne kadar estetik tasarımlar yapabilir? Bu araştırma, mimarların ve tasarımcıların tasarımları yerine konsept verilerini kullanarak, yapay zeka ile daha estetk tasarımların üretilebilirliğini incelemeyi amaçlamaktadır. Buradan da anlaşılacağı üzere, yapay zekâ, mimarlık ve tasarımın ruhunu oluşturan insan yaratıcılığını, sezgisel düşünceyi ve kültürel duyarlılığı asla tam olarak kavrayamaz; gerçek yenilik ve anlamlı tasarım, ancak teknolojinin gücü ile mimarların ve tasarımcıların vizyonu arasındaki dinamik işbirliğinden doğabilir.

Anahtar Kelimeler: *Yapay zekayla üretilen tasarım, teknoloji, tasarım, estetik, mimarlık ve şehir planlama.*

1 Introduction

Cities offer both physical and spiritual platforms and infrastructures that enable people to reach their full potential. As a result, these individuals produce commodities and services that raise the general public's standard of living [1]. Since the extraordinary increase in urbanization worldwide, which is predicted to reach roughly 68% by 2050 [2], cities are coming under greater pressure from governmental, social, economic, and environmental perspectives. Consequently, resilience and sustainable urban development have gained significant attention, in recent years[3]. This shift has prompted designers and urban planners to prioritize sustainability and a sense of identity in their projects, recognizing that these elements are essential for creating livable urban

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environments[4]. To create more resilient, responsive, sustainable, and informed urban design and planning, leveraging big data analysis is needed. In other words, decision-making that is better informed, more effective, and more responsive is made possible by the growing integration of data analysis into urban planning and architecture. However, the architectural and urban design industries have not yet included many sources of information in their workflow, despite the vast amount of urban data available to them[5].

Especially, developing countries are strained by this, particularly regarding time and financial resources. Growing computational power and developing computational technologies, like artificial intelligence (AI), open up new ways to address urban problems[6]. Particularly the long-standing sustainable development issues of social justice, economic growth, and environmental preservation[7] are among these problems. Artificial Intelligence (AI) is poised to become a primary tool for local governments to achieve sustainable and intelligent growth due to its sophisticated capabilities[8]. AI improves decision-making in urban design, building performance, and transportation optimization through data analysis. This technology is increasingly being used to increase efficiency and sustainability in urban planning and architecture. AI has clear impacts on urban planning because it can be used to predict what people want or how they will behave [9]. Governments worldwide are racing to establish dominance in artificial intelligence through strategic national initiatives. For instance, the AI strategy put forward by the German government also anticipates that AI will be crucial to sustainable development[10]. The state participates in these strategies in three ways: first, as a regulator, establishing the legal framework for the development and application of AI; second, as a facilitator, constructing infrastructure or granting access to public data to AI companies; and third, as an AI user, utilizing AI in public administration or to deliver public services[11]. Likewise, an AI strategy that acknowledges the current global trend toward smart cities and smart urban infrastructure was announced by the Australian government in 2019[12]. So, a field of increasing interest and investigation is the incorporation of Artificial Intelligence into the architectural and urban design process. So, AI in architecture transcends being merely a design tool, instead functioning as a transformative technological force that restructures the entire architectural ecosystem, creating new methodologies, professional roles, and knowledge frameworks while fundamentally altering the relationship between architects, clients, and the built environment.

In addition to this Artificial Intelligence has emerged as a noteworthy tool in the fields of aesthetic architecture and picture production, providing novel avenues for design innovation, visualization, and creative artistic expression[13]. AI technologies are changing how artists work, creating new human-machine collaborations that expand artistic possibilities and aesthetics [14]. With just a basic natural language command, users may now create images or text thanks to a multitude of AI technologies that have been made public in the past year alone[15]. It is generally accepted that AI is capable of analyzing architectural designs to assess aesthetic aspects according to predetermined standards like balance, symmetry, and proportion. On the other hand, the literature reveals the parameters such as order, balance and harmony, proportions, rhythms, scale, character and identity, and the meaning of architecture (intellectual, formal, and spiritual ideas) that create aesthetic pleasure in architecture and designs [16]. Architects can improve their designs and attain desired aesthetic results by using this method. The aesthetic parameters and the basis on which these parameters are decided are outside the scope of this article. Analyzing the parameters one by one is the subject of another article. However, the literature-based aesthetic parameters given here are also accepted within the scope of this article.

Artificial intelligence tools can examine patterns in architectural tastes and styles by analyzing information from sources like design journals and social media. This makes it easier for architects to keep up with and apply design trends to their work. Nonetheless, the question now comes up, can AI replace architects and urban designers in reaching more aesthetic designs? So, in addition to AI data analysis, can it also perform aesthetic analysis? This article does not criticize or endorse the role of artificial intelligence in architecture and urban design areas. On the contrary, this article aims to analyze how artificial intelligence is used in architectural design processes and reveal its strengths and weaknesses. Finally, it tries to offer suggestions that can be improved for the future.

The background of the literature is covered in the second section. The section has presented the idea of AI, and its visual effect in the design area. The research plan, which combined a case study and a survey of the literature, is described in section three. Three legendary architectural projects in Istanbul/ Turkey have been selected in this case. The first one is a public place/ regional place. The second and third are residential apartment designs. The projects, which are classified as architectural projects with a design concept rather than contractor work, were chosen for their potential in modern architectural design.

The concepts of these projects, which were gathered from the literature and/or their original sites were used as prompts for generating digital images from short descriptive texts[17], for AI design. So it was important that selecting the cases must have design concepts. The findings of the study are discussed in section four under the topics of AI's advantages and disadvantages, and suggestions for improvement.

As a result, AI and designers must work together, thus it's important to address who makes design decisions.

2 Research Plan

Figure 1 depicts the process of conducting research. This study's methodology employed a descriptive-analytical approach. The theoretical investigation, which was compiled from books, relevant scientific websites, research articles, and studies, was made visible through the use of this technique. The approach contrasts theoretical concepts related to the cases of study. Four steps form the basis of the research, as Figure 1 illustrates. Research questions, a literature review, research of the case studies, and comparison and conclusion are these steps.

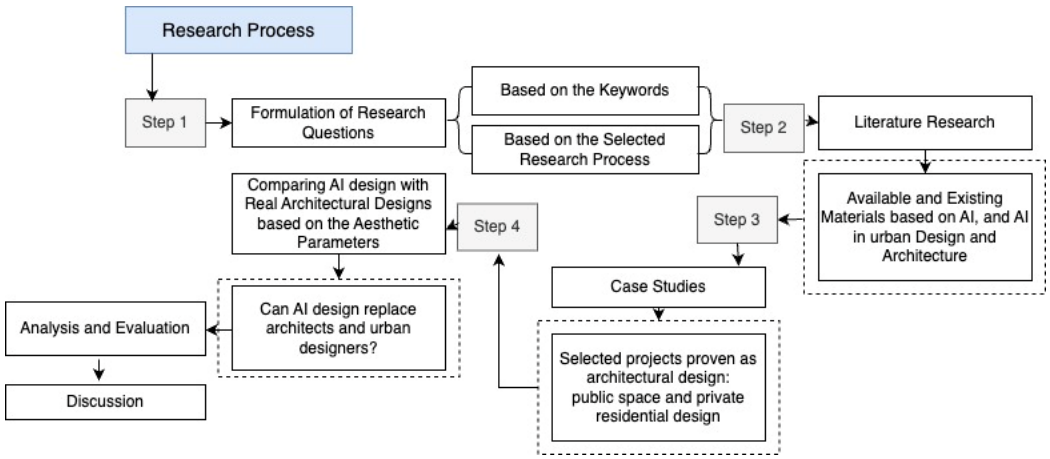


Figure 1.The research process (by author, 2024).

3 Literature Background

3.1 AI in Contrast to Conventional Techniques and Tools

Within the fields of science, business, and technology, terminology like artificial intelligence and cognitive technologies are already widely used. In general, nonetheless, they arouse various connotations in society, where their primary source of knowledge is science fiction cinema[18]. AI originated in the 1940s and was first mentioned in a short science fiction narrative written by Isaac Asimov. The landmark book "Computing Machinery and Intelligence" by Alan Turing, who developed the concept of computing intelligent machines, was published in 1950 and is currently regarded as the standard for determining an artificial system's level of intelligence. Irving John Good made predictions regarding artificial intelligence that might surpass human intelligence as early as 1966[19]. Since then, artificial intelligence has achieved milestone after milestone and is still advancing at a rapid rate. Later, more research was conducted, particularly in the 1980s when Japan began making significant investments in artificial intelligence[20]. The foundation of artificial intelligence is the creation of autonomous agents with the ability to think and plan toward an objective without underlying environmental knowledge[21]. AI already influences and interacts with people's everyday lives on an almost daily basis[22]. AI is among the most revolutionary technologies of our day. Because AI provides smart governance options and platforms that are both efficient and effective, it has become an essential component of urban services in recent years[23]. Artificial Intelligence is predicted to change how governments run, how people live, and how economies function overall. On the nature and scope of AI's influence, however, there is disagreement. On the one hand, it might improve economic development and productivity while raising public service efficiency. However, it can also make labor market imbalances worse and make national and international disparities worse[24]. According to Gummesson (2023) [25], Since artificial intelligence is still in its infancy and evolving, it is famously hard to define without changing our understanding of what constitutes AI. As of right now, there isn't a single, widely agreed-upon definition for "artificial intelligence"[26]. But the definition is accepted and used as software that, given goals, produces recommendations, predicts, content, or decisions that affect their surroundings is referred to as artificial intelligence[27]. This acceptance is also used within the scope of research. It is referred to as a buzzword frequently employed in scholarly and public conversations by Palmini and Cugurullo (2023) [28]. In a broad sense, it refers to scientific endeavors to teach machines self-learning or to automate cognitive functions like planning, language, pattern identification, and text or speech recognition[29]. In conclusion, different definitions of artificial intelligence have been offered by scientists and researchers over time, reflecting advancements in technology. Artificial Intelligence (AI) has been defined as a broad range of tools, applications, and methods that allow computer systems to learn, reason, solve problems, interact with their surroundings, and make decisions that are on par with or better than those of humans[30]. The advent of AI, as a kind of text-to-image technology, has significantly changed the architectural design process because designers are now able to create intricate, creative, and futuristic designs with it[31].

3.2 Visual Information of AI and the Architectural Designs' Imagination

Generative AI applications are growing in popularity in highly creative domains like research, design, and art, and text-to-image AI-based systems have drawn a lot of interest lately [32] . Visual representations facilitate easier comprehension and interpretation of design concepts, intents, and needs by giving designers and stakeholders a shared language. This enhances communication and collaboration[33]. Researchers observed that "AI was found to bring a distinct perspective that opens up new avenues for artistic expression," providing a novel and creative approach to the process of designing[34]. The capacity to provide original and novel design concepts is one of the main advantages of integrating AI into architecture and urban design, besides technological advantages like building management systems [35]. Artificial Intelligence has the capability to generate design solutions that surpass conventional architectural thinking through the utilization of generative design methodologies and machine learning algorithms [36]. Images/ illustrations played a significant and long-

lasting role in the study of cities by offering insightful information on the physical environment. Images have made it easier for academics to observe, record, and evaluate the layout, aesthetics, and functionality of urban environments since the eighteenth century[37]. Even with these improvements, it is still difficult to figure out which text prompts to use to get the correct images. Text-to-image generative models use user-inputted word prompts to create images. During this procedure, variances may appear in the output images even when the prompts have the same content (see Table 8). The generative process' underlying complexity and the interpretability of textual descriptions are the causes of this diversity[38]. In this research, three cases are selected. The projects were selected to test the architectural understanding capability of artificial intelligence in various contexts. Different prompts were used for two of the selected cases. Whereas for the last one, the same prompt was used. Nevertheless, different images emerged from all the results.

4 Case Studies

The research aims to determine the similarities or differences between the selected case studies, and the AI design results by using design concepts of the selected cases as prompt data for AI design. While it is impossible to say for sure which AI is and will be most useful to architects and planners in practice, both as a technological and design tool, there are several AI tools and potential capabilities that are predicted to be used worldwide. For the aim of the research, the Leonardo.ai program was used. An advanced AI art generator of Leonardo AI, which is a web-based platform, offers a wide range of models and tools for producing excellent visual art[39]. Maybe some other programs such as Midjourney.ai or stable difussion.ai provide and create more aesthetical and real models but these programs are dollar-based which is difficult and expensive for countries such as Turkey to buy and use. Leonardo AI is used in this research because of its free nature and its detailed and realistic rendering capability in visualizing architectural concepts and designs.

4.1 Public Space Design/Religious Space

Traditional mosque architecture has developed over centuries in Islamic architecture in nations like Turkey, where Islam is the predominant religion. Most of Turkey's mosque inventory is "Ottoman-type" mosques[40]. Since the military intervention in 1980, there has been an increase in political and social conservatism in Turkey[41]. Consequently, mosque architecture has attracted interest from the general public and experts. During this time, some mosque designs transformed from the formalized, commercialized, and traditional style to modern and contemporary mosque architecture by famous Turkish architects. One of these designs is the Sancaklar Mosque in Istanbul. Regarding the link between form and function, spatial organization, general architectural features, traditional courtyard design, and the use of common components in mosque architecture, the chosen sample highlights a creative and modern design trend in Turkey[42], which has been honored with awards for its unconventional architectural philosophy, unique physical and thematic formation, and ability to challenge our preconceived notions of mosques[43]. By rejecting any obvious resemblance to the historical mosque type and the usage of any traditional mosque features, the Sancaklar Mosque represents a substantial attempt to break free from the dominant formal traditions seen in the majority of existing mosques[44].

The purpose of this study is not to compare traditional and modern mosque architecture. It is to evaluate the redesign of modern and transformed mosque architecture, which has been proven in the literature, using artificial intelligence. Therefore, the definition, history, and details of mosque architecture are outside the scope of this study. Only what is required for a mosque design, and the concept of the selected case study are included in the scope of the research. In light of this circumstance, a quote mentioning the Sancaklar Mosque will be adequate to ensure the veracity of the chosen case study;

Uğur Tanyeli mentioned that [the architect] simply ignored the prevailing language of contemporary mosque architecture and poetically reconceptualized it[45].

Design Concepts/ AI Prompts

The mosque is situated in a neighborhood with numerous gated communities, with a view of Büyükçekmece Lake. Given that, a mosque lacks a set shape and that a prayer room can be anywhere that is clean, the Project distanced itself from discussions centered on form to concentrate only on the fundamentals of a holy space. Pleasure, both mental and physical, was paramount. The goal of the design was to depict the most basic forms of matter and light, as well as an inner world devoid of all cultural constraints. The building was intended to vanish off the site's slope, anchor to the earth as though it had always been there, and eliminate any temporal and cultural connections[46]. The mosque's overall design, which is characterized as unassuming and modest, stands out due to its prismatic minaret and domeless cover. It blends in well with the surrounding landscape.

In the scope of this research, the design concept of the selected case which represented form, shape, and visual designs, was obtained through a literature study and presented to AI as a prompt in four steps. Contemporary mosque cover, image phenomenon, form, character, and courtyard design have been the focus of this study, plan type and spatial organizations, pulpit, mihrab, and congregational area are outside the scope of the study.

Trying to get closer to the real design concept by increasing the details as prompt in each trial by AI. Thus, the second trial presents a more concrete design. Each trial offers four different design samples. In the next attempt, everything was written in detail, but the project was much different from the real design. This shows that when you write too much and in detail to the AI, it gets confused and can produce absurd results. In the last stage a prompt that emphasized more detail was written but slightly more important concepts, which gave good results, but since it did not fully perceive the environment and context, it created a design independent of the environment.

Table 1. Public space design concepts by the architect (Photos by the author, July 2024).

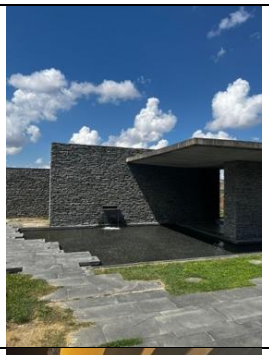
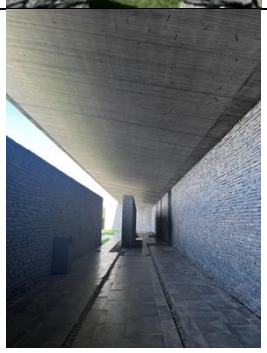
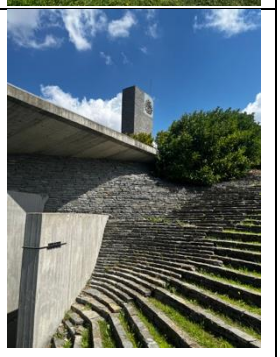
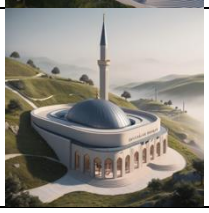
Design Concepts of the Selected Public Space	
Architect/ Urban Designer	**Real Design**
- Modern -Underground - integrate with the topography -focuse solely on the essence of the religious space by removing itself from conversations that are form-based - on a sloping, rural land - simple and impressive - beyond shape-based patterns - appeals to physical and emotional perceptions - Steps that gradually descend with the slope of the land - With the splits and cracks along the Gibla wall allow daylight to penetrate into the prayer hall. -Represent purest form of light and matter, just as a primary inner world free from all cultural burdens. - Garden surrounded by horizontal courtyard walls and vertical prismatic mass of stone -A green roof -Rural plants	        

Table 2. Public space design by AI[47].

Textual Inputs		**Initial Image**	
AI Prompt 1	**AI Prompt 2**	**AI Design 1**	**AI Design 2**
-modern mosque - buried underground - the mosque integrate with the topography - the mosque be on a sloping, rural land - It should be located in a meadow landscape separated by a highway next to the mosque. - it be simple and impressive. - it go beyond shape-based patterns and create a mosque that appeals to physical and emotional perceptions. - Steps that gradually descend with the slope of the land - The slits and cracks along the qibla wall allow daylight to penetrate into the prayer hall.	-modern mosque - buried underground - the mosque integrate with the topography - the mosque be on a sloping, rural land - mosque overlook the meadow view - be simple and impressive - only concrete material and gray stones be used on the facade - it go beyond the shape-based patterns and create a mosque that appeals to physical and emotional perceptions -enter the mosque with the steps going down with the slope. -the daylight leak into the prayer hall through the slits and cracks along the qibla Wall - the roof of the mosque be a green terrace roof - people walk and take photographs on the roof - the mosque be entered from below with the stone stairs created by natural slopes from the side of the roof. - Outside the mosque, there is a long, rectangular structure. Include a minaret.	  	  

Table 2 (Continued). Public space design by AI[48].

Textual Inputs		Initial Image	
AI Prompt 3	**AI Prompt 4**	**AI Design 3**	**AI Design 4**
- Mosque with modern and minimalist features. 1. Integration with Natural Materials and Topography: - Constructed using local natural stone, integrated with the topography. - The structure should harmonize with the environment, appearing as if it is part of the natural landscape. 2. Exterior and Facade Design: - Preserving the natural texture of local stone on the facades. - A minimalist and modern aesthetic for the exteriors. - Combined use of natural stone walls and concrete surfaces. 3. Use of Light and Space: - Ensuring natural light enters the interior through large windows and skylights. - Design elements that highlight the reflections and shadows of light in the space. 4. Interior Layout and Minimalist Design: - A minimalist interior design approach with minimal decoration and clean lines. - Geometric forms and simple decorative elements. - Use of natural stone walls and local materials in the prayer area. 5. Religious Elements of the Space: - A simple and modern mihrab on the qibla wall. - A minimalist minbar design. - A spacious, open, and airy arrangement in the main prayer area. 6. Landscape and Environmental Design: - A large courtyard integrated with the landscape. - Natural vegetation and green areas in the courtyard. - Simple yet striking abluti	- create an exact replica of the Sancaklar Mosque Natural, local stones and concrete materials used throughout the structure. The mosque is naturally set into the terrain, integrated with its surroundings. A simple, austere, and minimalist design approach. Large windows and skylights allowing ample natural light into the interior. Organic and modern forms in both interior and exterior spaces. Minimalist interior arrangements, minimal decoration, clean lines, and geometric shapes. A simple and modern mihrab on the qibla wall, minimalist minbar. A large courtyard integrated with the landscape, natural vegetation, and green areas. Simple yet striking ablution areas near the entrance. Acoustic solutions to ensure a quiet and serene worship environment. Creating a spiritual and peaceful atmosphere with natural stone walls and local materials. A modern and unique aesthetic that differs from traditional mosque designs.	  	     

4.2 Residential Building Design/ Apartment-Loft Buildings

Loft structures, an alternate response to the homelessness crisis of the 1970s in the United States, were developed and gradually implemented in Turkey as well. These buildings were once abandoned industrial buildings converted to residential or commercial spaces[49]. Loft living has just become accessible in Istanbul, and there have been a few instances of loft designs being exhibited[50]. In this research, two examples of loft apartments in Galata are selected. The first one is the Micro Loft Bulut Project, located on a total gross area of 45 m^2 in Beyoğlu, Istanbul[51]. The building's topography was chosen to maximize opportunities in the least area and adapt to shifting occupant patterns and behavior[52]. A two-story detached house that had been abandoned was the site of the structure with its distinctive staircase[53]. It is neither forced, contrived, or of a nature that overlooks or disregards the relationship that the apartment establishes with its chaotic surroundings, which are made up of stacks of buildings dominated by uncertainties and secret backyards / inner gardens squeezed in between[54].

The artificial intelligence trial of this project can be considered more successful than other projects. The results did not make a whole difference in some trials. It perceived the desired things better. Assuming that the original design was very abstract and the concept was clearer and less emotional, we can accept that the trials are close to reality. The second residential building is the Galata Apartment, which is also situated inside the traditional housing texture in Istanbul. The primary objective of the design is to create a façade that is both distinctly contemporary and unique, while also harmonizing with the surrounding area's tone and material utilization[57]. Because of its location, the building was constructed with a layered façade that would maximize daylighting while simultaneously offering privacy. The building's interior design was to produce volumes and surfaces that would allow for maximum utilization in a serene, contemporary style[58].

Table 3. Residential Building design concepts by the architect[55] (Photos by the author August 2024).

Design Concepts of the Selected Apartment Design			
Architect/ Urban Designer	**Real Design**		
-Intended and designed to be a microloft - The staircase home, which makes up the entire street facade, was viewed as a vertical extension of the anonymity on the street within the property because of the lot's very small size (gross area of 45 m2). - This open-front staircase house has landings that serve as balconies viewing the ground floor apartments and common areas at different periods. -The hue blue on the front façade draws attention to the staircase house's unusual placement.			

Table 4. Residential Building Design by AI[56].

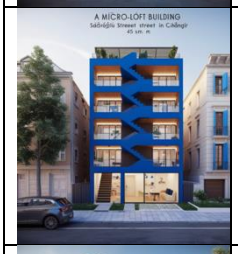
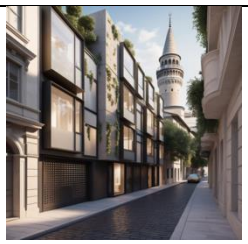
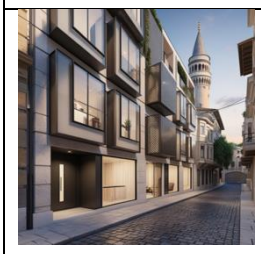
AI Prompt 1	**AI Prompt 2**	**AI Design 1**	**AI Design 2**
-Design a unique, modern structure that replaced an old two-story detached house. -The plot is very small, about 45 square meters. The building features an open staircase that forms the entire street-facing facade, designed to continue the street's anonymity vertically. -The staircase landings sometimes function as communal spaces and sometimes as balconies for the apartments they serve, facing the street. -The staircase facade is highlighted in a vibrant blue color, making it stand out. -In the back, overlooking a small garden, the blue color reappears in the form of sunshades. -The overall aesthetic should emphasize the building's integration into the narrow urban space, with the blue elements providing a striking contrast against the surrounding environment.	-The building is built on a very narrow, 45 square meter plot, replacing a dilapidated two-story detached house. -The design is innovative, with the entire street-facing facade dominated by an open, external staircase. -This staircase, painted in a striking blue, runs vertically along the front of the building, serving as a communal space and as balconies for the apartments at each level. -The blue facade creates a bold contrast against the urban environment, drawing attention to the building's unique architecture. -In the rear, the blue color reappears through sunshades overlooking a small, lush garden. -The setting should include surrounding buildings, typical of the neighborhood, with narrow streets and a mix of old and new architectural styles, to emphasize the building's integration into its urban context.	   	   

Table 5. Residential Building design concepts by the architect (Photos by the author August 2024).

Design Concepts of the Selected Apartment Design			
Architect/ Urban Designer	**Real Design**		
- Located in one of the most historical areas of the city, within the historical housing texture. - The structure has a relatively small project area of 71 m². - creating a facade that is characteristically contemporary and original, but compatible with the tone and material usage in the immediate vicinity within the historical texture. - In this context, a layered facade design was adopted in this area. - Allow maximum daylight but would also provide the privacy environment that a residential structure should have. - In the interior design of the building, a calm, simple and modern design was aimed to create surfaces and volumes that allow maximum use.			

Table 6. Residential Building design by AI[59].

AI Prompt 1	**AI Prompt 2**	**AI Design 1**	**AI Design 2**
-Located in one of Istanbul's most historic districts, Pera. -The design should capture the modern yet harmonious integration of the building within its historic surroundings. 1.Environment: Surrounding the building are narrow streets and historic stone buildings, primarily 1st-degree protected historical structures. 2.Building Characteristics: Facade Design: The building's facade is designed to maximize natural light while maintaining privacy, featuring a layered structure. -Different materials with varying light transmission properties—glass, stone, and metal—are used in these layers. -The facade includes movable panels that residents can adjust throughout the day, allowing for dynamic interactions with light and shadow. -The facade should incorporate transparent and semi-transparent glass, natural stone, and perforated metal surfaces. -These materials not only ensure modern aesthetics but also resonate with the historical context of the area. -The building has a relatively small footprint of 71 m². -Beyond the commercial space on the ground floor, the building is residential, designed to meet contemporary living standards with a focus on efficiency and modern comfort.	-The building is located in one of Istanbul's most historic districts. . The design should capture the modern yet harmonious integration of the building within its historic surroundings. 1.Environment: Surrounding the building are narrow streets and historic stone buildings, primarily 1st-degree protected historical structures. Building Characteristics: 2.Facade Design: The building's facade is designed to maximize natural light while maintaining privacy, featuring a layered structure. -Different materials with varying light transmission properties—glass, stone, and metal—are used in these layers. -The facade includes movable panels that residents can adjust throughout the day, allowing for dynamic interactions with light and shadow. -The facade should incorporate transparent and semi-transparent glass, natural stone, and perforated metal surfaces. These materials not only ensure modern aesthetics but also resonate with the historical context of the area. -The building has a relatively small footprint of 71 m². The ground floor is reserved for commercial use. -Beyond the commercial space on the ground floor, the building is residential, designed to meet contemporary living standards with a focus on efficiency and modern comfort.	   	   

5 Findings and Results

In the visualization made with Leonardo.ai, it was observed that some basic architectural features of Emre Arolat's Sancaklar Mosque were not adequately reflected. For example, although the concept of 'buried underground' was stated in the prompt, the structure was not positioned completely underground in the visuals generated by the AI. This situation shows that one of the most important architectural features of the mosque was not sufficiently

understood. Although the design language of the mosque, which integrates with nature and is oriented towards topography, is partially captured in the artificial intelligence visualization, the architectural details that form the underground-surface transitions in Arolat's original design appear not to have been processed in detail. Thus, it is realized that artificial intelligence has not yet been able to perceive the context and environment of the project or create the desired environment by sending a terrain image. This is a shortcoming of artificial intelligence at the moment because at this stage it can only produce indoor and outdoor images and visuals for what you need. Since it does not perceive the environment correctly, the desired result and the given result are very different from each other.

At the same time, despite the modern, concrete, and minimalist design of the Sancaklar mosque, some characteristic elements of traditional mosque architecture, such as the dome, can be seen in the examples designed with AI. This situation reveals that artificial intelligence has difficulty achieving a fine balance between traditional architectural elements and contemporary interpretation. In the AI-generated Microloft Bulut Project visuals, it is observed that there is a similarity with the original design. The abstract and minimalist language that is at the core of the project seems to have been successfully perceived and reproduced by the AI. The geometric simplicity and minimalist approach of the Microloft Bulut Project were reflected in the visuals produced by Leonardo.ai. This shows that AI can produce more consistent results in designs with clear forms and clean lines. The success of AI in interpreting geometrically simple, abstract designs such as the Microloft Bulut Project shows that such architectural languages have mathematically definable features that can be processed more easily by algorithms. The abstract nature of the original design appears to have been effectively conveyed in the illustrations of the Galata Apartment project made with Leonardo.ai. The project's modern architectural language and integration strategy into the urban fabric have been remarkably accurately replicated by artificial intelligence. The consistency in the visuals produced for the Galata Apartment project highlights the potential of artificial intelligence in contemporary urban architecture projects.

The ability of artificial intelligence to recognize and interpret architectural aesthetic qualities through various factors is demonstrated by these three projects, which were revisualized using Leonardo.ai. Artificial intelligence analyzes the Sancaklar Mosque, Microloft Bulut Project, and Galata Apartment projects differently because they each have unique architectural specifications and aesthetic approaches. When these three projects are evaluated together, they provide important clues about how AI interprets the basic parameters of architectural aesthetics, such as proportion, scale, rhythm, balance, and harmony. It is observed that these parameters are captured more accurately by AI, especially in designs with high geometric definability. This comparison also reveals that there are still certain limitations in the processing of more complex aesthetic parameters of architectural design, such as spatial depth, material texture, light-shadow relationship, and contextual integration by AI. These limitations become especially apparent in projects that use such parameters intensively, such as the Sancaklar Mosque.

6 Discussion

Concerns like the homogeneity of architecture and the loss of creative and individual vision are brought up in criticism of artificial intelligence's role in architecture. This is somewhat accurate, however, modern cities are essentially the same due to structures that would not classify as design or architecture. Are today's architectural designs highly innovative unique and valued?, since each architectural design should tell a unique story[60]. On the other hand, many scientific studies argue that today's cities lack design and aesthetics. This could lead to a physical environment that is monotonous and undifferentiated, failing to capture the variety and cultural backgrounds. On the other hand, artificial intelligence provides at least four distinct designs with precisely identifiable probes for every subject. This makes it possible for urban planners and designers to concentrate on important problems, offer a variety of solutions, investigate performance, carry out generative design and optimization, and foster teamwork. This can be applied to socioeconomic data, disaster mapping, urban development, and urban safety[61]. On the other hand, forming an urban design and planning depends on different political levels, with a certain aim and vision, while taking into account a multitude of interconnected interests, incredibly complicated framework circumstances, and in-depth knowledge of the local context. This is what is officially written and what is discussed in the literature. However, unfortunately, we do not see the development and consideration of these concepts in rapidly developing cities.

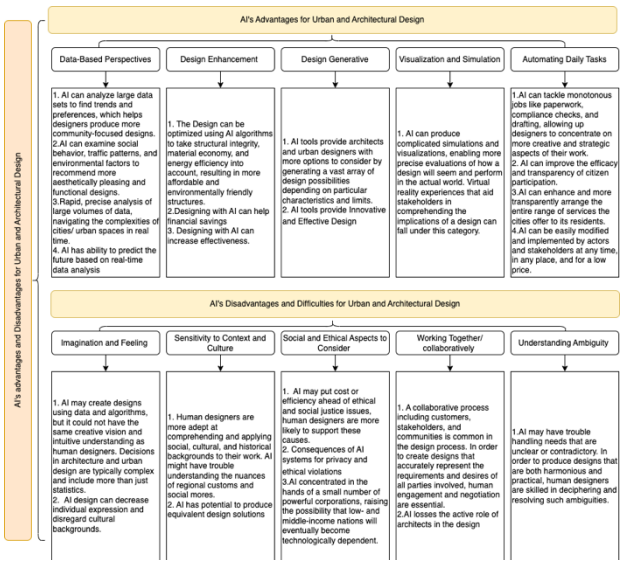


Figure 2. AI advantages and disadvantages in design area (by author, August 2024).

Completely making use of its many advantages besides creating and designing 3D modeling may bring us more identifiable, sustainable, and aesthetic cities. Better outcomes for cities and their citizens result from the integration of artificial intelligence (AI) and data analysis

into urban planning, which improves the capacity to anticipate and address urban difficulties.

7 Conclusion

To effectively utilize a wide range of data and make accurate decisions, developing more architect-effect-centric designs using AI systems necessitates tight collaboration between humans as stakeholders and a variety of architects as actors. Governments, especially developing governments, should include AI strategies in their development especially sustainable development plans and programs. Related governments should assist in supporting local creativity networks, enhance their project delivery capabilities, and draw attention to hazards. This at the same time will be a more participatory approach since considers the opinions of those who use and reside in cities. As Kaatz-Dubberke, and Kehl[62] mentioned human-centric AI should be an architect and urban designer-centric AI in the field of urban design and planning and becoming an ever more important issue. Though it's unlikely to replace human architects and urban designers completely, AI offers a lot of potential to improve the design process and aesthetic outcomes in these fields. In conclusion, artificial intelligence (AI) can greatly improve and complement the work of architects and urban designers, but it will probably perform best as a tool rather than a substitute. However, this study demonstrates that a new form of creative dialogue between architects and AI tools is possible. This dialogue carries the potential for interaction that enriches designers' creative processes rather than restricting them, allowing them to quickly explore different possibilities. The designer can consider the interpretations that the AI produces outside of what is expected as a starting point to question and enrich his or her creative process. However, it seems that no AI design can replace the connection that architects establish with their emotions and designs. In our world, where AI is rapidly developing, it is, of course, possible that we will encounter more powerful, more realistic, and more creative AI designs in the future. Combining AI's advantages with human designers' creativity, empathy, and contextual awareness frequently yields the best results.

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Ethics committee approval is not required.

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