

AI-Generated Imagery: A New Frontier for Nubian Artistic Expression

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Abstract

This study aims to explore the potential of Artificial Intelligence (AI) generated imagery in fostering a dynamic discourse between heritage and modernity, inspiring artistic diversity, and providing a new perspective on traditional Nubian heritage. It claims that the creative application of AI can enable a dynamic conversation between heritage and modernity, adding value to artistic diversity by offering a new perspective to traditional Nubian heritage without distorting its essential identity. AI-generated imagery presents a novel opportunity for an expanded cross-section of artists to re-engage with their visual cultures and histories. However, **the research Question:** How can Artificial Intelligence (AI) technology enhance and transform Nubian visual culture and art forms while maintaining the essential identity and cultural heritage of Nubia? By experimenting with specific AI art models, such as Leonardo, to explore and generate diverse types of designs for textiles, wall hanging, fashion and accessories that capture the essence of Nubian identity while pushing the boundaries of artistic expression. AI-generated imagery represents the new era for Nubian artists and crafts who are on their way to associating tradition with innovation and engaging in a dynamic discourse about culture. Though AI-generated imagery gives rise to entirely new forms of artistic expression, it is vital to maintain a balance between innovation and heritage; novelty cannot dominate tradition. To apply AI technology, respecting and upholding the principles that guide the culture's identity is necessary.

Keywords

Artificial Intelligence (AI), AI-generated imagery, Nubian heritage, culture, Leonardo AI.

المخلص

لقد أدى اندماج الذكاء الاصطناعي والفن إلى تقدم كبير، وتحويل العمليات الإبداعية وتوسيع قدرة التعبير الفني. تتعمق هذه الدراسة في إمكانات الصور المولدة بواسطة الذكاء الاصطناعي كوسيلة مبتكرة لإعادة تفسير التقاليد الفنية للثقافة البصرية النوبية. أدى فحص الأنماط والبحث عن مفاهيم جديدة إلى زيادة الانبهار بدمج التصميم التقليدي مع التكنولوجيا المبتكرة في المنسوجات المعاصرة وتصميم الأزياء والمنتجات. تقوم الدراسة بتقييم إمكانات الذكاء الاصطناعي (AI) في توليد صور بصرية جديدة وحقيقية تدمج العناصر التقليدية مع الجماليات الحديثة بسلاسة.

الكلمات المفتاحية

الذكاء الاصطناعي، الصور المولدة بواسطة الذكاء الاصطناعي، التراث النوبي، الثقافة، ليوناردو الذكاء الاصطناعي.

1. Introduction

The fusion of artificial intelligence (AI) and art has led to significant progress, transforming creative processes and expanding the capacity of artistic expression. This study delves into the potential of AI-generated images as an inventive medium for reinterpreting the artistic tradition of Nubian visual culture. Examining patterns and searching for novel concepts have led to an increasing fascination with integrating conventional designs with innovative technology in contemporary textile, fashion design, and products. The study evaluates the potential of artificial intelligence (AI) in generating novel and genuine visual depictions that seamlessly merge traditional elements with modern aesthetics. This paper will focus on Nubian visual culture, distinguished by its vivid colour, elaborate patterns, symbolic motifs, and various crafts. It delves into the potential of artificial intelligence (AI) in generating modern designs that capture the essence of Nubian visual heritage while upholding its cultural genuineness and unlocking novel creative horizons. Three experimental methodologies were employed to explore the capabilities of AI-generated visuals by utilising the Leonardo AI application to reinterpret the traditional culture. These methods include heritage-informed design, the impact of AI on established artistic forms, and contemporary design applications.

2. Artificial Intelligence (AI) for Art & Design

Integrating artificial intelligence (AI) into creative domains is increasingly recognised as a powerful tool and invaluable resource for designers and artists, albeit requiring substantial technical proficiency. This paper suggests that AI enhances existing artistic capabilities and expands the boundaries of creativity. Through AI algorithms, artists and designers can be inspired to identify patterns and trends, thereby exploring innovative, creative styles and methodologies previously inaccessible through conventional approaches. This collaboration between humans and machines fosters ideas. This collaboration between humans and machines fosters ideas and expands the boundaries of creative expression. Mojahedur (2024) discusses that AI is not a "replacement for human creativity"; however, it can be considered a powerful tool that can "enhance and expand the authors' understanding of art" and design, it also can open new potential "for artistic expression and push the boundaries of human creativity". His research declares that AI-generated art indicates technical skill and shows "creative potential, often surpassing human expectations" (Mojahedur, 2024). He adds that in the future, for creative trade or industries, there

is a need for the association between machines and humans to promote creativity and artistic expression. The synthesis of human creativity and artificial intelligence (AI) is expanding the boundaries of artistic expression, but it also presents complex challenges in the **rule** of intellectual property (IP). Anuttama et al. (2024) reveals the complicated engagement between humans and advanced algorithms, offering a new fresh perspective on the creative process. The connection of AI and creativity raises central questions about copyright, challenging traditional notions of authorship and infringement. As AI-generated art becomes increasingly prevalent globally, the study calls for a unified framework to address the legal complexities and ensure ethical considerations in this evolving view of creative technology (Anuttama et al., 2024). While artificial intelligence (AI) shows extraordinary potential in processing substantial amounts of data and achieving impressive balancing in intellectual rule, its limitations in areas requiring human judgment and creativity are essential. Elere et al. (2024) highlight these contrasting conditions. AI excels at analysing vast digital resources and providing efficient search results. They also present research demonstrating AI's shortcomings in areas like artistic evaluation. However, they add that AI attempts to precisely predict whether individuals who use AI in their artwork will achieve better results than those relying on their experience. This raise concerns as AI's use in determining people's futures is becoming increasingly prevalent despite its inherent limitations. While AI can be a powerful tool, its limitations should be recognised and addressed, especially in areas where human judgment and creativity are paramount, (Elere et al., 2024). Youjiang et al. (2024) highlights concern about image quality, cost, and copyright issues. They suggest that AI tools can enable individuals without classical expertise to engage in creative processes, but these benefits must be considered alongside the ongoing challenges in these areas. They also suggest that AI tools have the potential to standardise certain aspects of creative work, but this trend also raises questions about the future of artistic uniqueness and originality, (Youjiang et al., 2024). Text-to-image generation systems constructed on deep generative models have become popular art creation tools; set a prompt in standard language. These reproductive systems can create digital images or designs with high aesthetic quality, (Oppenlaender, 2022). Text-to-image generation applications are now available as open source. Oppenlaender (2022) explains that “Google’s Colaboratory1 (Colab)”, specifically, is an “online service” that contributes to the growth and “popularity of text-to-image generation due to Colab allowing execution of Python-based code free of charge”. Colab has become one of the core innovation resources in the passionate text-to-image art society

(Oppenlaender2022). This research will utilise image-to-text conversion to investigate the impact on artistic quality and identity in design and product applications. The study will use Leonardo AI to generate diverse types of images from Nubian heritage to provide a rich foundation for exploration.

3. Nubian visual culture

Nubia is “an ancient land stretching from the first cataract of the river Nile in Egypt to a less distinct boundary in the south, typically considered the fourth cataract” in Sudan to the south (Shinnie, 1996). The long history of Nubia from prehistoric times to today spawned a rich tangible and intangible cultural heritage that embodied Nubians’ way of life and traditions. However, most of this area was flooded due to the construction of the Aswan High Dam. In 1963, Egyptian Nubians were relocated to new areas and lands in Kom Ombo after the construction of Lake Nasser (Fernea and Gerster, 1973: 3). Nubian visual culture is known for its vibrant and intricate designs, often featuring geometric patterns, symbolic motifs, and figurative representations. These designs are deeply rooted in Nubian cultural practices and beliefs. It includes many crafts, objects of use, and pleasure—woven baskets, mats and house drawings. The craftswomen believed in their work's quality and the pleasure it created in everyday interaction. The researcher attempts to revive her Nubian heritage using Artificial Intelligence (Leonardo AI) by creating a contemporary interpretation of the patterns and symbols and introducing different contemporary products and designs to inspire Nubian craftswomen and young generations of entrepreneurs and designers.

4. Unlocking the language of Nubian images through Leonardo AI

Three experimental approaches were used to investigate the possibilities of Leonardo's image-to-text technology in creating modern designs and patterns. These approaches were divided into three categories: Heritage-informed design, AI's influence on existing artistic expressions, and contemporary design applications. The most powerful aspect of these experiments lies in carefully selecting images and effectively controlling Image Guidance parameters: Style Reference, Character Reference, Style Reference, and Content Reference, and also choosing one of the following presets Leonardo Kino X, Stock Photo, Concept Art, or Graphic Design based on the desired effects. Then, provide a detailed writing prompt to describe the desired outcome. This will help achieve unique and artistic results.

Heritage-informed design: Imagery from Nubian visual culture, including jewellery, baskets, hand fan, beads, houses, and served as a foundational dataset. This experiment aimed to assess the application's capacity to capture and reinterpret cultural heritage, creating balanced designs that preserve the essence of Nubian aesthetics to a certain extent.



1A



1B



1C



1D



1E



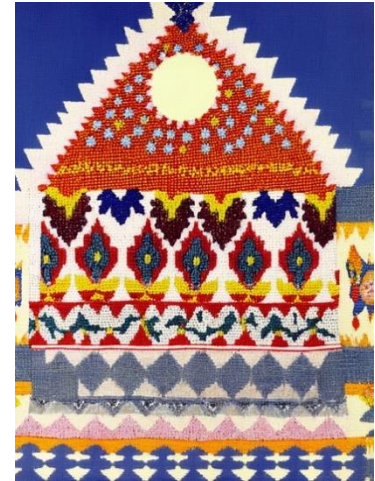
1F



1G



1H



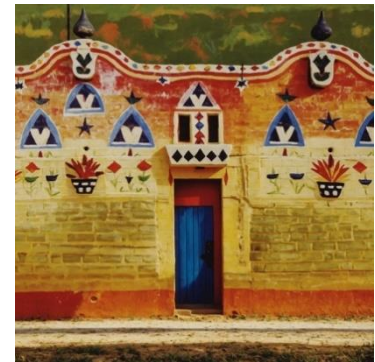
1I



1J



1k



1L

Table 1: Exploring Nubian images using AI.

The crucial elements of the table are aimed at augmenting photographs while preserving the authentic essence of Nubian patterns and artistic features through the meticulous arrangement of the prompt and selection of appropriate references. The models incorporated original photographs as content references, integrating them with images depicting Nubian embellishments and various textures sourced from Nubian crafts or dwellings to function as references for style and character. Examples of a **prompt in 1I, 1J, and 1K**: Develop a generative design algorithm to create a repeating pattern suitable for textile application. Colour palette: Vibrant hues of blue, green, yellow, and red for all elements. Background: Light-coloured base to enhance colour contrast. Embroidery simulation: Generate stitch patterns to mimic hand-embroidery techniques. Ensure seamless tiling of the pattern in both horizontal and vertical directions. Maintain a balanced composition, adhering to the specified layout while optimising visual appeal and aesthetic harmony. However, **the prompt for 1A, 1B, 1C, and 1D** is to design a set of modern accessories

with a specific emphasis on stylish bags that draw inspiration from the detailed patterns and colours in Nubian crafts and architecture. Utilize geometric forms, vivid colours, and customary designs to develop a culturally diverse visual appeal targeted towards modern women. Develop a generative design algorithm to create a pattern suitable for Nubian modern application by prompting E and 1F. Additionally, **prompt** for variables **G and H**: Develop a range of accessories influenced by Nubian artisanry and architectural styles, detailed designs and colour schemes. Deliberate in integrating geometric patterns, lively colours, and customary symbols to establish a contemporary yet culturally profound visual appeal. Finally, the **prompt for 1L** Nubian house: Create an image that depicts a traditional folk-art mural on a beige wall. The layout features a symmetrical design with red, blue, white, and yellow geometric patterns. The top border of the mural is decorated with a repetitive pattern of white triangular shapes resembling trees. The overall style is vibrant and colourful, emphasising symmetry and traditional motifs. The experiments' outcomes were both stimulating and distinctive, capturing the essence and defining look of the visuals while incorporating captivating textures and varied artistic elements. This search for texture was demonstrated in some of the pictures, for example, through 1A & 1B Nubian jewellery, which is a source of inspiration for Nubian women in their needlework and woven basket activities. The baskets in 1C, 1D and the plastic ornaments in 1I basket plate 1E evolved into more modern and commercially appealing versions of the original visuals due to the surface textures and colour schemes. Nevertheless, 1F, 1G, and 1H still maintain the original visual characteristics of the traditional crafts. Lastly, 1J, 1K, and 1L represent the culmination of this experimentation with innovative re-interpretation preserving Nubian architectural and motif symbolism.

AI influence on existing artistic expressions: A collection of the researcher's previous artworks was subjected to the image-to-text process. This methodology enabled an evaluation of the technology's influence on the aesthetic quality of existing artistic expressions.



2A



2B



2C



2D



2E



2F

Table 2: Studying the aesthetic quality of existing artistic expressions using AI.

To accomplish the primary objectives outlined in this table, the focus is exploring novel adaptations and manifestations of the preceding researcher's artistic creations while upholding its inherent style. Consequently, suitable visual representations were chosen to guide by using the given prompt. Within these frameworks, authentic photographs of the researcher's artworks were utilized as content reference points. A selection of artwork was presented to the AI to ascertain the comparative writing capabilities between Leonardo AI and ChatGPT. This particular **prompt** was then utilized for tasks **2A and 2E**, which involved the "analysis of the provided cross-sectional image of a layered material. Identify the number of distinct layers, measure their approximate thicknesses, and describe any observable irregularities or features at the layer interfaces". Quantify the degree of layer uniformity and suggest potential methods to characterize the material

composition and properties furtherly. However, the **2B and 2C** prompts focused on designing a contemporary wall hanging. The collection should incorporate the Nubian landscape, the Nile elements, and triangular and zigzag shapes. Enhance the designs with Nubian motifs, seamlessly blending vibrant colours and geometric patterns. The overall aesthetic should be a modern interpretation of traditional Nubian wall hanging. The **prompt for 2D**: Design a striking rectangle wall hanging for an interior Nubian house featuring a dynamic composition of interlocking triangles and circular woven basket motifs. Seamlessly integrate vibrant, contemporary colours with classic Nubian geometric patterns to create a modern design. Finally, the **prompt for 2F** was: Develop a generative design algorithm to create a repeating pattern suitable for textile application. Colour palette: Vibrant hues of blue, green, yellow, and red for all elements. Background: Light-coloured base to enhance colour contrast.

These visuals were amalgamated with depictions of Nubian embellishments and various patterns derived from Nubian handicrafts or visual culture to serve as sources of inspiration for style and character. The outcome of this phase yielded captivating results and introduced an additional layer of aesthetic appeal to the original pieces. Most artworks underwent significant transformations, manifesting in heightened vibrancy and an enriched textural quality. Nonetheless, artworks labelled 2D and 2A retained the core characteristics of the initial pieces, albeit with some loss of intricate details and alterations in colour palette.

Contemporary design application: The focus shifted towards generating modern designs suitable for accessories, fashion, and wall hangings. The objective was to develop innovative patterns while maintaining a solid connection to the visual identity of Nubian culture.



3A

3B

3C



3D



3E



3F



3G



3H



3I



3J



3K



3L



3M



3N



3O



3P



3Q



3R

Table 3: Contemporary Design Application.

This section focuses on crafting the suitable prompt and meticulously choosing the correct preset while incorporating Nubian visuals like Marwah, beads, and baskets to function as prompts for Character, Style, and Content throughout the design phase.

The prompts are as follows: For image 3A, create a carpet with vibrant and intricate woven textiles featuring a central panel adorned with bold geometric patterns. The panel is divided into three vertical sections, each highlighting a distinct pattern of diamonds, triangles, and squares in various vivid colours, including red, orange, green, blue, and black. A contrasting band of multicoloured stripes separate the sections.

For image 3B: Create a wall hanging, carpet, and chairs for the interior with ethnic Nubian motifs inspired by vibrant and intricate textile artwork. The patterns are composed of bold, contrasting colours, creating a visually striking composition. The overall style blends traditional and contemporary aesthetics with a modern interpretation.

3C & 3D: Design a striking rectangle wall hanging and chairs for an interior Nubian house featuring a dynamic composition of interlocking triangles and circular woven basket motifs. Seamlessly integrate vibrant, contemporary colours with classic Nubian geometric patterns to create modern design house Nubian-inspired interior aesthetics.

The prompt for 3E & 3F: Create a contemporary, textural wall hanging incorporating triangular and zigzag woven basket elements. Enhance the design with beads and Nubian-inspired motifs, seamlessly blending vibrant colours and geometric patterns. The final piece should evoke a modern interpretation of Nubian cultural aesthetics.

The prompt in 3G & 3K: Create fashionable long dresses for modest Nubian women wearing long layers with ethnic Nubian motifs, geometric patterns and textures of basket inspired by vibrant and intricate textile artwork. The patterns are composed of bold, contrasting colours, creating a visually striking composition. The overall style blends traditional and contemporary aesthetics of traditional ancient textiles with a modern interpretation. However,

the prompt for 3H, 3J & 3L: Design a contemporary fashion collection for a Nubian women's fashion show. The collection should feature modest dresses incorporating textural elements, triangular and zigzag shapes, and patterns inspired by woven baskets. Enhance the designs with beads and Nubian motifs, seamlessly blending vibrant colours and geometric patterns. The overall aesthetic should be a modern interpretation of traditional Nubian dress. Furthermore, **the prompt for 3I is to** create a fashionable girl in a modern, modest style with a triangle geometric pattern and layers of dress in a luxurious setting. The girl wears a colourful gold gown with Nubian patterns and rich textures. **The prompt for 3M, 3O, 3N:** Create modern Nubian bags with accessories, focusing on fashionable bags inspired by the intricate patterns and colours found in Nubian crafts and architecture. Incorporate geometric shapes, vibrant hues, and traditional motifs to create a culturally rich aesthetic for contemporary women. Finally, **the prompt for 3P, 3Q, and 3R:** Create a fashionable and ethnic style long dress with jewellery beads and woven baskets, with layers of hot golden yellow and blue colours. It was a remarkable opportunity to observe Nubian patterns and decorations across various functions and implementations using Leonardo AI. The outcomes highlighted the geomatic motifs and textures inspired by Nubian woven baskets and Marwaha. The products' colour palette was also vibrant and aligned with Nubian colour schemes, incorporating a contemporary flair. The final products encompassed various items, including wall hangings, carpets, accessories, bags, and garments, combining elements of ethnic tradition with

modern interpretations. This fusion of styles presents new avenues for designers and Nubian craftswomen to explore utilizing Leonardo AI and other tools in forthcoming endeavours. From 3A to 3F (as shown in Table 3), a contemporary innovative interpretation of well-designed products to decorate the internal spaces of a modern Nubian house, such as wall hanging and carpet with traditional patterns such as trainable, rectangle, zigzag, and circle (to present woven basket). Despite significant changes from the original traditional object, the colour, textures, and mathematical design still reflect the essence of Nubian visual culture. Fashion design was demonstrated in cells 3G-3L, which typically employ geometrical shapes in varied interpretations and sizes to create contemporary clothes. Most of these sets use red, blue, and orange colours with weaving baskets or Marwaha(fans) textures. Cells 3M to 3K showcase contemporary and distinctive bags and accessories with solid connections to Nubian traditional elements such as textures, vibrant colours, and repetitive geometric designs. Finally, AI can provide a limitless number of ideas and an array of modern and contemporary designs that may be used for a variety of reasons, assisting designers and craftswomen in developing their designs and products; nevertheless, additional control is required to ensure that the designs are tied to the original culture.

5. Conclusion

AI applications represent a significant frontier in the advancement of Nubian artistic expression. Using generative AI, novel and innovative forms of visual representation can be created, potentially transcending current aesthetic standards. However, designers and artists must maintain work over AI applications. This involves carefully selecting source images, effectively utilizing image guidance parameters within platforms such as Leonardo and striking a delicate balance between innovation and cultural heritage. It is crucial to emphasise that novelty should not replace tradition. Designers must remain committed to preserving their cultural legacy while embracing the principles inherent in AI technology. This development shows the dynamism of human artistic creation and digital operations and establishes new avenues for art production. By carefully applying AI image guidance, meticulously selecting source images, and crafting appropriate prompts, designers can generate synthetic images that align with this evolutionary trend. This approach facilitates the harmonious integration of traditional Nubian artists and designers with innovative technological advancements, potentially leading to a revival in artistic expression that distinguishes the past while embracing the future. In conclusion, the intersection of AI and Nubian

art presents challenges and opportunities. As this field continues to evolve, it will be essential for artists, designers, and scholars to engage in ongoing dialogue and critical reflection to ensure that technological advancements serve to enrich, rather than diminish, the rich cultural heritage of Nubian artistic traditions.

6. Recommendation

- Fusion of Traditional and Contemporary Techniques by exploring the use of generative AI application to produce works of art inspired by Nubian cultural heritage, generating new interpretations to improve the protection, accessibility, and appreciation of Nubian art.
- Support Nubian artists and designers to apply AI tools to blend traditional techniques with modern methods, creating innovative and dynamic art forms. This fusion can lead to unique expressions that echo the evolving identity of Nubia.
- Apply AI-driven educational plans to improve AI knowledge among Nubian communities, safeguarding that they are equipped to participate in the development and preservation of their cultural heritage.

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