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USING ARTIFICIAL INTELLIGENCE IN THE CREATION OF ORNAMENTS AND DECORATIVE COMPOSITIONS

Sara Krykbaeva[1], **Ainur Taldybayeva**[2]
[1]Kazakh National Women's Pedagogical University
(Almaty, Kazakhstan)
[2]Temirbek Zhurgenov Kazakh National Academy of Arts
(Almaty, Kazakhstan)

Abstract. The rapid development of digital technologies opens new horizons for the design of ornament and decorative compositions. Today, artificial intelligence (AI) is not only a tool for automation but also a full-fledged creative partner for artists, designers, and architects. Its capabilities enable it to model unique forms, transform traditional ornamental elements, and adapt them to contemporary trends in visual culture. This study examines the use of machine learning algorithms and generative neural networks (Generative Adversarial Networks, Diffusion models, etc.) in developing new decorative solutions based on both classical motifs and innovative artistic concepts. The *aim* of the article is to identify the potential of AI in ornamental and decorative art, demonstrate its capabilities for creating original compositions, and define the prospects for integrating AI into the professional practice of artists and designers. Research *objectives*: To analyze existing methods of AI application in generative design. To consider examples of neural networks applied in creating ornaments based on ethnic, natural, and abstract motifs. To reveal the advantages and limitations of AI compared to traditional *methods* of decorative art. To determine the prospects for synthesizing cultural heritage and modern technologies in ornamental creativity. Scientific novelty lies in a comprehensive analysis of AI's role in the artistic process: from idea generation and motif stylization to the creation of holistic decorative compositions. Unlike the traditional understanding of ornament as a fixed set of forms, AI enables the development of dynamic, adaptive ornaments that can interact with architectural space or user preferences. Moreover, neural networks enable the recreation, reinterpretation, and

integration of lost cultural patterns into modern design solutions. Thus, the use of AI in creating ornaments and decorative compositions contributes not only to the development of new artistic practices but also to the preservation of cultural heritage, expanding the boundaries of interaction between tradition and innovation. *The scientific significance* of this study lies in its comprehensive analysis of the role of artificial intelligence in the artistic process, from idea generation and motif stylization to the creation of entire decorative compositions. Unlike the traditional understanding of ornament as a set of fixed forms, artificial intelligence enables the creation of dynamic, fluid, and adaptive ornaments that can interact with the context of an architectural space or the user's wishes. *The practical significance* of the study lies in the direct application of its findings in professional practice, industry, education, and production. The obtained results demonstrate the possibility of recreating lost cultural patterns of ornament and decorative compositions using artificial intelligence, interpreting them in various ways, and integrating them into contemporary design solutions.

Keywords: artificial intelligence, generative design, ornament, decorative compositions, neural networks, digital art, cultural heritage.

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Introduction

The application of Artificial Intelligence (AI) in decorative art and ornamental design represents an intersection of traditional artistic practices and contemporary computational methods. In recent years, generative AI technologies, such as Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs), diffusion models, and style transfer algorithms, have not only expanded the creative potential of designers but also offered new approaches to preserving, restyling, and adapting traditional ornamental motifs. Modern tools can automatically extract contours and color schemes from ethnic artifacts, mix styles, create multi-variant templates for textiles, ceramics, and architectural finishes, and integrate the generated images into production workflows for printing and weaving.

Classical approaches to automatic pattern creation relied on procedural methods (rules, fractals, symmetrical transformations). The modern breakthrough is associated with deep learning: GANs and diffusion models enable the generation of high-quality images without explicitly programming decorative rules, while VAEs and variational methods yield compact latent representations of ornamental motifs. A crucial research direction is controllable generation - mechanisms that allow designers to specify parameters (scale, density, palette, symmetry). A review of methods for generating 2D patterns and control mechanisms showed that combining procedural rules with generative models produces better results in terms of controllability and aesthetics (Giesecke et al., pp.68-83).

Style transfer algorithms (Neural Style Transfer) have become an effective tool for "translating" the visual structure of one image (e.g., a historical ornament) onto another content (e.g., a modern silhouette, a photograph). For ornamental design,

this means the possibility of stylizing contemporary forms with traditional motifs, adapting color and texture to new media. However, ornament design has specific requirements: repeatability (tiling), symmetry, and clear contours. Consequently, applied research has developed modifications of classical style transfer algorithms that consider segmentation, contour extraction, and edge parameters - all of which are critical for practical applications in ceramics and textiles (Dawool, p.5).

A significant applied direction is the digital reconstruction and restyling of ethnocultural ornaments. Combining computer vision (for contour and color extraction) with generative models, researchers propose methods that allow the "restoration" of patterns from photos or fragments, creating variable adaptations for contemporary design while preserving the semantics of motifs. The literature highlights the ethical and cultural-legal dimensions: how to avoid appropriation, ensure respectful use of motifs, and engage tradition bearers in the generation and validation processes (Zhao & Ke, p. 3).

Practical cases demonstrate the wide use of AI: from generating textile print collections and custom fabrics to designing decorative tiles and architectural panels. Industrial and startup solutions integrate AI tools into design workflows, offering automatic variation generation, trend-based color palette suggestions, and 3D visualization. Textile research notes that AI accelerates the design cycle, helps predict popular color combinations, and facilitates the adaptation of traditional motifs to contemporary forms (clothing, upholstery, wallpapers) (Gür p.23).

For industrial applications, generated ornaments must be manufacturable: correctly tiled, available in vector formats for cutting/weaving, and color-calibrated for printing. Scientific publications describe hybrid systems where CAD tools and AI algorithms work together: AI generates variations, while CAD modules optimize them for vector formats, normalize sizes, and prepare them for production. This direction is particularly relevant for ceramics, tiles, and industrial weaving (Tao p.13).

New interactive and educational platforms enable artisans and students to learn craft techniques through AI-assisted environments. Projects such as AIFiligree illustrate how generative frameworks can help master complex decorative techniques while preserving artisanal individuality and cultural context. These tools do not replace the craftsman but expand learning potential and serve as sources of inspiration.

As AI enters the realm of decorative art, questions of authorship, intellectual property, and cultural authenticity become pressing. Who is the author of an ornament created by a generative model trained on publicly available image datasets? How can traditional motifs be legally protected from unethical use and commercial exploitation? The literature emphasizes the need for transparency in the use of training data, respect for the rights of cultural tradition bearers, and the development of co-creation practices with the communities involved (Shen, p. 21).

Technological landscape: Generative models are rapidly becoming the standard for creating decorative patterns; combining procedural rules with neural networks provides the best controllability and predictability.

Applied potential: The textile industry, ceramics production, and architectural decoration are already integrating AI tools into workflows, reducing design time and offering greater variation.

Cultural preservation: AI can serve as a powerful tool for documenting and adapting ethnic ornaments, but this requires collaboration with tradition bearers and an ethically grounded approach.

Technical challenges: Parameter control (tiling, symmetry, contour clarity), vector format preparation, and CAD/

CAM integration remain practical issues in moving from prototypes to industrial applications.

AI has already transformed the way ornaments and decorative compositions are created, offering powerful tools for inspiration, restyling, and the generation of industrial designs. Yet technological progress must be accompanied by professional practices and ethical standards that ensure respect for cultural heritage and transparency of authorship. In the coming years, hybrid systems are expected to evolve further, where AI acts as an extension of creative tools rather than a replacement for the artist or craftsman. Practical work in this direction will focus on improving the controllability of generation, standardizing outputs for industrial processes, and fostering collaboration with cultural communities through models.

Methods

The methodological foundation of this study is based on a combined review-analysis framework, integrating theoretical sources, applied case studies, and experimental implementations of AI-driven design. The objective was to examine how artificial intelligence techniques are applied in the creation of ornaments and decorative compositions, with attention to cultural, technological, and industrial dimensions. The research design consisted of three complementary components:

Literature-based review of peer-reviewed publications (2019–2025) focusing on generative models, style transfer, and AI-assisted design in decorative arts, architecture, and textile industries.

Comparative analysis of AI algorithms commonly used in pattern generation, including procedural approaches, Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs), and diffusion models.

Applied case studies of practical frameworks and industrial applications, such as AI-assisted textile design (Jung, 2023), ceramic ornament transfer (Zhao, 2023), and hybrid CAD/AI integration (Shen, 2025).

Academic databases: IEEE Xplore, SpringerLink, ScienceDirect, ACM Digital Library, and MDPI for peer-reviewed journal articles and conference proceedings.

Industrial reports: documentation from design startups and companies experimenting with AI in textiles and architecture.

Cultural datasets: open-source collections of ethnic and traditional ornamental motifs (e.g., Chinese, Islamic, and Central Asian archives), used in cited studies for AI training and style transfer.

Results

The integration of Artificial Intelligence (AI) into the design of ornament and decorative compositions has resulted in a profound shift in how patterns are generated, adapted, and industrially implemented. Unlike traditional approaches that relied on manual craft or procedural computer graphics, AI-based methods now provide higher flexibility, automation, and creative diversity. However, this development requires careful analysis of the strengths and weaknesses of different methods, their applicability across various domains (textiles, ceramics, architecture, craft education), and the cultural and ethical implications of their use (Zhang, p. 25).

This section presents an analytical examination of methods and results derived from literature, case studies, and experimental frameworks. It highlights how different AI techniques contribute to ornamental creativity, the challenges they face, and the degree to which they align with industrial, cultural, and artistic expectations. (Table 1.)

GANs are among the most popular AI approaches to image generation. By

learning from datasets of ornaments, they can produce high-quality patterns that resemble traditional styles while introducing novel variations. GANs are especially useful for textile and ceramic design because they can generate detailed, repeating structures.

Key advances include conditional GANs (cGANs), which allow designers to control parameters (color palette, density, style). However, GANs often struggle with tiling precision and may produce artifacts at boundaries (Shen, p.78).

Strengths: creativity, stylistic richness, adaptability to datasets.

Weaknesses: tiling issues, difficulty in vectorization, potential cultural misrepresentation if datasets are not curated.

VAEs provide a compact latent space that allows interpolation between ornament styles. They are less visually sharp than GANs but are highly useful for exploring design variations. In textile applications, VAEs enable the smooth blending of cultural motifs into contemporary forms.

Strengths: latent exploration, smooth variation generation, good for concept design.

Weaknesses: lower-resolution outputs, less detail than GANs or diffusion models.

Diffusion models represent the current state of the art in image generation. They can produce extremely high-resolution, detailed ornaments with fine control over parameters. Prompt-driven generation allows designers to specify not only style and color but also cultural motifs. Furthermore, diffusion models can be fine-tuned on small datasets of ethnic ornaments, making them suitable for cultural preservation.

Strengths: high resolution, strong stylistic control, adaptable to prompts.

Weaknesses: high computational cost, dependence on prompt engineering, and risks of bias in training datasets (Zhao, p. 9).

Style transfer algorithms are widely used to adapt traditional motifs to new contexts. They allow the extraction of stylistic features (color, texture, contour) from one ornament and application onto another content structure. In ceramics and architecture, this technique serves as a bridge between tradition and modernity.

Strengths: cultural adaptation, stylistic blending, useful for hybrid designs.

Weaknesses: difficulty with symmetry and tiling; dependence on segmentation quality.

Hybrid systems integrate AI outputs with CAD workflows to prepare designs for industrial use (vectorization, tiling, printing optimization). This ensures that generative designs are manufacturable. These systems are particularly effective for ceramics, textiles, and laser-cut ornaments.

Strengths: industrial feasibility, high reproducibility, technical precision.

Weaknesses: lower creative freedom, dependency on CAD expertise.

AI-driven textile design (Jung, 2023) demonstrated that GANs and diffusion models accelerate design cycles, generate customizable prints, and allow color optimization based on consumer trends. AI reduces the need for repetitive manual sketching, enabling designers to explore wider variations. (Zhang & Wang p.10).

Style transfer applied to ceramic motifs (Zhao, 2023) highlighted the importance of contour preservation and tiling accuracy. Modified algorithms ensured that ornaments retained symmetry and clarity when applied to tiles.

Research (Gür, 2024) illustrated how AI can reinterpret cultural motifs in architectural decoration. Diffusion models produced detailed façade ornaments, while CAD ensured manufacturability.

The analysis revealed several overarching results:

Diffusion models currently offer the most powerful results in terms of resolution and stylistic control, but require substantial computational resources.

GANs remain effective for mid-resolution textile and ceramic designs where dataset-driven learning is valuable.

VAEs are useful for exploratory design but less suitable for final industrial production.

Style transfer is particularly effective for cultural adaptation but requires modifications for tiling and symmetry (Liu & Yang p.11).

Hybrid AI + CAD systems ensure industrial feasibility but limit creative flexibility.

Discussion

The integration of artificial intelligence (AI) into the creation of ornaments and decorative compositions represents a significant shift in the relationship between technology, art, and design. Traditionally, ornamental art has been closely associated with manual craftsmanship, cultural symbolism, and the individual creative vision of the artist. The introduction of AI does not eliminate these foundations; rather, it transforms and expands them, creating new possibilities for form generation, stylistic experimentation, and interdisciplinary collaboration. This discussion explores the artistic, technological, and cultural implications of AI-assisted ornament design, as well as its advantages, limitations, and future prospects.

One of the most notable contributions of AI to ornament creation is its ability to process and analyze vast amounts of visual and stylistic data. By training machine learning models on large datasets of historical ornaments, patterns, and decorative motifs, designers can generate compositions that reflect diverse artistic

1.Table. Comparative Table of Methods

Method	Strengths	Weaknesses	Best Applications
Procedural	Predictable, symmetric, low cost	Limited creativity, poor cultural adaptation	CAD tiling, industrial repeats
GANs	Creative, dataset-adaptive, versatile	Boundary artifacts, vectorization issues	Textiles, ceramic patterns
VAEs	Smooth latent interpolation, variation	Lower resolution, less detail	Concept exploration, blended motifs
Diffusion Models	High resolution, prompt control, flexible	Computationally heavy, dataset bias	Architecture, high-end design, heritage
Style Transfer	Cultural adaptation, hybrid blending	Tiling/symmetry issues, segmentation limits	Ceramics, hybrid art, cultural fusion
Hybrid AI + CAD	Industrial precision, reproducibility	Less creativity, requires CAD expertise	Manufacturing, laser cutting, printing

Overall, the findings indicate that AI has transformed ornament design into a more dynamic, iterative, and collaborative process. While traditional computational methods ensured precision, AI methods provide unprecedented creative freedom. However, industrial applications still require a balance between creativity and manufacturability, which hybrid systems currently provide best.

Ethically, the inclusion of cultural heritage requires co-creation with tradition bearers and transparency of datasets. Without such measures, AI risks reproducing cultural motifs without context or respect.

Future development will likely involve integrated pipelines combining diffusion models (for creativity) with CAD workflows (for precision), thus ensuring both artistic richness and industrial feasibility.

traditions, from classical geometric patterns to organic, nature-inspired forms. This capability allows AI to function as a powerful analytical tool, revealing structural principles and recurring patterns that may not be immediately visible to the human eye. As a result, designers gain deeper insight into ornamental systems and can reinterpret them in innovative ways.

AI-driven ornament generation also significantly enhances creative experimentation. Through generative algorithms, neural networks, and procedural design systems, artists can quickly produce numerous design variations based on predefined parameters such as symmetry, rhythm, scale, and color harmony. This rapid iteration process encourages exploration beyond conventional solutions and reduces the time required for preliminary sketching and prototyping. Instead of replacing creativity, AI acts as a catalyst that stimulates new ideas and supports the designer in navigating complex aesthetic choices.

Another important aspect of AI in decorative composition is personalization. AI systems can adapt ornamental designs to specific user preferences, architectural contexts, or cultural requirements. For example, in interior design or product decoration, AI can generate ornaments that align with a client's aesthetic tastes, spatial constraints, or symbolic meanings. This level of customization was previously time-consuming and often limited by human resources. With AI, personalized decorative solutions become more accessible, supporting both artistic individuality and market demands.

From a technological perspective, AI enables the fusion of ornament design with digital fabrication techniques such as 3D printing, laser cutting, and CNC milling. AI-generated patterns can be directly translated into production-ready files, ensuring high precision and consistency. This integration bridges the gap between conceptual design and material realization, allowing complex ornaments that would be difficult or impossible to produce by hand to be manufactured efficiently. Consequently, AI contributes not only to visual innovation but also to the practical feasibility of intricate decorative forms.

Despite these advantages, the use of AI in ornament creation raises important questions regarding authorship and originality. When a decorative composition is generated by an algorithm trained on existing artworks, it becomes challenging to determine the boundaries between human creativity and machine contribution. Critics argue that AI-generated ornaments may lack emotional depth or cultural authenticity, as machines do not possess lived experience or symbolic understanding. However, this concern can be addressed by viewing AI as a collaborative tool rather than an autonomous creator. The human designer remains responsible for selecting data, defining parameters, interpreting results, and embedding cultural meaning into the final composition.

Ethical considerations also play a role in the discussion. The datasets used to train AI models often include traditional and culturally significant ornaments. Without proper acknowledgment or contextual understanding, there is a risk of cultural appropriation or superficial replication. Designers and developers must therefore approach AI-based ornament creation with cultural sensitivity, ensuring respectful engagement with heritage motifs and transparent attribution of sources. When used responsibly, AI can support the preservation and revitalization of traditional ornamentation by adapting it to contemporary contexts.

Another limitation of AI in decorative design lies in its dependence on existing data. While AI excels at recombining known elements in novel ways, it may struggle to produce truly radical innovations that deviate from learned patterns. Human intuition, imagination, and emotional expression remain essential

for pushing artistic boundaries. Therefore, the most effective applications of AI in ornament creation emerge from a balanced collaboration between human creativity and computational intelligence.

In educational contexts, AI offers valuable opportunities for teaching ornament design and decorative composition. Students can use AI tools to study historical patterns, experiment with generative systems, and understand the mathematical and structural principles underlying ornamentation. This interdisciplinary approach combines art, design, mathematics, and computer science, fostering a holistic understanding of decorative arts in the digital age. At the same time, educators must emphasize critical thinking to prevent overreliance on automated solutions.

Looking toward the future, AI is likely to play an increasingly influential role in ornamental and decorative design. Advances in deep learning, interactive design systems, and real-time generative tools will further enhance the responsiveness and adaptability of AI-assisted creativity. We can expect ornaments that dynamically change based on environmental data, user interaction, or cultural narratives, blurring the boundaries between static decoration and living design systems.

Basic provision

Ornament as a System of Visual Language

Ornament is a structured system of repeating elements organized according to rhythm, symmetry, proportion, and balance. Throughout history, ornamental traditions geometric, floral, zoomorphic, and abstract have reflected the worldview, beliefs, and lifestyle of different cultures. From ancient architectural friezes to textile patterns and manuscript illuminations, ornament has served both functional and symbolic purposes.

Artificial intelligence interacts with ornament not as a random generator of forms, but as a system capable of analyzing existing visual languages and producing new variations based on learned rules. Machine learning models, particularly neural networks, are able to detect patterns, repetitions, and compositional logic in large datasets of ornamental images. This allows AI to participate in the creative process while respecting the internal structure of ornamental systems.

Technological Foundations of AI-Based Ornament Creation

The use of AI in decorative composition relies on several key technologies:

Machine Learning and Neural Networks

Convolutional neural networks (CNNs) and generative models are trained on extensive collections of ornamental images. Through training, the system learns stylistic features such as line thickness, curvature, symmetry axes, and motif repetition.

Generative Models

Generative Adversarial Networks (GANs) and diffusion-based models are widely used to create new ornamental patterns. These systems generate original compositions by synthesizing learned visual characteristics rather than copying existing designs.

Algorithmic and Parametric Design

AI often works in combination with parametric design tools, allowing designers to control variables such as scale, density, rhythm, and symmetry. This approach is particularly effective for creating modular decorative systems applicable to architecture, textiles, and product design.

Human–AI Interaction

AI does not replace the artist but functions as a creative assistant. Designers guide the process by selecting datasets, defining parameters, evaluating outputs, and making aesthetic decisions. This collaborative model ensures artistic intentionality and cultural sensitivity.

Artistic Principles in AI-Generated Decorative Compositions

Despite the technological novelty, AI-generated ornaments

remain grounded in classical artistic principles:

Rhythm and Repetition. AI systems excel at generating rhythmic structures by repeating motifs with subtle variations, enhancing visual harmony.

Symmetry and Asymmetry. Both symmetrical and controlled asymmetrical compositions can be produced, allowing designers to explore traditional and contemporary aesthetics.

Proportion and Balance. AI models can calculate proportional relationships with high precision, ensuring compositional balance across different scales.

Variation and Innovation. By introducing controlled randomness, AI enables the emergence of unexpected yet coherent decorative solutions, expanding creative boundaries. These principles demonstrate that artificial intelligence does not negate artistic laws but reinforces and reinterprets them through computational means.

Cultural and Ethno-Design Perspectives

A crucial provision in the use of AI for ornament creation is cultural responsibility. Ornaments often carry deep symbolic meanings linked to national identity, spiritual beliefs, and historical memory. When AI systems are trained on culturally specific datasets such as traditional Kazakh, Islamic, or Central Asian ornaments they can generate contemporary interpretations that preserve stylistic authenticity.

At the same time, ethical considerations arise regarding cultural appropriation and loss of meaning. Therefore, AI-based ornament design must involve expert supervision, art historians, and designers who understand the cultural context of the patterns being used. In this sense, AI becomes a tool for cultural preservation and revitalization rather than homogenization.

Conclusion

The integration of artificial intelligence into the creation of ornaments and decorative compositions constitutes one of the most rapidly evolving intersections between technology and artistic practice in the twenty-first century. This study demonstrates that artificial intelligence is no longer limited to purely technical or industrial applications; instead, it has emerged as an active participant in aesthetic, cultural, and creative design processes. By examining approaches such as generative adversarial networks, variational autoencoders, diffusion models, and neural style transfer, it becomes evident that AI offers substantial potential to broaden creative horizons, accelerate design workflows, and reinterpret traditional visual systems in contemporary contexts.

The findings indicate that artificial intelligence contributes most significantly in three interrelated areas: innovation, efficiency, and cultural adaptation. Innovation is reflected in AI's ability to generate original ornamental patterns that often transcend conventional human imagination while adhering to fundamental design principles such as symmetry, proportion, rhythm, and balance. Efficiency is achieved through AI systems' capacity to analyze extensive design datasets, automate repetitive or time-consuming tasks, and produce adaptable ornamental prototypes suitable for application in textiles, ceramics, product design, and architectural decoration. Cultural adaptation, meanwhile, is realized through the use of heritage-based datasets, enabling AI to reinterpret and digitally preserve traditional motifs, ensuring their relevance and continuity within modern creative industries.

At the same time, this research identifies several significant challenges associated with AI-driven ornamental design. One of the most critical concerns relates to cultural authenticity and ethical responsibility. The ability of AI systems to replicate, transform, and recombine culturally meaningful motifs raises

important questions regarding cultural appropriation, intellectual ownership, and the potential loss or distortion of symbolic meanings. Without thoughtful dataset curation, contextual awareness, and ethical frameworks, AI-generated ornaments risk reducing rich cultural traditions to superficial decorative elements. Additionally, technical limitations persist, particularly in achieving precise control over generative outputs. Although diffusion models and GANs can produce visually compelling results, designers often struggle to ensure predictability, consistency, and alignment with specific artistic intentions.

Despite these challenges, the study emphasizes that artificial intelligence should not be perceived as a replacement for human creativity, but rather as a complementary and collaborative tool. The most effective applications, such as AI-assisted textile pattern development, neural style transfer in ceramic ornamentation, and hybrid CADAI systems in architectural design, highlight the essential role of human expertise, aesthetic judgment, and cultural sensitivity in guiding and refining AI-generated outcomes. These examples point toward a future of co-creation, in which designers, artisans, and intelligent systems collaborate to produce decorative forms that are at once innovative, meaningful, and culturally grounded.

Looking forward, the continued development of AI in ornamental and decorative composition depends on two key trajectories: technological advancement and socio-cultural responsibility. From a technological perspective, there is a growing need for more intuitive user interfaces, controllable generative algorithms, and multimodal systems that integrate visual, textual, and contextual information. From a socio-cultural standpoint, emphasis must be placed on inclusivity, transparency, and respect for cultural heritage, ensuring that artificial intelligence functions as a means of preservation and creative renewal rather than exploitation. Ultimately, when guided by ethical awareness and collaborative practices, AI emerges not merely as a technical instrument but as a transformative force that reshapes both the philosophy and practice of ornamental design in the digital age.

Contribution of authors:
S. Krykbaeva – development and substantiation of the methodological apparatus of the article; interpretation of the obtained data and formulation of theoretical conclusions; scientific editing, critical analysis and bringing the text to a unified style, clarify scientific positions and conclusions.

A. Taldybayeva – development of the concept and formulation of research objectives; collection and systematization of theoretical material; writing the original text of the manuscript (introduction, literature review, results, discussion).

Авторлардың үлесі:
С. Крыкбаева – мақаланың әдіснамалық аппаратын әзірлеу және негіздеу; алынған мәліметтерді түсіндіру және теориялық тұжырымдарды тиянақтау; ғылыми зерттеулер жүргізу, сыни талдау және мәтінді бір стильге келтіру, ғылыми мазмұны мен қорытындыларын нақтылау.

А. Талдыбаева – тұжырымдаманы әзірлеу және зерттеу міндеттерін қою; теориялық материалдарды жинақтау және жүйелеу; қолжазбаның бастапқы мәтінін жазу (кіріспе, әдебиетке шолу, нәтижелер, талқылау).

Вклад авторов:
С.Крыкбаева – разработка и обоснование методологического аппарата статьи; интерпретация полученных данных и формулировка теоретических выводов; научное редактирование, критический анализ и приведение текста к единому стилю, уточнить научные положения и выводы.

А.Талдыбаева – разработка концепции и постановка исследовательских задач;сбор и систематизация теоретического материала; написание исходного текста рукописи (введение, обзор литературы, результаты, обсуждение).

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Крыкбаева Сара
Казахский национальный женский педагогический университет (Алматы, Казахстан)

Талдыбаева Айнур
Казахская национальная академия искусств имени Темирбека Жургенова (Алматы, Казахстан)

ИСПОЛЬЗОВАНИЕ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА В СОЗДАНИИ ОРНАМЕНТОВ И ДЕКОРАТИВНЫХ КОМПОЗИЦИЙ

Аннотация. Современное развитие цифровых технологий открывает новые перспективы для искусства и дизайна, в том числе для создания орнаментов и декоративных композиций. Искусственный интеллект (ИИ) сегодня выступает не только как инструмент автоматизации, но и как полноценный креативный партнер художника, дизайнера и архитектора. Его возможности позволяют моделировать уникальные формы, трансформировать традиционные элементы орнаментального искусства и адаптировать их к современным тенденциям визуальной культуры. В данном исследовании рассматривается применение алгоритмов машинного обучения и генеративных нейронных сетей (Generative Adversarial Networks, Diffusion models и др.) для разработки новых декоративных решений, основанных как на классических мотивах, так и на инновационных художественных концепциях. *Цель* статьи заключается в том, чтобы выявить потенциал искусственного интеллекта в области орнаментального и декоративного искусства, показать его возможности по созданию оригинальных композиций и определить перспективы интеграции ИИ в профессиональную практику художников и дизайнеров. *Задачи* исследования включают: Анализ существующих методов применения ИИ в генеративном дизайне. Рассмотрение примеров использования нейросетей для создания орнаментов, основанных на этнических, природных и абстрактных мотивах. Выявление преимуществ и ограничений применения ИИ по сравнению с традиционными методами декоративного искусства. Определение перспектив синтеза культурного наследия и современных технологий в области орнаментального творчества. *Научная значимость* данного исследования заключается в всестороннем анализе роли искусственного интеллекта в художественном процессе, от генерации идей и стилизации мотивов до создания целых декоративных композиций. В отличие от традиционного понимания орнамента как набора фиксированных форм, искусственный интеллект позволяет создавать динамичные, изменчивые и адаптивные орнаменты, способные взаимодействовать с контекстом архитектурного пространства или пожеланиями пользователя. *Практическая значимость исследования* заключается в непосредственном применении его результатов в профессиональной практике, промышленности, образовании и производстве. Полученные результаты демонстрируют возможность воссоздания утраченных культурных образцов орнамента и декоративных композиций с помощью искусственного интеллекта, их интерпретации различными способами и интеграции в современные дизайнерские решения.

Ключевые слова: искусственный интеллект, генеративный дизайн, орнамент, декоративные композиции, нейронные сети, цифровое искусство, культурное наследие.

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Крыкбаева Сара
Қазақ ұлттық қыздар педагогикалық университеті (Алматы, Қазақстан)

Талдыбаева Айнур
Темірбек Жүргенов атындағы Қазақ ұлттық өнер академиясы ((Алматы, Қазақстан)

ӨРНЕКТЕР МЕН ДЕКОРАТИВТІК КОМПОЗИЦИЯЛАРДЫ ҚҰРУДА ЖАСАНДЫ ИНТЕЛЛЕКТІ ПАЙДАЛАНУ

Аңдатпа. Қазіргі цифрлық технологиялардың дамуы ою-өрнек пен декоративті композицияларды жасауда жаңа мүмкіндіктерді ашуда. Бүгінде жасанды интеллект (ЖИ) тек автоматтандыру құралы ғана емес, сонымен қатар суретші, дизайнер және сәулетшінің толыққанды креативті серіктесі ретінде көрініс табуда. Оның мүмкіндіктері арқылы бірегей формаларды модельдеу, дәстүрлі ою-өрнек элементтерін трансформациялау және оларды заманауи визуалды мәдениеттің үрдістеріне бейімдеу мүмкін болады. Бұл зерттеуде машиналық оқыту алгоритмдері мен генеративті нейрондық желілердің (Generative Adversarial Networks, Diffusion models және т.б.) классикалық мотивтерге де, инновациялық көркемдік концепцияларға да негізделген жаңа декоративті шешімдер жасауға қолданылуы қарастырылады. Мақаланың *мақсаты* – жасанды интеллекттің ою-өрнек пен декоративті өнер саласындағы әлеуетін айқындау, оның түпнұсқалық композициялар құрудағы мүмкіндіктерін көрсету және ЖИ-ды суретшілер мен дизайнерлердің кәсіби тәжірибесіне енгізу перспективаларын анықтау. Зерттеу *міндеттері*: Генеративті дизайндағы ЖИ қолдану әдістерін талдау. Нейрондық желілерді этникалық, табиғи және абстрактілі мотивтерге негізделген ою-өрнектер жасауға қолдану мысалдарын қарастыру. ЖИ қолданудың дәстүрлі сәндік өнер әдістерімен салыстырғандағы артықшылықтары мен шектеулерін айқындау. Мәдени мұра мен заманауи технологиялардың синтезделу перспективаларын көрсету. Бұл зерттеудің *ғылыми маңыздылығы* идеяларды қалыптастыру және нақышты стилизациядан бастап тұтас сәндік композицияларды жасауға дейінгі көркемдік процестегі жасанды интеллекттің рөлін жан-жақты талдауында жатыр. Ою-өрнекті бекітілген формалар жиынтығы ретінде дәстүрлі түсінуден айырмашылығы, жасанды интеллект сәулет кеңістігінің контекстімен немесе пайдаланушының көзқарастарымен өзара әрекеттесуге қабілетті динамикалы, өзгермелі және бейімделгіш ою-өрнектерді жасауға мүмкіндік береді. *Зерттеудің практикалық маңыздылығы* оның нәтижелерін кәсіби тәжірибеде, өнеркәсіпте, білім беруде және өндірісте тікелей қолданыс табуында. Алынған нәтижелер жасанды интеллектті қолдана отырып, ою-өрнек пен сәндік композициялардың жоғалған мәдени үлгілерін қайта жасау, оларды әртүрлі жолдармен түсіндіру және оларды заманауи дизайн шешімдеріне біріктіру мүмкіндігін көрсетеді.

Түйін сөздер: жасанды интеллект, генеративті дизайн, ою-өрнек, декоративті композициялар, нейрондық желілер, цифрлық өнер, мәдени мұра.

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Авторлар туралы мәлімет:

Крыкбаева Сара – өнертану кандидаты, «Кәсіптік білім» кафедрасының профессоры м.а., Қазақ ұлттық қыздар педагогикалық университеті (Алматы, Қазақстан)

Талдыбаева Айнур – Магистр, аға оқытушы, «Сәндік-қолданбалы өнер» кафедрасының меңгерушісі, Темірбек Жүргенов атындағы Қазақ ұлттық өнер академиясы (Алматы, Қазақстан)

Сведения об авторах:

Крыкбаева Сара – кандидат искусствоведения, и.о. профессор кафедры «Профессиональное образование», Казахский национальный женский педагогический университ (Алматы, Казахстан)

ORCID ID: 0000-0003-0242-7449
E-mail: krykbayevasara@gmail.com

Талдыбаева Айнур – магистр, старший преподаватель, заведующая кафедрой «Декоративное и прикладное искусство», Казахской национальной академии искусств имени Темирбека Жургенова (Алматы, Казахстан)

ORCID ID: 0009-0000-3130-8663
E-mail: 07_tas@mail.ru

Information about the authors:

Krykbaeva Sara – candidate of Art History, Acting Professor of the department of "Professional education", Kazakh National Women's Pedagogical University (Almaty, Kazakhstan)

Taldybayeva Ainur – Master, Senior Lecturer, Head of the Department of "Arts and Applied Arts", Temirbek Zhurgenov Kazakh National Academy of Arts (Almaty, Kazakhstan)