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ANALYSIS OF ARTIFICIAL INTELLIGENCE BASED SYSTEMS FOR AUTOMATED GENERATION OF DIGITAL CONTENT

This paper is aimed at the examination of contemporary challenges related to the integration of generative models API of artificial intelligence (AI) into a unified information system to facilitate the automated generation of digital content. In the context of rapid advancements in AI technologies and the increasing demand for diverse and personalized digital content, the integration of API-based generative models emerges as a crucial driver for progress in this field. The research findings underscore the significance of incorporating API-based generative AI models into a unified system, marking a significant step towards automating the process of digital content creation to meet modern market demands. By streamlining content generation workflows, such integration holds promise for enhancing efficiency and scalability while fostering creativity and innovation. Furthermore, the integration of generative AI models into a unified system presents opportunities for the development of personalized and innovative solutions tailored to the needs and preferences of end-users. This not only enhances user experiences but also enables the creation of content that resonates more effectively with target audiences across various domains. The findings gleaned from our research underscore the importance of integration of API-based generative AI models into a unified framework, representing a monumental stride toward the automation of digital content creation that caters to the exigencies of today's market dynamics. By streamlining content generation workflows and alleviating manual intervention, such integration holds immense promise in enhancing operational efficiency, scalability, and adaptability, while simultaneously nurturing a fertile ground for creativity and innovation to flourish. The further efforts of our research team are committed to the practical implementation of this concept and the exploration of its applicability across diverse domains. By continuing to refine and expand upon this integration, we aim to unlock new possibilities for automated content generation and drive further innovation in the digital content creation landscape.
Keywords: Generative Artificial Intelligence (GAI), digital content, API, information system

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АНАЛІЗ СИСТЕМ НА ОСНОВІ ШТУЧНОГО ІНТЕЛЕКТУ ДЛЯ АВТОМАТИЗОВАНОГО ГЕНЕРУВАННЯ ЦИФРОВОГО КОНТЕНТУ

Стаття спрямована на вивчення сучасних викликів, пов'язаних з інтеграцією API генеративних моделей штучного інтелекту (ШІ) в уніфіковану інформаційну систему для сприяння автоматизованому створенню цифрового контенту. У контексті стрімкого розвитку технологій штучного інтелекту та зростаючого попиту на різноманітний і персоналізований цифровий контент інтеграція генеративних моделей на основі API стає вирішальним рушієм прогресу в цій галузі. Результати дослідження підкреслюють важливість об'єднання генеративних моделей штучного інтелекту на основі API в уніфіковану систему, що є значним кроком у напрямку автоматизації процесу створення цифрового контенту для задоволення сучасних вимог ринку. Завдяки спрощенню робочих процесів створення вмісту така інтеграція обіцяє підвищення ефективності та масштабованості, одночасно сприяючи творчості та інноваціям. Крім того, інтеграція генеративних моделей штучного інтелекту в єдину систему відкриває можливості для розробки персоналізованих та інноваційних рішень, адаптованих до потреб і переваг кінцевих користувачів. Це не тільки покращує взаємодію з користувачами, але й дозволяє створювати контент, який ефективніше взаємодіє з цільовою аудиторією в різних доменах. Висновки, отримані в результаті дослідження, підкреслюють важливість об'єднання генеративних моделей штучного інтелекту на основі API в єдину структуру, що представляє собою важливий крок до автоматизації створення цифрового контенту, який задовольняє потреби сучасної динаміки ринку. Завдяки спрощенню робочих процесів створення контенту така інтеграція має великі перспективи для підвищення операційної ефективності, масштабованості та адаптивності.. Подальші зусилля авторів будуть спрямовані на практичну реалізацію цієї концепції та дослідження її застосовності в різних областях.
Ключові слова: генеративний штучний інтелект (GAI), цифровий контент, API, інформаційна система

Introduction

Currently, the use of systems and services based on artificial intelligence (AI) can be observed in almost all areas of human activity and life. The relevance of AI lies in its potential to improve efficiency and productivity in many areas. It can also solve problems that cannot be solved by human methods. Logical programming, as a component of AI, uses rules to make decisions. These logic models can be applied in fields such as logistics and planning, legal decision making, and even healthcare. According to a Gartner study [1], in 2022, 25% of companies in the world used artificial intelligence. This is almost 100% increase compared to the previous year. According to [2] by 2025 generative AI will account for 10% of all data produced, up from less than 1% in 2021.

With the release of the ChatGPT language model in 2022, the statistics regarding the application of this generative model have increased significantly. Therefore, in 2022, 25% of companies in the world used AI to generate text, and by 2025 this number is expected to grow. The most common way to use AI to generate text is to create content for social media. Other popular ways to use AI to generate text include creating marketing materials, writing articles, and translating languages.

In 2022, 15% of companies in the world used AI to generate images. This number is expected to increase to 30% in 2025. The most common way to use AI to generate images is to create content for social media. Other popular uses of AI to generate images include creating marketing materials, creating illustrations, and creating 3D models.

According to Statista [3], in 2022, 10% of companies in the world will use artificial intelligence (AI) to generate videos. This number is expected to increase to 20% in 2025. The most common way to use AI to generate video is to create content for social media. Other popular ways to use AI to generate videos include creating marketing materials, creating educational videos, and creating 3D videos. AI has the potential to revolutionize the way video is created. It can help companies create more creative and engaging content, and it can also help them save time and money.

Summarized statistics on the use of generative AI in 2022 and its expected growth in 2025 for text, image and video generation according to [1-3] are shown in Figure 1.
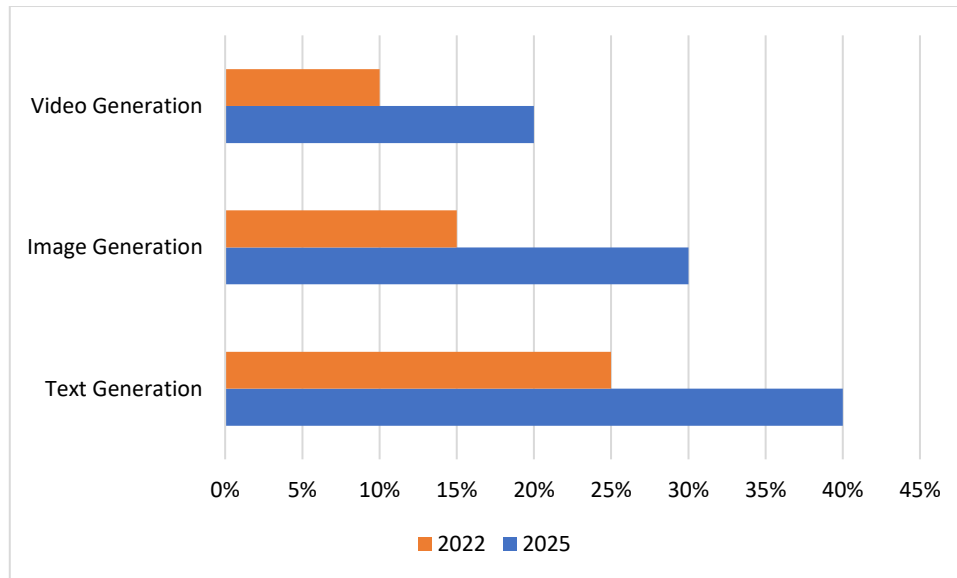

Fig.1. Summarized statistics on the use of generative AI in 2022 and its expected growth in 2025 for text, image and video generation according to [1-3]

Domain analysis

Analysis of current technological trends in the development and implementation of generative AI models has been conducted. The scientific publications [4-16] had been analyzed and the major methods and approaches were indicated.

The paper [4] presents and discusses various tools and techniques that can be used to detect the source or whether the content has been created using generative AI models. The study [5] aims to address the gap by exploring Finnish pre-service craft teachers' and teacher educators' (N = 15) insights into the potential benefits and challenges of AI, particularly text-to-image generative AI. The study [6] proposes a framework that can help business managers develop effective strategies to enhance their operations. The research [7] investigated several digital technologies, including the Metaverse, artificial intelligence, blockchain, virtual reality, and augmented reality. The study [8] ought to develop a conceptual framework that gathers the negative aspects of GAI development in management and economics, with a focus on ChatGPT. The paper [9] aimed to test the ability of GPT-3 to advance public health and to explore the feasibility of using AI as a scientific co-author. The paper [10] examines the potential of artificial intelligence (AI) to address societal megatrends, with a specific focus on OpenAI's Generative Pre-Trained Transformer 3 (GPT-3). The review [11] showed that AI adoption in AVC could increase agriculture income, enhance competitiveness and reduce cost. The study [12] offers recommendations on how ChatGPT could be leveraged to maximize teaching and learning. The paper [13] presents a systematic literature research to identify publications of artificial intelligence-based cyber-attacks and to analyze them for deriving cyber security measures. In [14] two basic models (BioCNN-1 and BioCNN-2) and a Python module for calculating IS and FID metrics for cytological images were developed. The developed module works with color images with a resolution of 64 x 64 pixels. Comparisons of metrics based on the base model and the developed models for estimating GAN networks for cytological image synthesis were compared. The main goal of [15] is to analyze the algorithms for finding a word in the dictionary, which are significant elements of the developed machine translation system at the stage of improving the created new dictionaries on the basis of existing dictionaries. The purpose of the study [16] is to improve the quality of spam search by determining the sentiment of comments using machine learning. As a result, an LSTM neural network and a dataset were chosen to train and test it. Three metrics were described to assess the quality of the neural network, and the dataset was analyzed and broken down as well as training, validation, and test samples.

An analysis of scientific research over the past two years has shown that in 2023, the number of scientific articles that investigate the application of AI for various fields of human activity and business has increased

significantly. Therefore, further research in the direction of the application of generative networks based on AI for the automated creation of digital content is relevant.

Analysis of existing solutions and technologies

In recent years, the proliferation of artificial intelligence (AI) technologies has revolutionized various facets of modern society, ranging from healthcare and finance to entertainment and education. One particularly notable application of AI lies in the automated generation of digital content, where machine learning algorithms and neural networks are harnessed to produce multimedia content such as images, videos, and text autonomously. The relevance of AI-based content generation tools in everyday life cannot be overstated, as they offer unparalleled efficiency, scalability, and creativity compared to traditional manual methods.

AI is used in a variety of industries, including:
• Finance: 40% of companies in the financial industry use AI. AI is used to detect fraud, manage risk and provide financial services.
• Healthcare: 35% of healthcare companies use AI. AI is used to diagnose diseases, develop drugs and personalize treatment.
• Manufacturing: 30% of manufacturing companies use AI. AI is used to automate tasks, improve efficiency and product quality.
• Retail: 25% of companies in the retail industry use AI. AI is used to personalize the customer experience, identify trends and make product recommendations.
• Transportation: 20% of transportation companies use AI. AI is used to develop autonomous cars, improve road safety and optimize transport infrastructure.

Figure 2 presents a classification chart of AI capabilities and directions of their application in various areas of human life.
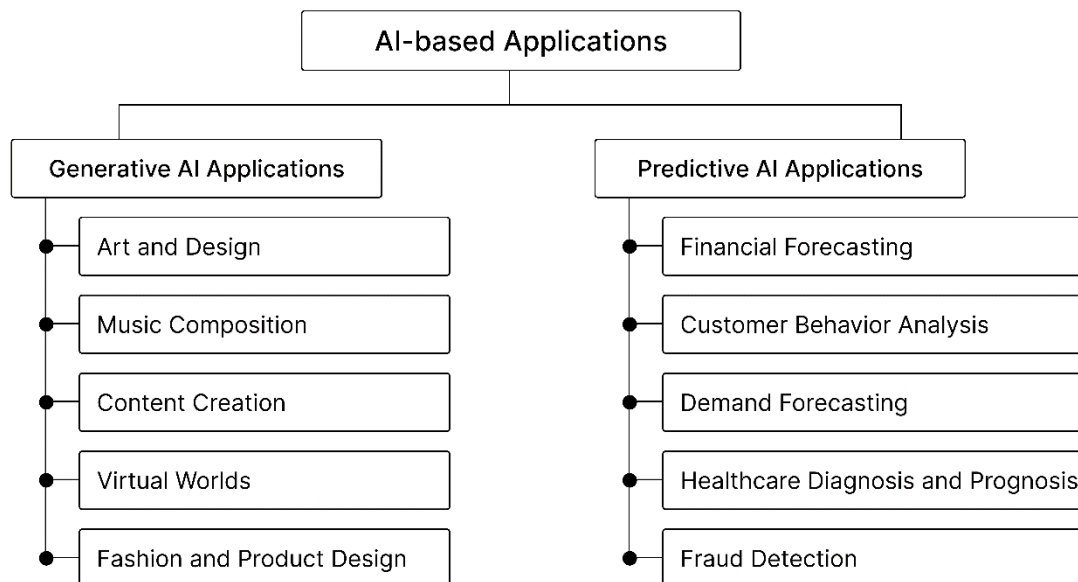

Fig.2. Classification of AI-based Applications and directions of their application in various areas of human life

Generative AI and predictive AI have distinct applications across various domains, each offering unique advantages and capabilities:

Generative AI Applications:
• Art and Design: Generative AI empowers artists and designers to craft original artwork, devise fresh design concepts, and explore innovative styles and compositions.
• Music Composition: Generative AI tools can create original music compositions, remix existing tracks, and experiment with diverse genres and musical styles.
• Content Creation: Generative AI simplifies the process of generating text, images, and videos, streamlining content creation workflows and enabling tailored experiences.
• Virtual Worlds: Generative AI models contribute to the creation and population of virtual environments in video games, simulations, and virtual reality scenarios.
• Fashion and Product Design: Generative AI supports the development of new fashion designs, enhances product aesthetics, and predicts emerging fashion trends.
Predictive AI Applications:
• Financial Forecasting: Predictive AI models analyze historical financial data to forecast stock market trends, identify investment opportunities, and evaluate financial risks.

• Customer Behavior Analysis: Predictive AI aids businesses in analyzing customer data, predicting buying behaviors, and personalizing marketing strategies.

• Demand Forecasting: Predictive AI models anticipate future product or service demand, optimizing inventory management and streamlining supply chain operations.

• Healthcare Diagnosis and Prognosis: Predictive AI assists healthcare professionals in disease diagnosis, prognosis, and treatment planning by analyzing patient data and providing valuable insights.

• Fraud Detection: Predictive AI plays a crucial role in identifying fraudulent activities, empowering businesses to mitigate financial losses and safeguard against cyber threats.

Moreover, the importance of prompt engineering - a term coined to describe the seamless integration of AI technologies into various domains - cannot be emphasized enough. Prompt engineering not only accelerates the development and deployment of AI-based systems but also ensures their adaptability and scalability in response to evolving user needs and technological advancements. By leveraging AI tools for automated content generation, prompt engineering enables organizations and individuals to stay ahead of the curve in an increasingly competitive and dynamic digital landscape.

This paper aims to provide a comprehensive analysis of AI-based systems for the automated generation of digital content. By examining existing research, methodologies, and applications in this domain, we seek to elucidate the potential benefits, challenges, and future directions of AI-driven content generation. Ultimately, our goal is to shed light on the transformative impact of AI technologies on digital content creation and consumption, as well as to highlight the opportunities and considerations associated with their adoption in everyday life and beyond. In this context, more attention will be paid to generative AI models.

All currently existing generative AI tools can be divided by four groups, depending on the object of generation: visual content generators, audio generators, text generators and code generators. More detailed classification is shown in Figure 3.
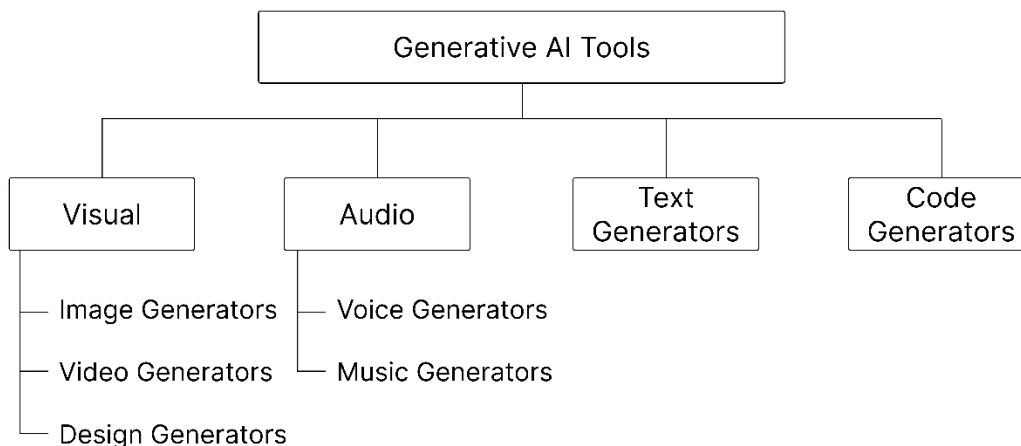

Fig.3. Classification of Generative AI Tools

Analysis of AI-based systems for automated generation of digital content

The emergence of AI-powered content generation represents a paradigm shift in how digital content is produced and consumed. With the exponential growth of online platforms and social media, there is an ever-increasing demand for high-quality, engaging content to capture and retain audience attention. AI-based systems have risen to meet this demand by enabling the rapid creation of tailored content that resonates with target audiences, thereby facilitating effective communication and engagement in the digital realm.

Therefore, an urgent and important task is to conduct an analysis of already existing generative language models to investigate the possibility of their integration into a system for automated generation of digital content. Generative models for digital content have a wide range of potential applications, including:

1) Content Creation: To create various types of content including text, images, videos and music.
2) Translation: to translate text from one language to another.
3) Data analysis: to identify trends and patterns in large data sets.
4) Artificial intelligence: to create new artificial intelligence algorithms.

In the course of this study, the analysis of such language models as Chat GPT 3.5, Google Bard, Jurassic-1 Jumbo, Megatron-Turing NLG (MT-NLG) was carried out.

GPT-3.5 "Generative Pre-trained Transformer 3.5" is currently one of the most powerful intelligent systems developed by OpenAI. This deep learning model can perform a variety of natural language processing tasks. A special feature of GPT-3.5 is its huge size and number of parameters - about 175 billion, which makes it one of the largest neural network models created by mankind.

Bard is a large language model, also known as a conversational artificial intelligence or chatbot, that is trained to be informative and comprehensive. It is based on a large amount of text data and can communicate and

generate human-like text, answering a variety of prompts and questions. For example, Bard can create resumes on current topics or tell stories.

Jurassic-1 Jumbo is a large language model developed by AI21 Labs. It is one of the largest language models in the world, with 178 billion parameters. Jurassic-1 Jumbo is trained on a vast dataset of text and code, and can communicate and generate human-like text in response to a wide range of prompts and questions.

Megatron-Turing NLG (MT-NLG) is a large language model developed by Microsoft and NVIDIA. It is one of the largest language models in the world, with 530 billion parameters. MT-NLG is trained on a huge dataset of text and code, and can communicate and generate human-like text in response to a wide range of prompts and questions.

A number of new services for the automated generation of digital content have been developed based on the use of AI-based AI language models. Their analysis is shown in Table 1.

Table 1

Analysis of well-known services for generating digital content based on API of AI language models

Service Name	Developer company	Description
DALL-E	OpenAI	A generative image modeling system developed by a company that can generate images based on text descriptions.
Imagen	Google AI	Generative Image Modeling System. It is more realistic than DALL-E and can generate images based on more complex text descriptions.
Midjourney	OpenAI	Generative Image Modeling System. It is similar to DALL-E, but it can also generate images based on the styles of different artists.
NightCafe Creator	NightCafe	Generative Image Modeling System. It is similar to DALL-E, but it can also generate images based on various creative tasks, such as writing poetry or composing music.

Since the purpose of the study is to integrate the API of the generative model based on AI to create a new system for the automated generation of digital content, an analysis of the possibilities of obtaining an API for its further use in development was also carried out. The results of the analysis are presented in Tables 2-4.

Table 2

Analysis Results of the possibility of APIs obtaining of known generative AI-based models for text generation

Model Name	Availability of API in the public access	Paid or free
Chat GPT 3.5	Yes	Free
Google Bard	Yes	Free
Jurassic-1 Jumbo	No	Paid
Megatron-Turing NLG (MT-NLG)	No	Paid

Table 3

Analysis Results of the possibility of APIs obtaining of known generative AI-based models for images generation

Model Name	Availability of API in the public access	Paid or free
DALL-E	Yes	Beta Testing
Imagen	Yes	Beta Testing
Midjourney	Yes	Free
NightCafe Creator	Yes	Free

These systems are examples of how generative models can be used to create digital content. As generative modeling technologies advance, we will likely see even more innovative applications of these models. Here are some specific examples of how these systems are currently being used: DALL-E and Imagen are used to create promotional materials such as posters and videos. Midjourney is used to create illustrations for books and comics. NightCafe Creator is used to create creative content such as pictures, music and poems.

Generative models have the potential to change the way we create, consume and interact with digital content. Here are some examples of specific systems developed using these APIs:

•   Artbreeder: a generative image modeling system that allows users to create and edit images of people, animals, and objects.

- • Wombo Dream: A generative imaging system that allows users to create images based on their thoughts and feelings.
- • DeepDream: A generative imaging system that allows users to create images with visual effects such as hallucinations or illusions.
- • StyleGAN: A generative image modeling system that allows users to create images in different styles such as painting, photography, or comics.
- • GPT-3: A large language model that can generate text, translate languages, write various kinds of creative content, and answer your questions informatively.

Table 4

Analysis Results of the possibility of APIs obtaining of known generative AI-based models for video generation

Model Name	Availability of API in the public access	Paid or free
DeepFakes	No	Paid
StyleGAN	Yes	Free
BigGAN	No	Paid
VQGAN	Yes	Free

Here are some specific examples of how these systems are currently being used: DeepFakes is used to create fake news, political propaganda and other forms of disinformation. StyleGAN is used to create illustrations, video games and other forms of creative content. BigGAN is used to create realistic images for use in advertising, film, and other industries. VQGAN is used to create abstract art and other forms of experimental content.

The Concept of Information System for automated creation of digital content for social media using generative AI models

Previous research has shown that generative AI models show significant potential in generating a variety of digital content, from text and images to audio and video. Integrating these models through APIs into a single information system simplifies and accelerates the content creation process, allowing users to easily access a variety of generative capabilities without having to dive into technical details. The concept of the Information System for automated creation of digital content for social media using generative AI models is shown in Figure 4.
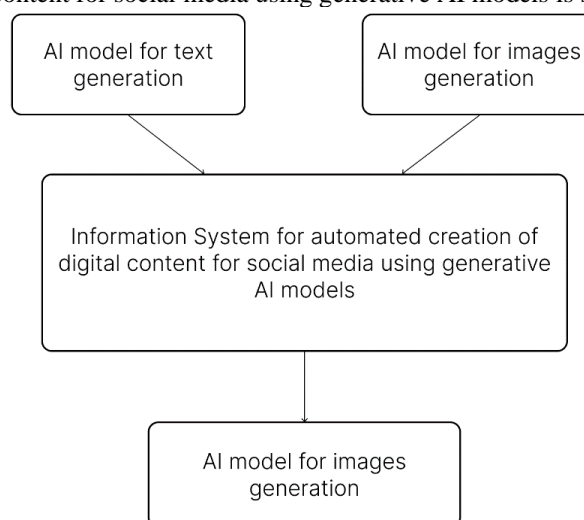

Fig.4. The Concept of Information System for automated creation of digital content for social media using generative AI models

Our research confirms that the API integration of generative AI models into a single system can be a key step towards the automated generation of digital content that meets modern market requirements and helps provide personalized and innovative solutions for users. Further, our work will be aimed at the practical implementation of this idea and further research of its possibilities in various fields of application.

Conclusions

This article examines the topical issues of integration into a unified information system API of generative models of artificial intelligence (AI) for the purpose of automated generation of digital content. In the context of the rapid development of artificial intelligence technologies and the growing need for diverse and personalized digital

content, API integration of generative models becomes extremely important for further advancement in this direction.

In the course of the study, an analysis of scientific publications in the field of application of generative models based on AI for the automated generation of digital content, namely text, images and video content, was carried out. An analysis of existing solutions in the form of ready-made models, such as Chat GPT 3.5, Google Bard, Jurassic-1 Jumbo, Megatron-Turing NLG (MT-NLG), DALL-E, Imagen, Midjourney, etc., was also carried out. for various fields of human life, such as Art and Design, Music Composition, Content Creation, Virtual Worlds, Fashion and Product Design, Financial Forecasting, Customer Behavior Analysis, Demand Forecasting, Healthcare Diagnosis and Prognosis and Fraud Detection.

The research confirms that the introduction of the API of generative models of artificial intelligence into a single system can be a key step in the development of an automated process of creating digital content that meets modern market requirements and contributes to the creation of personalized and innovative solutions for users. The future work of our team will be focused on the practical implementation of this concept and further research of its possibilities in various fields of application.

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