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# DEVELOPMENT OF A VIRTUAL PSYCHOLOGICAL ASSISTANT WITH ARTIFICIAL INTELLIGENCE IN THE HEALTHCARE SECTOR

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***Summary***

**Introduction.** The global transformative changes that the modern world has been undergoing since the beginning of the 21st century have brought mental health to the forefront as one of the most pressing challenges of our time. According to the World Health Organization, approximately 970 million people live with cognitive disorders, with anxiety and depression being the most common, affecting about 264 million individuals (World Health Organization, 2019). As experts conclude, this trend shows a steady increase, which is especially pronounced during wars, pandemics, and natural and man-made disasters.

The demand for psychological assistance is evident and, in some cases, grows during post-catastrophic, post-pandemic, and post-traumatic periods. One of the major challenges faced by mental health services is limited access to care. Some of the primary reasons for the lack of access to mental health services include high costs, absence or shortage of service providers, long distances, lack of time, societal stigma, and many other factors. To bridge this gap, many digital intervention services and professional support tools are being developed in mental health care.

**Aim.** This work aims to provide scientific and methodological justification and practical development of an online platform for the chatbot "Virtual Psychological Assistant," powered by artificial intelligence (AI), to provide psychological assistance to the population during wartime, disasters, and other emergencies.

**Materials and methods.** The functional capabilities of the online platform "Virtual Psychological Assistant," its operating algorithms, and its effectiveness in supporting users' mental health are considered. Special attention is given to potential risks, such as the spread of misinformation and privacy concerns, as well as proposed measures to mitigate them.

**Results.** The results of the practical development and pilot application of the AI-based online platform "Virtual Psychological Assistant" are presented, particularly the chatbot for psychological counseling, which was created by a joint working group of scientists from the National Academy of Educational Sciences of Ukraine and the Institute of Artificial Intelligence Problems of the Ministry of Education and Science and the National Academy of Sciences of Ukraine.

**Conclusions.** The developed AI-powered chatbot is a powerful tool for addressing the mental health issues of the population of Ukraine, making mental health services accessible to all who need them.

***Keywords*:** psychological assistance, AI-based chatbots, virtual assistants, AI applications, stress and post-stress disorders, human consciousness.

*Резюме*

**Вступ.** Глобальні трансформаційні зміни, яких сучасний світ зазнає з початку XXI століття, проблема ментального здоров'я постає одним з найактуальніших викликів сучасності. За даними ВООЗ, близько 970 мільйонів людей живуть з ментальними розладами, серед яких найбільш поширеними є тривога та депресія, негативні наслідки яких охоплюють близько 264 мільйонів людей (World Health Organization, 2019). Зазначена тенденція, за висновками фахівців, показує стійке зростання. Особливо яскраво це проявляється під час війн, пандемій, природних і техногенних катастроф.

Потреби у наданні психологічної допомоги, відчуваються а, у деяких випадках - зростають, у посткатастрофний, постпандемічний, постстресовий періоди. Одна з найбільших проблем служб психічного здоров'я – обмежений доступ до них. Деякі з головних причин відсутності доступу до послуг психічного здоров'я включають високу вартість, відсутність або дефіцит постачальників послуг, великі відстані, брак часу, суспільну стигматизацію та багато інших. Щоб усунути цю прогалину розробляється багато послуг цифрового втручання та надання професійної допомоги у сферу охорони психічного здоров'я.

**Мета.** Метою роботи є науково-методичне обґрунтування та практичне створення онлайн-платформи для чат-боту «Віртуальний психологічний асистент», що

керується штучним інтелектом (ШІ), для надання психологічної допомоги населенню під час воєнних дій, катастроф та інших надзвичайних ситуацій.

**Матеріали та методи.** Розглядаються функціональні можливості онлайн-платформи «Віртуальний психологічний асистент», її алгоритми роботи та ефективність у підтримці психологічного здоров'я користувачів. Особливу увагу приділено потенційним ризикам, таким як поширення дезінформації та проблеми з конфіденційністю, а також пропонуються заходи для їх мінімізації.

**Результати.** Представлені результати практичної розробки та пілотного застосування онлайн-платформи «Віртуальний психологічний асистент» на основі ШІ, зокрема чат-боту «Віртуальний психологічний асистент», який був створений спільною робочою групою науковців Національної академії педагогічних наук України та Інститутом проблем штучного інтелекту МОН і НАН України.

**Висновки.** Розроблений чат-бот, керований штучним інтелектом, є потужним інструментом для вирішення проблем ментального здоров'я населення України, що робить доступними послуги із психічного здоров'я для всіх, хто їх потребує.

***Ключові слова*:** психологічна допомога, чат-боти на основі ШІ, віртуальні асистенти, застосування ШІ, стресові і пост стресові розлади, свідомість людини.

## INTRODUCTION

A state of stress leads to a significant increase in psychological pressure on the civilian population, resulting in a heightened demand for psychological assistance. In Ukraine, since the onset of full-scale military aggression, the number of individuals requiring psychological support has risen substantially. According to the Ministry of Health of Ukraine, as of early November 2022, 650,000 Ukrainians had sought help from psychologists and psychiatrists, while approximately 14 million Ukrainians still require such support. This demand stems from both direct consequences of military actions, such as trauma, loss of loved ones, and destruction of homes, and indirect consequences, including forced displacement, unemployment, social isolation, and others. The establishment and implementation of the National Mental Health and Psychosocial Support Program is designed to address these challenges. It is essential to ensure that mental health services are accessible to all who need them now or may require them in the future. Experts estimate that certain population groups in need of psychological assistance will include 1.8 million military personnel and veterans, 7 million elderly individuals, and approximately 4 million children and adolescents. The projected demand for mental health support in primary healthcare is estimated at 27 million consultations.

In April 2024, with the aim of creating an online platform that, through the use of advanced artificial intelligence technologies, would expand the possibilities for providing psychological assistance to the population during wartime, the National Academy of Educational Sciences of Ukraine launched the project "Psychologist Chatbot" by official decree. A working group of scientists from the National Academy of Educational Sciences of Ukraine and the Institute of Artificial Intelligence Problems of the Ministry of Education and Science and the National Academy of Sciences of Ukraine (hereafter referred to as IAIP) was established to implement this project. The working group was tasked with developing an automated system for interacting with individuals who have experienced psychological trauma in the form of a digital multichannel service (chatbot) accessible through various platforms and devices. This article presents the interim results of the group's work.

The development of telemedicine technologies, remote online consulting, and virtual assistants in the public health sector has seen explosive growth due to the isolation of patients from doctors and psychologists during the COVID-19 pandemic. The use of chatbots to support and complement traditional healthcare systems has increased worldwide. An analytical review by Lee Wilson, PhD, and Mariana Marasoiu [1] systematically identified the healthcare areas with the most evidence supporting the development and use of chatbots, the types of chatbots deployed in these domains, and the methods by which chatbots are evaluated in healthcare programs. The authors [1] also explored the implications for future research on the development and deployment of chatbots in healthcare, considering the evidence supporting their use.

The problem of implementing artificial intelligence (AI) into human life, integrating intelligent technologies into social practices, and assimilating them in a manner similar to printed media, computer technologies, and electronic networks requires a deeper understanding of the principles of AI functioning and the boundaries it cannot surpass at each stage of its implementation. One of the critical steps in this process is understanding the nature and functioning of human consciousness, elements of which AI must demonstrate, particularly in human interaction through products like chatbots. Besides pragmatic concerns related to the effectiveness of these technologies, ethical issues must also be considered: Should AI at some point inform users that it merely simulates communication? Is it possible or necessary to set the goal of developing an artificial consciousness that resembles human consciousness?

In addressing these tasks, epistemological challenges arise, reflecting the difficulties in comprehending consciousness. Modern research in this area offers a range of theoretical

perspectives. The surge in such studies began with articulating the well-known "hard problem of consciousness" by Chalmers [2].

Today, approximately half of researchers view the mind and consciousness as functions of neurophysiological processes in the brain, while an equally large portion disagrees with this perspective.

Theoretical research on consciousness conducted by the Institute of Artificial Intelligence Problems (IAIP), one practical manifestation of which can be seen in the development of chatbots, has been reflected in scientific publications [3] and became the subject of a specialized project (A.I. Shevchenko's diagram). This theoretical model marks one of the first steps within the Ukrainian segment of AI research. Its main distinction lies in being an interdisciplinary field that integrates philosophy, mathematics, cognitive sciences, psychology, and more. Therefore, successful modeling within the project framework will contribute to the study of artificial models of conscious acts in a global context [4].

The impact of artificial intelligence on modern psychological research, along with the prospects and opportunities of "digital psychology," has been described by authors P. Sevastyanov, V. Klimushev, and G. Klimusheva [5]. The researchers note that AI expands the possibilities of analytical activity within the Big Data framework, facilitates the organization of psychological research, and enables its automation. They point out that the relevance of "digital psychology" is linked to the rapid development of innovative technologies and the absence of "biases and judgments that can arise in traditional psychology." Zhou S., Zhao J., and Zhang L. argue that the preconditions for a paradigm shift in approaches accepted for personalized medicine, psychological interventions, and diagnostics are innovative technologies such as machine learning, Big Data, and artificial intelligence [6]. The authors analyze the potential of using internet-based psychotherapy in the treatment of depressive states, emotional distress, and other mental disorders. There is also concern in the literature regarding the clinical, legal, and ethical aspects of using chatbots in healthcare. This is entirely justified given the speed with which they have been implemented in practice [7].

The functioning of AI-driven chatbots is based on machine learning and deep learning algorithms. These algorithms enable systems to recognize the emotional state of the user and adaptively learn from previous experiences and new data. The strategy for AI development in Ukraine and the prospects for its implementation are outlined in the monograph [8] and in the works [9, 10]. Medicine, as one of the priority areas for AI implementation, is highlighted in studies [11-23]. The hardware-software and other key aspects of AI development strategies for mobile technologies are discussed in the works [24-28]. Proposals for improving chatbot

response quality based on subworld embedding, as well as suggestions for the multimodality of chatbot services, are indicated in the work [29].

Among the well-known early chatbots in the field of psychological assistance are ELIZA (1966; an “imitation of a Rogerian psychotherapist”), PARRY (1972; a chatbot simulating a person with paranoid schizophrenia, developed by a psychiatrist in response to ELIZA), and ALICE (1995; a general conversation chatbot inspired by ELIZA) [30].

Recent advances in the development and application of chatbot technologies, as well as the rapid proliferation of messaging platforms, have contributed to the sharp increase in the use and development of chatbots, which began around 2016 [31]. Improvements in natural language processing (NLP - including speech recognition, text-to-speech conversion, speech-to-text conversion, natural language understanding, and natural language generation) and the emergence of commercial "virtual assistants" such as Siri, Google Now, Cortana, and Alexa have brought artificial intelligence into many aspects of our daily lives, including healthcare.

The use of chatbots in the medical field, particularly for psychological therapy, is described in studies [32-39]. AI-based chatbots must ensure the confidentiality of information to encourage individuals who may feel ashamed or afraid to seek professional help in person. Studies [40-43] show that consumers perceive robots less negatively when the social presence of humans is a source of discomfort. The use of AI systems in psychological support can be integrated with other medical and social services, enabling the provision of comprehensive support.

The methods of artificial intelligence for the development of chatbots are described in studies [44-46].

Ensuring the protection of user data is crucial in stressful conditions, where there is a heightened risk of information leakage. For example, in 2020, a data breach from medical institutions in the United States led to serious consequences for patient confidentiality. The implementation of encryption technologies and other security measures is essential to minimize such risks. The use of AI in psychological support also raises some ethical concerns, particularly regarding responsibility for decisions made and their potential consequences. Developing ethical codes and guidelines for the use of AI in this field will help ensure the safe application of these technologies [47].

The provision of psychological assistance by a chatbot (or more accurately, the quality imitation of such assistance) takes into account the psychological processes of post-crisis development for individuals in the context of the full-scale war in Ukraine. This development involves a constructive rethinking of traumatic experiences, which encompasses resolving intrapersonal conflicts and uncovering hidden or repressed aspects of the crisis. Cognitive-

affective processing is directed toward finding new meanings in life, with a key role played by the personal reevaluation of the crisis, allowing the individual to reconstruct their worldview and their place within it. This transformation helps overcome unproductive fixation on past experiences, strengthens a positive outlook, and enables adaptation to new life circumstances. Post-crisis development occurs when a person can reflect and find new significance in the events they have experienced, while the chatbot assists in creating conditions conducive to this growth [48].

When evaluating the work of the chatbot to users, it is appropriate to define its function as psychological support or an imitation of such support, aimed at assisting in adaptation to changed life circumstances (due to war and other traumatic factors). The first stage of support involves overcoming acute emotional reactions to stress and restoring the cognitive functions necessary for thinking and task-related competencies. The second stage focuses on the development of resilience, which helps individuals maintain their core personal traits and qualities during a crisis. It is also important at this stage to address uncertainties about the future, personal goals, values, and self-esteem. The third stage includes social-psychological rehabilitation: rebuilding or forming new social connections, roles, and plans for the future. Only after this can full post-traumatic growth be discussed [49].

An important direction of the chatbot's work with users is fostering the development of their agency. Agency is understood as the ability of an individual to use their capacities, intentions, and values in practical and intellectual activities, directed both at the external world and their mental framework. The agency is integrated into a complex system of interactions, where the individual both influences the world and is influenced by it. The development of personal agency is reflected in the individual's increasing influence on both external and internal realities, as well as in the realization of personal potentials through their external application, enabling individuals to take responsibility for their lives, psychological state, and actions, and to change them in pursuit of desired goals [50].

Thus, AI-powered chatbots have the potential to provide psychological support to society, particularly during times of martial law. Their use can improve the accessibility and quality of care while simultaneously requiring ongoing attention to issues of security, confidentiality, and ethics. Further research and development of such technologies will enhance the methods of psychological assistance and increase their effectiveness in crisis.

## AIM

The objective of this study is to develop an online platform, "Virtual Psychological Assistant," in which one of the main functionalities is a chatbot powered by artificial intelligence. This platform is designed to provide psychological assistance to the population

during martial law. The "Virtual Psychological Assistant" platform is created to help individuals with psychological issues through interactive communication with a virtual assistant based on artificial intelligence. The primary task of the assistant is to engage in real-time dialogue with the user, understand their emotional state, and provide recommendations for improving mental health. The system adapts to the user and creates personalized psychological profiles, offering recommendations for self-improvement or overcoming stress.

Potential clients of the service, in addition to individuals, may include rehabilitation facilities, centers for psychological assistance and psychotherapy, healthcare institutions, distributed telemedicine service providers, call centers for remote psychological assistance, and volunteer organizations.

## MATERIALS AND METHODS

The methodological framework of the study includes:

- Theoretical methods (e.g., systems analysis);
- Empirical-diagnostic methods for studying manifestations of anxiety and trauma, assessing psychological literacy among at-risk groups (validated and standardized questionnaires);
- Artificial intelligence methods, including large language models, reinforcement learning, semantic analysis of textual expressions, retrieval-augmented generation (RAG), and fine-tuning of deep learning models.

The "Virtual Psychological Assistant" online platform is multifunctional, but its core functionality lies in the chatbot "Psychologist," whose tasks may include:

- Conducting initial psychological diagnostics, such as determining the client's gender, age, educational level, etc., to provide effective individualized assistance;
- Providing information on psychoeducation, psychological prevention, and personal development;
- Searching for resource-based discourse to offer psychological support;
- Responding to users' questions, particularly those related to overcoming psychological disorders and working through effective coping strategies;
- Directing (if necessary) users to professional psychologists or specialized psychological centers (referral).

The development of a chatbot for remote psychological prevention and assistance has its own particular features, focusing on providing support and recommendations aimed at preventing and overcoming distress and other psychological disorders, as well as improving users' mental health and psychological well-being. In designing such a chatbot, several specific aspects must be considered, including the need for the chatbot to:

- Ensure a high level of user data protection, as psychological support requires confidentiality;

- Demonstrate empathy and compassion in interactions with users, in order to build rapport and create a supportive emotional atmosphere for expressing feelings and thoughts;

- Provide automated psychological support and advice by analyzing user queries and offering appropriate recommendations (without excluding the suggestion to consult professionals on specific issues, especially in complex or ambiguous cases);

- Offer crisis psychological assistance when necessary, which includes instructions for actions in such situations and providing contacts or links to websites of professional psychologists, crisis centers, and support hotlines;

- Monitor users' psychological states and provide progress reports, allowing timely responses to changes and offering additional support if needed;

- Provide users with access to a variety of informational resources and links to further information on psychological well-being, mental health, self-help, and professional psychological assistance.

Access to the "Virtual Psychological Assistant" online platform is implemented via a mobile phone network connection between the user and the server, utilizing intermediate communication router nodes. In parallel with this interaction, the platform is also available through dedicated mobile and desktop applications—messaging services such as Telegram. The simplified interaction model, shown in Figure 1, illustrates the aforementioned connection/communication channels. As a result, this access method already covers more than 80% of potential users.

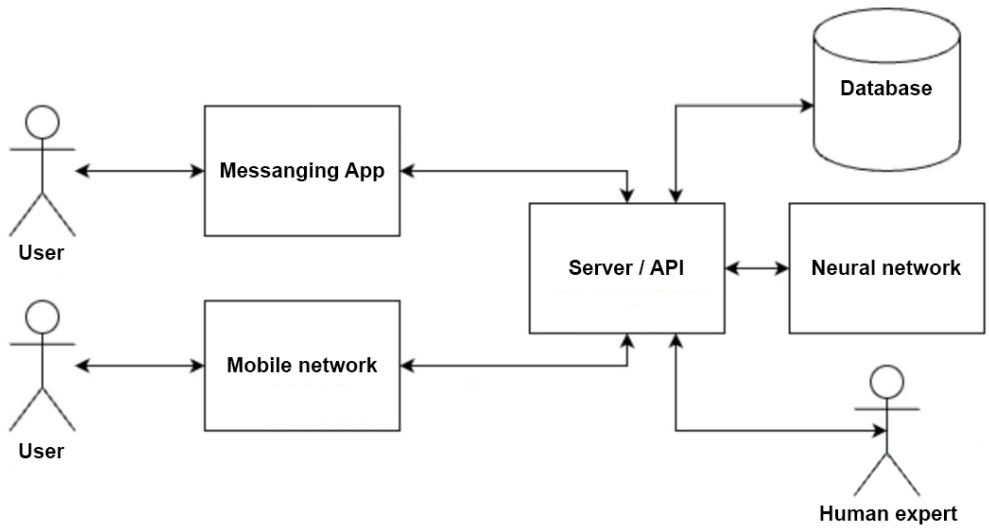


Figure 1. Simplified System Model and User Roles

For enabling voice interaction between users and the system, the Twilio platform was selected. This platform offers advanced capabilities through an Application Programming Interface (API) and a Software Development Kit (SDK) designed for integrating telephony features. Twilio supports the Session Initiation Protocol (SIP), allowing for the establishment, modification, and termination of multimedia sessions.

Speech transcription is performed using Twilio Speech Recognition, with additional fine-tuning, in conjunction with Google Cloud Speech-to-Text API. The advantages of Twilio include speech recognition using machine learning algorithms, such as Hidden Markov Models (HMM), n-gram language models, and Connectionist Temporal Classification (CTC), for converting speech to text. Integrated noise reduction technology from Krisp.ai utilizes deep neural networks to filter out background noise. Speech synthesis is implemented via the Google Cloud Text-to-Speech API, which is based on WaveNet technology. WaveNet is a generative neural network model for speech synthesis that simulates sound waves at the individual sample level, providing highly natural-sounding speech.

The dialogue routing module is implemented using the ASP.NET Web API framework and performs query classification functions, determining the type of query based on the results of semantic analysis, and routing, directing queries to the appropriate system modules or experts via integration with the Twilio API and messaging APIs. Thanks to the capabilities of the ASP.NET framework, the module ensures scalability and the ability to handle a large number of queries.

The self-diagnosis and fine-tuning module allows continuous system improvement through the collection of high-level data (such as dialogue complexity, token count, token types, query, and response length) and low-level technical parameters. User feedback analysis helps to identify problematic areas more quickly. To improve the accuracy of responses and rank the results, machine learning algorithms, including convolutional neural networks (CNN), are employed.

As part of ongoing work on the project, the extension of functionality has been agreed upon, specifically aimed at increasing user coverage by implementing additional access points to the platform. This includes the development of a dedicated mobile application for Android and iOS operating systems, the creation of additional chatbots in messaging platforms such as Viber, and the planned integration with additional data sources. User interface enhancements are also scheduled. Additionally, scientific research is planned to analyze the effectiveness of the virtual assistant and its impact on the psychological well-being of users.

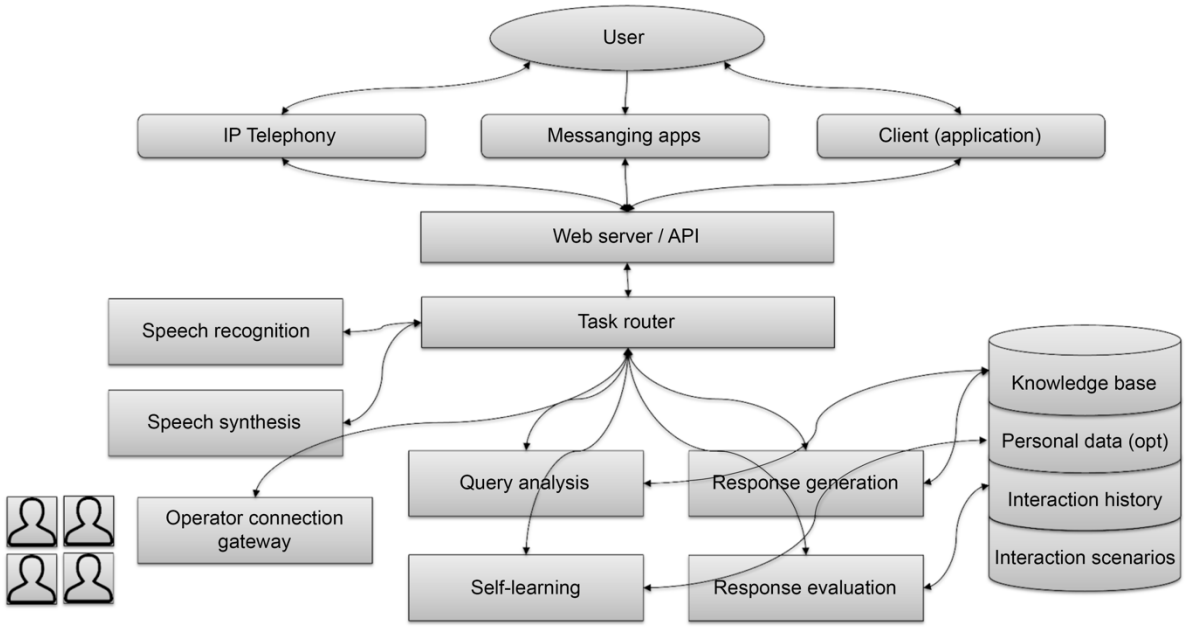


Figure 2. Expanded User Interaction Diagram with the System

In addition to mobile network and messaging connections, the "Virtual Psychological Assistant" online platform will be available via its dedicated mobile application for iOS and Android operating systems. The React Native framework is being used for developing the mobile app across both iOS and Android simultaneously, enabling the product to be launched on multiple OS platforms more efficiently. An alternative option could be Google's Flutter. For the frontend UI, the Material UI library (for Android) and Cupertino UI (for iOS) are considered the most promising for creating a native look and user-friendly interface.

Firebase Cloud Messaging (FCM) is utilized for push notifications, enabling the app to send alerts to users regarding new messages or scheduled sessions. Users can also interact with the platform through popular messaging platforms such as Telegram, Viber, WhatsApp, and Facebook Messenger. Appropriate APIs have been integrated, such as Twilio for WhatsApp and SMS messaging, Telegram Bot API for creating a bot to interact with users on Telegram, and Facebook Messenger Platform for integration with Messenger.

At the core of the platform is an AI assistant capable of understanding user queries, analyzing them, and providing personalized responses and recommendations using natural language processing technologies.

For natural language processing (NLP), local AI models are employed to quickly process input data and generate natural responses based on text, emotion analysis, and conversation context. A backup option is the use of API access to the GPT-4 model from OpenAI. For preliminary text processing and linguistic structure analysis, SpaCy is utilized. Deep text analysis and the construction of user psychological profiles are handled by local

models, such as BERT and alternative transformer models, ensuring rapid and high-quality processing.

Speech transcription and synthesis are performed using Google Cloud Speech-to-Text API and Deepgram (as a higher-quality alternative). For generating synthesized voice responses, Amazon Polly, Google Cloud Text-to-Speech, and ElevenLabs API (as a higher-quality alternative) are employed. Emotional analysis is conducted using IBM Watson Tone Analyzer and Deepgram.

In the event of an internet outage, the platform integrates with GSM networks and SMS messaging to maintain functionality. Twilio's mobile communication technology is used for SMS processing and voice calls, allowing users to interact with the platform via standard mobile communication channels.

User data, such as psychological profiles, message history, and settings, are stored on secure servers in compliance with confidentiality and data protection standards. For storing structured and unstructured data (depending on data model complexity and performance requirements), PostgreSQL is used as the most modern and standardized database. Confidential information is stored using AWS S3. Additionally, OAuth 2.0 will be implemented for user authorization and authentication via social networks or email. The processing and storage of personal data are conducted by GDPR to ensure the platform’s compliance with personal data protection standards in the European Union.

## RESULTS AND DISCUSSION

The "Virtual Psychological Assistant" online platform combines modern artificial intelligence technologies to analyze emotional states and provide support to users facing psychological issues. With the use of React Native or Flutter, the platform ensures stable performance on mobile devices, while integration with popular messaging services and the ability to operate via mobile networks makes it accessible even in regions with limited internet connectivity. The platform's architecture is designed with a high level of data security and confidentiality, which is particularly important when dealing with medical information**.**

The Virtual Psychological Assistant is a development in the fields of psychology and healthcare, designed to bridge the informational gap for individuals seeking advice and support. This platform and virtual assistant leverage advanced natural language processing (NLP) techniques and large language models to provide flexible and accessible information to users. The comprehensive solution is created with a deep understanding of the needs of modern healthcare information delivery. It is built from various logical components that seamlessly integrate into a unified system.

One of these components is call management, which processes calls through mobile networks. Its functionality includes connecting the user with the bot, managing call queues, and disconnecting calls when necessary. Another component is speech-to-text conversion, which allows the transcription of speech into text for further processing. The sentence meaning analysis component ensures understanding of the context and intent behind user inquiries. Through NLP, the structure and content of the text are analyzed, enabling context-aware responses.

Smart routing, as a key component of the system, directs inquiries to the appropriate processing mechanism. This component determines whether a query can be handled directly by the bot or if it needs to be escalated to a human expert, depending on the complexity of the issue and its context. This ensures that users receive personalized and specialized assistance.

In the future, as the chatbot scales to an architecture like MoE (Mixture of Experts) [25], the routing mechanism will enable the selection of the most competent artificial expert from among those available within the LLM. This will enhance the relevance of responses through deeper specialization and differentiation of the LLM's knowledge. Similarly, the best response can be chosen from those provided by external proprietary LLMs such as GPT-4o, Gemini1.5 Pro, Claude 3.5 Sonnet, and others.

The text-to-speech component is responsible for generating audio using Google Cloud API and Speech API. Importantly, this component also manages audio sessions with human experts by routing complex recordings, deemed difficult, to specialists. High-level call logging captures general call data, such as the user's phone number and the dialogue itself, enabling future reference and analysis. All data is stored anonymously and assigned a HASH code to identify queries from the same user, allowing the system to correlate the current conversation with previous ones.

Low-level call logging provides detailed records, including speech-to-text conversion, system decisions, and internal system information for further analysis and system improvement.

Users have the ability to leave feedback manually, which contributes to the system's continuous improvement. These reviews are analyzed by an internal subsystem and distributed among developers according to topic, helping to enhance the user experience and tailor functionality to user needs. The existing structure of the psychological voice bot reflects its user-centered design. The combination of artificial intelligence technologies with the ability to connect with experts makes it a powerful platform, while the bot's modular structure ensures flexibility, scalability, and adaptation to new technologies and approaches in service delivery.

## CONCLUSIONS

AI-powered chatbots are essential tools for providing psychological assistance during martial law, especially in situations where traditional services are unable to meet demand due to logistical constraints, a shortage of specialists, or technical difficulties. One of the key advantages of such chatbots is their ability to operate 24/7, ensuring continuous access to psychological support. In wartime conditions, when many people are unable to receive professional help due to destroyed infrastructure or forced migration, the availability of AI-based digital tools becomes one of the few viable solutions. These bots can be accessed via the internet or mobile networks, making psychological assistance available even in regions with unstable network access.

Another feature of AI chatbots is their ability to analyze the emotional state of users and provide personalized advice based on individual needs and conditions. By utilizing NLP technologies, these systems can respond not only to text but also to emotional context, helping to quickly detect signs of stress, depression, or anxiety. Data protection, especially during times of war, remains a priority. The use of modern encryption technologies, along with adherence to international security standards (GDPR, HIPAA), ensures confidentiality and helps maintain users' trust in the platform.

In addition to technical aspects, one of the positive outcomes is that such chatbots help reduce the stigma associated with mental health issues and seeking psychological help. Many people avoid reaching out for assistance due to fear of judgment or uncertainty about their problems. AI-powered bots allow users to maintain anonymity and receive consultations directly through their smartphones or computers. Despite their advantages, the use of AI chatbots requires constant monitoring and improvement to prevent risks such as the spread of misinformation or inaccurate recommendations. The implementation of ethical guidelines, continuous monitoring, and system adaptation based on user feedback are also key steps in enhancing the quality and effectiveness of these platforms.

Thus, the development of AI-powered chatbots for providing assistance during martial law is not only a technological advancement but also a step forward in the field of mental health care. It opens new perspectives in supporting individuals who need help and ensures their safety and confidentiality in crisis situations.

## FUTURE RESEARCH PROSPECTS

Further research on the use of AI chatbots for psychological support during martial law should focus on several key areas. First, improving algorithms for analyzing users' emotional states and personalizing responses will allow for more accurate and effective

recommendations. Second, security systems must continue to evolve in compliance with both existing and new functionality standards to minimize the risks of confidential data breaches. The third area is integrating chatbots with public healthcare services to provide comprehensive assistance. Finally, it is important to continue studying the ethical aspects of AI usage in psychology to prevent potential negative consequences.

The prospect of economically viable access to more advanced LLMs (such as OpenAI's o1/o2, Claude 3.5 Opus, Gemini 2, Grok-3) and the growing variety of alternatives in the public LLM sector highlights the challenge of selecting specific solutions for future chatbot versions. To ensure objective comparative analysis, it is advisable to develop more sensitive test datasets that evaluate LLM capabilities and their suitability for the chatbot's intended purpose. An important consideration is the recent introduction of an improved RAG mechanism, enabling retrieval-augmented generation of LLM responses based not only on text data but also on images and videos. This opens up the possibility of incorporating visual information into client interactions with the chatbot via smartphones, raising the quality of psychological support to a new, multimodal level.

Additionally, it is necessary to develop scientific and methodological guidelines for psychologists, psychotherapists, and family physicians regarding the use of the "Virtual Psychological Assistant" online platform in consultative and therapeutic practice. The development of training programs for healthcare and psychological support professionals to enhance their skills in utilizing AI-powered consultation chatbots remains a relevant task.

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## ETHICAL STANDARDS COMPLIANCE

In conducting this research, the authors adhered to all applicable ethical standards. No personal data of users were used in the study.

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