RESEARCH ARTICLE

The Application of Artificial Intelligence in Diagnosis and Psychotherapy

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Abstract

As the second decade of the twenty-first century draws to a close, human aspirations are growing to resolve escalating global challenges—especially those related to mental health. With the limitations of traditional approaches becoming increasingly evident, there is renewed hope that advanced computer technologies, particularly artificial intelligence (AI), may offer innovative solutions. Psychological disorders continue to strain the available resources, making it difficult to meet the needs of a growing number of individuals seeking care. In response, the integration of new, scalable, and more effective methods has become a necessity. Recent advancements in AI applications in public health—particularly in mental health—suggest that AI has the potential to significantly transform the field of psychiatry for both clinicians and patients. This development raises a critical question: What are the prospects of using artificial intelligence in diagnosing mental health conditions and providing psychological support to those in need?

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Introduction

Contemporary societies are witnessing a significant rise in the prevalence of mental disorders. In contrast, the field of mental health care is facing a clear shortage in the human resources required to provide adequate psychological services. This has led to a substantial gap between the actual need for psychological support and the available capacity to meet that need. Despite ongoing efforts to improve mental health services, the limited number of specialists and the difficulty in accessing treatment—especially in remote or resource-poor areas—remain significant barriers to achieving comprehensive coverage. According to the World Health Organization (2020), mental disorders are among the most pressing public health challenges today. The scarcity of mental health professionals, including psychologists, psychiatrists, clinical psychologists, and psychiatric social workers, constitutes one of the main obstacles to delivering essential mental health care to all.

In this context, artificial intelligence (AI) has emerged as a promising tool that may help bridge this gap by developing more efficient and cost-effective digital diagnostic and therapeutic solutions. Numerous recent studies suggest that AI could bring about a fundamental transformation in psychiatric practice for both clinicians and patients (Allen , 2020, p. 2). In recent years, AI applications have demonstrated promising potential in supporting psychotherapeutic practices, whether by enhancing diagnostic accuracy through the analysis of behavioral and linguistic patterns or by developing data-driven digital therapeutic models based on big data and machine learning. Additionally, AI-powered chatbots and smart applications have been used to provide immediate and continuous psychological support. The significance of these applications lies in their ability to deliver flexible, customizable, and low-cost services compared to traditional methods.

However, the effectiveness of these tools, the limits of their use, and the ethical concerns surrounding them remain subjects of wide debate and lack sufficient systematic scientific evaluation.

To what extent can AI technologies be employed in psychotherapy to overcome the challenges posed by the shortage of human resources and provide effective and safe psychological support? And what are the ethical considerations associated with this use?

A Historical Overview of the Emergence of Artificial Intelligence Technologies

The construction of the mechanical calculator by Blaise Pascal in 1642 is considered one of the earliest attempts in which technology approached the simulation of human cognitive processes. Pascal described his invention as being "closer to thought than anything animals do." In 1672, Gottfried Leibniz developed a calculator known as the *Step Reckoner*, which enabled the execution of the four basic arithmetic operations. This constituted a foundational step toward the emergence of early concepts of automated computation. Philosophers of that era began using the term *automata* to refer to self-operating machines, reflecting the nascent idea of devices exhibiting some form of "intelligent behavior."

By the second half of the nineteenth century, the idea of *artificial intelligence* began to emerge under the label of *thinking machines*, evolving from speculative imaginings into a serious subject of theoretical inquiry, in parallel with advancements in the construction of early modern computers.

The development of computers experienced a qualitative leap during World War II, particularly with the British secret project *Colossus*, designed to decode Nazi messages encrypted by the *Enigma* machine. Mathematician Alan Turing, a key figure in this project, is widely regarded as one of the founding fathers of both computer science and artificial intelligence. In 1948, Turing contributed to the development of the first modern electronic computer at the University of Manchester. Two years later, he published a paper in which he proposed a thought experiment known as *The Imitation Game*, later referred to as the *Turing Test*. In this experiment, a third-party evaluator engages in a written dialogue with two hidden participants—one human and one machine—without knowing which is which. If the evaluator cannot reliably distinguish the machine from the human, the machine is considered to have successfully simulated human intelligence. This conceptual model remains a reference point today in evaluating the capabilities of AI systems, particularly in fields such as natural language processing, pattern recognition, and human-computer interaction (Al-Hamwi, 2024).

It was Professor John McCarthy of Stanford University who first coined the term *Artificial Intelligence* in the early 1950s, defining it as "the science and engineering of making intelligent machines, especially intelligent computer programs" (Nasrallah & Kalanderian, 2019, p. 33).

Previous Studies

In a study conducted by researchers from the University of Munich (Fiske, Henningsen, & Buyx, 2019), the use of artificial intelligence in mental health care was examined. The researchers evaluated the growing applications of AI in psychotherapy, particularly through the use of virtual therapists and therapeutic robots. This was accomplished by reviewing a range of prior studies and analyzing the topic across three dimensions: assessment of potential benefits, analysis of general ethical concerns, and discussion of specific ethical and social issues related to therapeutic interventions. The study outlined several potential advantages of these technologies, such as improving access to treatment, enhancing patient responsiveness, and saving specialists' time. It also addressed accompanying ethical and social challenges, including data privacy, lack of regulatory guidance, and the risk of compromising the quality of traditional care. The authors offered preliminary recommendations emphasizing the need for clear regulatory

frameworks, professional training, transparency in algorithm use, and further research into the long-term effects of these applications on the understanding of illness and human identity.

In a global survey involving 791 psychiatrists from 22 countries, aimed at exploring the potential replaceability of psychiatrists by AI and machine learning technologies, results revealed that most psychiatrists do not believe they can be fully replaced in the near future. While 75% of participants acknowledged that AI could perform administrative tasks such as updating medical records, tasks requiring human empathy—such as direct psychological care—were met with considerable skepticism, with only 17% believing they could be replaced. Furthermore, half of the respondents expected these technologies to bring about major changes in the nature of their work, without eliminating the need for psychiatrists altogether. The study also highlighted regional and gender-based differences in perception, with psychiatrists in the United States and female practitioners demonstrating greater openness toward the potential benefits of AI. These findings suggest that AI is currently perceived more as an assistant in certain tasks rather than a genuine replacement for physicians in the complex human and clinical dimensions of psychiatric practice (Doraiswamya, Blease, & Bodner, 2020).

Other studies have indicated that commonly used therapeutic approaches—such as Cognitive Behavioral Therapy (CBT), Psychodynamic Therapy (PDT), Psychoanalytic Therapy (PAT), as well as systemic and integrative approaches—can be adapted for digital programming. Acceptance and Commitment Therapy (ACT), Mindfulness-Based Therapy (MFT), and Interpersonal Therapy (IPT) have also been incorporated into self-help programs that can be delivered online, either with or without professional guidance (Alimour et al., 2024, p. 2). Additionally, various meta-analyses consistently suggest that Computer-Aided Cognitive Behavioral Therapy (CCBT), delivered via desktop or mobile applications, can be as effective—or even more effective—than traditional face-to-face CBT (Alimour, et al., 2024).

In a recent study conducted by a group of British researchers (Zubala , Pease, Lyszkiewicz, & Hackett, 2025) to explore the potential of creative artificial intelligence in supporting art therapy practices and visually expressive psychological interventions, the researchers reviewed ten studies covering diverse AI applications in this field. They analyzed these studies based on target populations, types of interventions, and the technologies used. The findings highlighted significant benefits such as expanding opportunities for self-expression and improving treatment accessibility. However, the study also cautioned against risks such as diminishing the therapist's role or undermining the patient's sense of agency. It concluded by emphasizing the need for further research to understand the psychological and cultural implications of using creative AI before its broad adoption in art therapy.

The Meanings of Artificial Intelligence

Generally, artificial intelligence (AI) represents an advanced form of technology that utilizes algorithmic principles rooted in mathematics, similar to those employed by the human mind, to overcome the complex challenges posed by daily practices (Sufyan, Shokat, & Ali Ash, 2023), AI encompasses two main subfields: machine learning (ML) and deep learning (DL).

Machine learning is defined as a set of methods and algorithms capable of automatically discovering hidden patterns in data and then using them to make predictions or decisions regarding future data. In contrast, **deep learning** is a branch of machine learning based on multi-layered artificial neural networks, which allow computers to learn from past experiences and represent knowledge through a hierarchical sequence of abstract concepts.

Machine learning can be categorized into three main types:

- **Supervised learning**, where the system is provided with pre-labeled data and is used to learn the mapping relationship between inputs and outputs.
- **Unsupervised learning**, which is applied to unlabeled data to uncover the internal structure or patterns of the data.
- **Semi-supervised learning**, a hybrid model that combines elements of both previous types, involving a mixture of labeled and unlabeled data.

Additionally, some researchers categorize AI into two fundamental types:

- **General (or strong) AI**, which is hypothesized to possess analytical capabilities equal to or surpassing those of humans, including the ability to self-reflect, feel, and be conscious.

- **Narrow (or weak) AI**, which refers to systems designed to perform specific tasks efficiently without true awareness or understanding. All current AI applications are considered examples of narrow AI (Nasrallah & Kalanderian, 2019, p. 34).

AI enables machines to learn and recognize patterns and relationships from large representative samples and to simulate human cognitive activity. These capabilities can serve as revolutionary tools for psychiatric and precision medicine research. The comprehensive implementation of AI for internalizing psychological disorders requires algorithms capable of efficiently integrating complex, heterogeneous, and multidimensional data (Sun, et al., 2023). AI and related technologies are increasingly prevalent in business and society, and their application in healthcare has begun. These technologies have the potential to transform many aspects of patient care and administrative processes within healthcare institutions (Davenport & Kalakota, 2019).

Applications of Artificial Intelligence in Psychotherapy Practice :

For most mental disorders, diagnosis and treatment effectiveness in psychiatry still rely entirely on conscious, subjective symptoms and observable clinical signs assessed by qualified human professionals. However, with the advancement of biotechnology and the advent of the era of big data, there are growing notions that AI could serve as a bridge linking psychiatry and psychology with foundational research in various sciences, drug development updates, and global clinical practice advancements. AI methods now have the potential to integrate clinical, psychological, and biological validations and confirm probabilities of accuracy in a digital format (Sun, et al., 2023).

From this perspective, the future of AI in psychiatry appears promising, especially with the growing need for and increased use of AI robots in symptom management by leading research entities (Pham, Nabizadeh, & Salih, 2022, p. 252). In recent years, AI technologies have been integrated into medical diagnostic and treatment domains. A notable example is IBM's "Watson" system, developed to support the diagnosis of complex diseases such as cancer. However, these systems have encountered significant challenges when transitioning from research environments to practical implementation, particularly regarding integration with clinical workflows.

On the other hand, deep learning techniques have contributed to medical imaging and genomic data analysis, enhancing diagnostic accuracy. Yet, their use still faces integration challenges with electronic health record systems. AI can also be utilized to promote patient engagement and adherence to treatment plans. The healthcare sector suffers from a widespread issue of poor adherence to prescribed treatment, prompting the use of AI to develop tools that effectively support patient participation. These tools include personalized alerts and predictive recommendations based on patient behavior to improve adherence and reduce relapse rates. Nevertheless, further studies are required to assess the long-term effectiveness of these solutions (Davenport & Kalakota, 2019).

Recent innovations in smart technologies, such as chatbots, offer numerous advantages. For example, they help overcome the stigma associated with discussing psychological, particularly sexual, issues with doctors and specialists. They also offer increased personal comfort, reduced costs, and expanded access. However, AI chatbots lack the diverse skillset of psychiatrists or trained therapists, have limited capacity to apply personal patient details to cognitive tasks, and may fall short in expressing the empathetic responses expected from mental health professionals (Pham, Nabizadeh, & Salih, 2022, p. 252). Therefore, future studies should focus on evaluating the effectiveness of AI-based interventions in clinical practice, particularly by assessing individuals' responses to these experiences and the potential of algorithms to replicate emotional engagement, narrowing the gap between interactions with machines and human professionals.

In addition to AI designed to replicate human processes, physicians and researchers have explored the use of animal-like smart robots to enhance psychological outcomes such as stress reduction, alleviation of loneliness, emotional regulation, and mood improvement. Companion robots like *Paro*, a robotic seal, and expressive bear-like robots such as *eBear* interact with patients and provide benefits akin to animal-assisted therapy. *Paro* has been used to assist dementia patients experiencing isolation or depressive feelings. AI-powered robots have also been studied for supporting children with autism spectrum disorders (ASD) through educational and therapeutic interventions (Pham, Nabizadeh, & Salih, 2022, p. 251).

AI algorithms can extract behavioral patterns from various data sources, make predictions by analyzing these patterns, and continuously update these predictions with new data. This suggests wide-ranging potential applications of AI in psychiatry, including the diagnosis and treatment of individuals with severe mental disorders (Allen , 2020, p. 2). Over the past two decades, AI has been integrated into neuroimaging studies of psychiatric patients using deep learning models to classify patients with mental disorders. For example, one AI-based program accurately classified

schizophrenia patients with an accuracy of 85.5% by extracting functional connectivity patterns from resting-state fMRI scans compared to healthy individuals. These results indicate that deep learning holds promise for classifying psychosis based on neuroanatomical and neurofunctional information (Nasrallah & Kalanderian, 2019).

Studies (Zhong, Luo, & Zhang, 2024) highlight promising prospects for effectively using AI in remote and internet-based psychotherapy interventions. AI can extend mental health services to broader populations, providing immediate support to individuals unable to access traditional therapy due to financial, geographical, or other constraints. AI systems can analyze vast amounts of data to personalize psychotherapeutic interventions, tailoring them to each user's preferences, behaviors, responses, and personality traits (Alimour et al., 2024). The emergence of AI-based chatbots has revolutionized clinical psychology and psychotherapy, offering individuals unprecedented access to psychological support and helping overcome time and geographical barriers at a relatively low cost. Nonetheless, despite their immense potential, studies on the effectiveness of these online platforms and bots in addressing common mental health problems such as depression and anxiety have shown mixed results.

Medical and technological researchers are also working on incorporating AI-generated innovations into smart robotic designs for clinical practice. For instance, animal-like smart robots such as *Paro*—a soft, stuffed polar seal—are increasingly used to support dementia patients. Alongside the furry robot *eBear*, these are categorized as "companion robots," functioning as home health aides that interact with users through speech and movement in dynamic dialogues. They aim to provide psychological support to the elderly, isolated individuals, or those suffering from depression by offering interaction and companionship. These robots have shown promise in supporting patients with autism, dementia, and mental disorders by enhancing communication, social skills, and reducing isolation and stress. Despite the initial positive outcomes, these technologies remain experimental and require thorough ethical and regulatory evaluation before widespread clinical adoption (Fiske, Henningsen, & Buyx, 2019).

Other goals of AI in psychological diagnosis and therapy include the use of digital games and smartphone applications. Initially employed for symptom tracking and psychoeducation, digital games have now evolved into full intervention programs. Gamification methods are being used in psychological, social, and cognitive fields to target specific deficits caused by various mental disorders, aiming to restore functionality to impaired domains. These services include behavioral cognitive therapy techniques, behavior modification, social stimulation, attention enhancement, and other psychotherapeutic strategies.

Digital games remain widely appealing due to their accessibility via smartphones. Smartphone applications have also become a prominent AI application, such as the *MindLAMP* app (Learn, Assess, Manage, Prevent), developed by Torous' group. It uses smartphones and built-in sensors to understand individuals' experiences with mental illness and predict recovery through data collection, cognitive and behavioral assessments, GPS tracking, and physical activity monitoring. The *BiAffect* app employs machine learning algorithms and keystroke dynamics (e.g., typing variability, errors, pauses in messages) to predict manic and depressive episodes in individuals with bipolar disorder (Pham, Nabizadeh, & Salih, 2022).

Recent research has focused on the effectiveness of using smartphones and sensors to monitor mental health, understand illness trajectories, and guide recovery. These smart applications gather diverse data such as questionnaires, geolocation, and physical activity. The research team aims to use machine learning algorithms to predict psychiatric relapses and deliver real-time personalized interventions. Studies have shown that consistent movement patterns are associated with better mental health (Allen , 2020, p. 4).

Real-time digital data captured from smart devices enhances the potential for promoting both mental and physical health by enabling individuals to engage in continuous self-monitoring linked to their everyday environments. Smartphones and smartwatches, for instance, can collect information on sleep, physical activity, and heart rate—contributing to a wealth of data that helps predict relapses, refine diagnoses, and track psychological states with greater precision. Although these methods have demonstrated effectiveness in psychological diagnosis and care, they have yet to be fully integrated into clinical practice worldwide and remain primarily used in research contexts.

One of the most significant examples of future applications lies in the development of intelligent programs capable of monitoring mood, sleep, and daily activity, utilizing machine learning algorithms to predict relapses, alert clinicians, and recommend timely interventions. Despite the availability of such technologies, the systems supporting these applications have not yet been widely implemented in digital mental health clinics (Vaidyam, Halamka, & Torous, 2019, p. 2).

In general, common AI applications in psychological and healthcare settings for patients include, according to Doraiswamy, Blease, and Bodner (2020), the following:

- Providing necessary documentation for psychologists and psychiatrists (e.g., continuously updating medical records).
- Evaluating when to refer patients to outpatient versus inpatient psychiatric care.
- Analyzing patient information to determine diagnoses.
- Analyzing patient data to detect acute homicidal ideation.
- Analyzing patient data to detect suicidal ideation.
- Aggregating patient information to reach diagnostic conclusions.
- Conducting mental status examinations.
- Interviewing psychiatric patients in various settings to gather medical history. (Doraiswamya, Blease, & Bodner, 2020)

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Ethical Issues Related to the Use of Artificial Intelligence in Psychotherapy

In a research paper by scholars from the University of Munich in Germany (Fiske, Henningsen, & Buyx, 2019), it was concluded that embodied artificial intelligence in therapeutic psychological contexts remains in its early stages. Thus, any ethical and social analysis at this point is largely anticipatory. Nonetheless, the authors identified a set of crucial conclusions and recommendations that should guide ethical considerations in this domain:

1. **Regulatory Frameworks**: Clear regulatory frameworks must be developed to determine whether, and which, embodied AI applications should undergo conventional health technology assessments and require formal approval from competent authorities. This includes extending provisions that govern the use of such applications outside the direct supervision of healthcare professionals.
2. **Professional Guidelines and Training**: Professional associations and formal and informal bodies operating in the field of mental health should develop guidelines for the optimal use of AI in this domain. They should also provide recommendations for integrating this topic into medical training curricula to equip future psychiatrists, psychologists, and care providers to engage effectively with embodied AI tools within integrated models of mental and healthcare.
3. **Supplement, Not Substitute**: AI tools in mental healthcare should be seen as complementary resources—not substitutes—for high-quality specialized care. It is necessary to closely monitor their impact on the availability and use of traditional services.
4. **Supervised Use and Risk Management**: To uphold care obligations and ensure harm reporting, embodied AI applications should ideally remain under the direct supervision of mental health professionals. Applications used outside formal therapeutic frameworks—such as digital apps and chatbots—must meet reliable standards for risk assessment and ensure appropriate referral pathways to professional care when needed.
5. **Transparency and Privacy**: Ethical use of such technologies requires transparency, including the development of clear guidelines that ensure respect for patients' autonomy and privacy—especially regarding obtaining explicit and informed consent for the use of personal data.
6. **Algorithmic Bias and Accountability**: AI algorithms should be subjected to critical scrutiny, particularly concerning potential biases in data and design. Mental health professionals should be trained to explain the functioning of these algorithms to patients. These technologies should also be open to ongoing scientific discussion and review.

7. **Broader Implications**: Finally, the expansion of embodied AI in mental health necessitates in-depth analytical studies to examine its direct and indirect effects on the therapeutic relationship and on human relationships more broadly. Additionally, it is important to assess its influence on individuals' self-perception, identity, and agency. Long-term consequences must also be considered, such as the rise of reductionist views of health, the increasing objectification of human beings, and the implications of these trends for our understanding of humanity itself.

Conclusion

The primary challenge facing artificial intelligence in mental healthcare is not its efficiency, but rather its integration into daily clinical practice. For these systems to gain widespread adoption, they must be approved by regulatory bodies, integrated with electronic health record (EHR) systems, and standardized sufficiently to ensure the consistent operation of comparable smart products. Moreover, these systems must be incorporated into medical education, funded by public or private institutions, and subject to continuous updates.

While overcoming these challenges will likely take longer than the maturation of the technologies themselves, it is expected that AI will be used in a limited capacity in clinical practice within the next five years, with broader adoption anticipated within the next decade.

It is also probable that AI systems will not replace human clinicians but rather support and enhance their efforts in delivering care. Over time, the role of clinicians may become increasingly centered on tasks that rely on uniquely human skills, such as empathy and persuasion. Conversely, healthcare providers who resist collaboration with AI may find their roles diminished or obsolete over time.

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