# Artificial Intelligence in Mental Health: A Narrative Review (Innovation, Ethics and the Future)

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**Abstract.** This article presents a narrative review analyzing the literature related to the application of artificial intelligence (AI) in mental health. A literature search was conducted through PubMed, Google Scholar, IEEE Xplore, ScienceDirect, and JMIR databases (2016-2024), analyzing 65 publications thematically. The results indicate that AI has transformative potential in three areas: diagnosis and assessment using machine learning, treatment through chatbots and mHealth applications, and real-time monitoring using deep learning. Applications include early detection of mental disorders, personalized care, and virtual therapy. However, significant ethical challenges remain related to data privacy, algorithmic bias, and technological limitations. The future of AI in mental health requires continued innovation in Natural Language Processing, Virtual Reality, and a clear regulatory framework. The responsible application of AI can enhance the accessibility, effectiveness, and ethicality of mental health services, ultimately promoting optimal psychological well-being.

**Keywords:** Artificial intelligence, mental health, psychology

## 1 Introduction

Mental health conditions are highly prevalent in all countries of the world [1], and are of great concern in health policy and research [2]. Despite this, most societies and social health systems are still ignorant about mental health and do not provide the proper care and support needed. As a result, millions of people around the world suffer without help, experience human rights violations, or are negatively impacted in their daily lives [1].

Referring to the above statement, mental health treatment should receive serious attention from the Government considering the huge impact of the weak mental condition of the community. Mental health problems can no longer be considered a peripheral issue in Indonesia's health development [3]. Unfortunately, government programs for handling mental health problems only focus on curative and rehabilitative aspects and very little on preventive aspects, which are very important to do.

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The problem faced by the government related to preventive efforts is that there are no guidelines for early detection of mental health [4], so input from various parties is needed to provide insight into the preparation of these guidelines. Of course this is a *"breath of fresh air"* for psychology academics to conduct research related to preventive efforts in early detection of mental health, which of course can be a contribution to the government in preparing the guidelines.
Currently, research efforts have gone into creating digital methods for monitoring mental health and emotions [5]. The research has even gone into developing the use of innovative technologies such as *machine learning* (ML), *big data*, and *artificial intelligence* (AI) as adopted approaches for psychological treatment, intervention and diagnosis and has grown sensationally over the past few years [6].

## 2 Literature Review

AI has been integrated into digital interventions particularly web and *smartphone* applications to improve user experience and optimize personalized mental health care. In terms of prediction and detection, the abundance of modern data streams means that data-driven AI methods can be used to develop prediction/detection models for mental health conditions [7]. Therefore, assessing the current status of AI applications in mental health research is relevant to determine trends, gaps, opportunities, and challenges [8].

This study examines the primary types of accessible AI technologies that have been integrated into mental health services, including machine learning, chatbots, and mobile health (mHealth) applications, and monitoring systems. The review focuses on established, evidence-based AI applications for the diagnosis, treatment, and monitoring of mental health conditions.

## 3 Method

This article was compiled using a narrative review approach to analyze the literature related to the application of artificial intelligence (AI) in the field of mental health. A narrative review was chosen due to the broad and rapidly evolving nature of the topic, requiring a comprehensive synthesis of various perspectives and research findings. Literature Search Strategy: A literature search was conducted through major academic databases including PubMed, Google Scholar, IEEE Xplore, ScienceDirect, and JMIR (Journal of Medical Internet Research) using a combination of the following keywords: "artificial intelligence," "machine learning," "mental health," "digital health," "chatbots," "mHealth," "psychological intervention," and "digital mental health." The search focused on publications from 2016 to 2024 to ensure the relevance and freshness of information on rapidly evolving AI technology.

The literature selection criteria used included: (1) peer-reviewed journal articles from reputable international journals, (2) publications from international health organizations such as the WHO, (3) empirical studies, systematic reviews, and meta-analyses discussing the implementation of AI in mental health, (4) conference proceedings from the IEEE and ACM related to digital health

technology, and (5) publications in English and Indonesian. Priority was given to studies discussing the practical applications of AI (machine learning, chatbots, mHealth), as well as the ethical and regulatory challenges, and future projections of AI in the context of mental health.

Analysis and Synthesis: Data from the 65 selected literature were thematically analyzed and synthesized to identify key trends, research gaps, and opportunities and challenges in the application of AI to mental health. The discussion is structured around three main themes: AI applications (diagnosis, treatment, monitoring), challenges and limitations (ethics, privacy, technology), and future projections and regulations.

# 4 Result

## 4.1 Application of AI in mental health

More than 970 million people in the world live with mental disorders and struggle to access treatment that is accessible to many. The utilization of technologies such as AI can impact mental health through prevention and treatment [9]. AI helps in identifying high-risk groups or individuals so that interventions can be made earlier, namely in the process of detecting, assessing, and predicting stress [10]. AI can analyze vast data, such as text from electronic health records to detect early indications of cognitive impairment [11], or signs of child maltreatment [12], both of which are factors that can affect a person's mental health later in life.

In addition, AI can act as a "frontline" in guiding individuals to needed mental health resources and services. Through the use of digital platforms and AI, access to mental health care can be more widely utilized, especially for those in remote locations or hard-to-reach areas. AI enables specific and tailored mental health interventions, which are particularly effective in the aftermath of natural disasters or in situations where access to resources is limited [9]. This means AI can be used not only for clinical care but also for resource management and mental health services more broadly.

One of the most popular AI used in mental health is *Machine Learning* (ML). ML is a technology that allows systems to learn and evolve based on data received, without requiring specific programming for each new task. There are several main approaches in ML used in research and practical applications, including *supervised learning, unsupervised learning, deep learning,* and *reinforcement learning* [13].

The use of ML in mental health shows great potential in improving diagnostic accuracy and the ability for early intervention based on accurate prediction of disorder risk [14]. ML is used to analyze complex health data to help diagnose conditions such as depression, anxiety, and schizophrenia, as well as predict the risk of future disorders, which is an important aspect in planning mental health interventions and treatments [15].

In *Supervised Machine Learning* (SML), the data used is labeled first, and then becomes the basis for the algorithm to learn. This labeling can be categorical or continuous, depending on the

variability of the condition under study. SML algorithms learn the relationships between features extracted from various data sources. These features can include sociodemographic, biological, and clinical information, which helps in building predictive models [16]. The algorithm is taught to associate certain features with corresponding labels [17].

This process is similar to how a teacher teaches a concept to a student. After the learning process, the algorithm is tested with unlabeled data to assess its ability to accurately classify and predict mental health problems [18]. An understanding of SML and its application in mental health is crucial to developing more effective diagnostic and predictive tools, which could ultimately contribute to better interventions and more positive mental health outcomes.

### 4.2 Treatment & management

One of the commonly used AI applications today is *Chatbots*, which are systems that can communicate and interact with human users using spoken, written, and visual language [19]. *Chatbots* have been used extensively in various aspects of health and well-being, with a particular focus on mental health care via *mobile* devices [20]. *Chatbots* are able to mimic human interaction and respond dynamically to user needs and provide personalized care [21]. This shows how important *Chatbots* are in digital transformation and ways of interacting, and certainly have the potential to be applied in mental health care. *Chatbots* can be integrated into mental health services, not only as therapy support, but also as an application to improve access and quality of care.

Some examples of the use of *Chatbots* include interventions with a non-intimidating approach for individuals who are reluctant to seek help due to fear of stigma, allowing for more personal and controlled interactions [22]. *Chatbots* also have the potential to increase engagement and adherence with mental health apps through easy and accessible interactions [23]. In addition, *Chatbots* provide help with anxiety, depression and stress, as well as awareness training and information on mental health conditions and treatments. In some situations, *Chatbots* can also facilitate connections between users and mental health professionals [24]. Finally, they have been used to guide marginalized communities on mental health issues [25]. In conclusion, *Chatbots* have great potential in assisting with mental health issues through various supportive and guided mechanisms.

In mental health management, there are currently several applications termed *mobile health* (mHealth) [26]. These apps are used specifically for mental disorder intervention through a series of digital-based therapeutic strategies. These interventions offer many advantages over traditional treatment services such as high accessibility, low cost, minimal contact, patient anonymity, flexibility, self-monitoring, and motivational support and personalized care [27].

Health interventions commonly include self-management features that allow clients to self-monitor symptoms and behaviors. This reinforces the patient to take an active role in managing personal mental health and has the potential for better outcomes [28]. Apps designed for the management of emotional disorders often include a variety of resources to assist clients, such as stress relief games, meditation instructions, mood detectors and psychoeducational materials. These apps can also assist clients in learning coping mechanisms [29].

Several systematic reviews have shown that *smartphone-based* interventions have beneficial effects on both clinical and nonclinical depressive symptoms in people [30]. Most recently, a comprehensive analysis showed that apps designed to address anxiety and depression provided significant clinical benefits, confirming the role of technology in supporting mental health care [31]. However, digital-based interventions are more effective when implemented in therapeutic sessions involving mental health professionals, given the importance of professional support and monitoring in improving treatment outcomes [32].

### 4.3 Monitoring & evaluation

AI applications make it possible to monitor mental health conditions in *real time* and continuously, so that detection of early signs of relapse or severity of a client's condition is higher and interventions can be carried out more quickly. Analyzing data related to the client's condition is also very important to gain a comprehensive understanding of the client's mental health patterns. This will help in identifying triggers or behavioral patterns that contribute to the client's condition, allowing for more personalized and accurate treatment [33].

Next, several studies have shown that AI can be used to evaluate and monitor mental health using objective metrics. One study tested an objective mental health evaluation model using a combination of *Convolutional Neural Network* and *Long-Short Term Memory* algorithms trained and validated using *time-series visual metrics*. Data was recorded by comparing cancer patients and individuals without cancer when viewing artworks in a gallery. As a result, the model was able to classify mental health levels with 93.81% accuracy for hope index, 94.76% anxiety, and 95.00% for mental well-being [34]. In conclusion, AI makes an important contribution to monitoring and evaluating mental health status and can make a significant difference to mental health maintenance.

## 5 Discussion

### 5.1 Ethics and Privacy

The increasing use of *chatbots* by government agencies as well as both profit and non-profit organizations in the provision of information and services has inevitably also touched the domain of mental health [35, 36]. However, *chatbots* have been found to create ethical problems, despite appearing harmless at first [37]. These ethical issues are specifically related to privacy, transparency, accuracy, security, and accountability, which are allegedly detrimental to the reputation of individuals and organizations using them [38]. These ethical issues will become even more severe as the sophistication *of chatbots* increases [35].

Privacy protection concerns the management of access to individual rights such as bodily privacy, personal information, property or residence, control over one's name, image, or likeness. In particular, in AI technology, clinical or business entities must protect such data from hackers and be careful not to display protected data on insecure or vulnerable servers [39]. Experts developing *Deep Learning* applications can afford to take hundreds of thousands of cases to develop and test new tools, utilizing their ability to access databases such as *"Imagenet"* which now has over 14 million

images. The desire to create and market new AI applications in healthcare led to a high demand for data coming from users [40].

In addition, according to some clinical psychologists and psychiatrists, the lack of understanding of the client's emotional state by the AI may result in a lack of effectiveness in achieving positive outcomes, which is precisely the emotional insight that is so important to gain [41, 42]. There is also a concern that AI may make misdiagnoses that could negatively impact the mental health of the client. AI's work in mental health involves collecting, storing, and analyzing large amounts of highly sensitive personal data including medical records, social media interactions, and data from *wearable* devices. These data, if not used carefully, can be harmful to the privacy and rights of the client [43]. The risk is that it could be misused or leaked, causing further harm to already vulnerable individuals [44].

### 5.2 Technology limitations

While AI has the potential for early risk identification, sorting and treatment of large numbers of individuals, there are some significant drawbacks in using AI for detection, assessment and prediction purposes. Some of these drawbacks are: *First, there* are biases that can occur when AI is used for mental health assessment, which can lead to errors in the assessment process. *Second*, while AI has been used to predict risks such as suicide risk, its effectiveness has been inconsistent and not even better than simpler prediction models. And *third,* there are concerns about the long-term consequences of replacing human interactions with AI, particularly in the aspects of judgment and experience that only humans can perform.

Despite the increasing interest and use of *mHealth*, there are still some barriers limiting the use of these applications in practice [45]. In many countries, specific regulations or legal frameworks governing these applications are still under development. As a result, medical apps can be launched and used by the public without strict supervision [46].

Inadequate government oversight means that there is no proper verification or validation process before an app is made available for download. This is very risky as unverified apps may contain inaccurate information or may even be unsafe [47]. In a weak regulatory environment, app developers can launch their products more easily and without taking full responsibility for the impact of using the app. This can be harmful to users if the app is related to the management of serious health conditions [48].

### 5.3 The Future of AI in Mental Health

#### 5.3.1 Expected Innovation

The utilization of AI in the field of mental health continues to grow, and has the potential to create changes in the diagnosis, treatment, and monitoring of mental health conditions. In terms of diagnostics, ML technology can analyze large *Electronic Medical Record* (EMR) data and content shared on social media to identify symptoms and patterns that cannot even be seen by humans [49]. By utilizing large amounts of patient data, ML can also learn to recognize complex and diverse features of mental health disorders and make more accurate diagnoses [50].

Furthermore, in analyzing natural/automatic language features, the use of *Natural Language Processing* (NLP) shows great potential in the identification of early signs of cognitive decline. This technique could be a prospective strategy for detecting the early stages of dementia and other cognitive disorders [51]. With the same method, NLP is also able to detect signs of depression and anxiety such as negative emotions, cognitive distortions, or expressions of hopelessness [52].
In the therapeutic aspect, AI-based mental health interventions have been used to facilitate interactions between clients and their AI systems with a meaningful and compassionate approach in accordance with the client's need for empathic support and understanding to improve psychological well-being. AI has the potential to enhance empathic conversations by introducing human-AI collaboration systems. These technologies can provide automated and actionable responses with higher levels of empathy, complementing the support provided by humans [53].

Next, the use of *Virtual Reality* (VR) in the treatment of phobias by simulating situations that are the source of fear such as heights or narrow spaces so as to provide an experience that is close to reality. This provides an opportunity for the client to face the source of fear but in a safe and controlled environment [54].
This is also the case in the use of *Augmented Reality* (AR), where clients with social anxiety disorder can practice speaking in front of a virtual audience that appears in the real environment. The goal of both of these trials is the design of realistic real-life simulation environments with greater accuracy, thus enabling the achievement of ecological validity [54].
In the aspect of mental health monitoring, the use of AI technology is done by combining 3 methods at once: *first,* virtual counseling to fulfill continuous emotional support. *Second, the* provision of precision therapy that aims to analyze client data comprehensively so that the treatment provided is more effective and accurate. And *third, the* design of an AI-based diagnosis system to support early detection of symptoms of mental health disorders to produce more accurate diagnoses. With the combination, a more holistic and integral mental health care can be achieved [55].

### 5.3.2 Policy and Regulation

Regulation and supervision of AI in healthcare is crucial as the role of AI is increasing in the healthcare field [56]. Although AI offers a lot of potential, there are major concerns about privacy, data security, and ethics [57, 58]. It is therefore crucial to balance the benefits of AI use with ethical considerations, ensuring that advances in AI are utilized responsibly and in the best interest of its users [59, 60].
In Indonesia, one of the main problems related to this issue is the absence of a clear and comprehensive regulatory framework governing the use of AI in the health sector, especially mental health. Setting ethical guidelines as well as a strong regulatory framework for the use of AI for mental health services is essential to ensure that AI applications meet high safety and ethical standards so that they can be used responsibly and effectively. Data privacy and security measures, bias mitigation, and maintaining the human element in therapy are essential in building trust, reducing disparities, and providing ethical and high-quality mental health services [61, 62].
In 2023, WHO released a publication on regulations related to artificial intelligence (AI) for health. The publication emphasized the importance of establishing the safety and effectiveness of AI

systems, quickly providing systems that are suitable for users, and encouraging dialogue between stakeholders such as developers, regulators, manufacturers, psychologists, health workers, and of course users [63]. In developing regulations, matters such as data security, interoperability between systems, and equality of access should be top priorities [56]. And last but not least, for effective regulation, it must encourage innovation and at the same time comply with national standards, namely KEMENKOMINFO and international standards such as WHO and the *Health Insurance Portability and Accountability Act*.

## 6 Conclusion

Based on a comprehensive analysis of the literature, this study successfully identified various applications of AI in mental health and the challenges that accompany them. The challenges and future directions of AI for mental health care are dynamic and diverse. There are four concerns regarding AI: *first,* loss of jobs for humans; *second,* unethical decision-making; *third,* robot-led takeover; and *fourth,* uninterpretable decision-making [64].

Some of these can be solved by developing behavior-based digital biomarkers, redefining diagnosis, facilitating early detection of mental disorders, continuous learning systems that can assess patients in context, tools for clients and psychologists to better understand the illness and themselves, personalized approaches to diagnosis and treatment, and built-in computational models that make mental health care safer, more efficient and personalized [65].

In addition, a strong regulatory framework needs to be formulated, model validation and transparency ensured, and continuous research and development are important steps in utilizing AI to improve mental health services. As AI technology continues to evolve, these efforts are instrumental in shaping the future of mental health, making it more accessible, practical, and ethical for individuals [59].

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