AI in Mental Health

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ABSTRACT

Mental health disorders affect 970+ million people globally, with 75%+ treatment gaps in developing countries. This chapter examines AI's transformative potential through machine learning, natural language processing, computer vision, and wearable technologies enabling early detection, personalized interventions, and continuous monitoring. Current applications show promise: CBT chatbots like Woebot and Wysa reduce depression/anxiety symptoms; digital phenotyping platforms detect relapses days earlier; computer vision systems enhance PTSD screening. However, challenges exist including algorithmic bias against minorities, privacy concerns, system opacity, and over-reliance risks. The chapter explores future directions emphasizing human-AI collaborative frameworks, federated learning for privacy protection, and explainable AI for transparency. Successful implementation requires interdisciplinary collaboration between computer scientists, healthcare professionals, ethicists, and policymakers for equitable mental health care delivery.

1. INTRODUCTION: THE RISE OF AI IN MENTAL HEALTH

Mental health disorders have emerged as a critical global challenge, affecting over 970 million people worldwid. Depression alone stands as the largest contributor to disability globally, yet mental health systems remain chronically underfunded and unevenly distributed. The treatment gap in low- and middle-income countries exceeds 75%, creating an urgent need for innovative, scalable solutions. In this context, artificial intelligence (AI) presents unprecedented opportunities to transform mental healthcare delivery.

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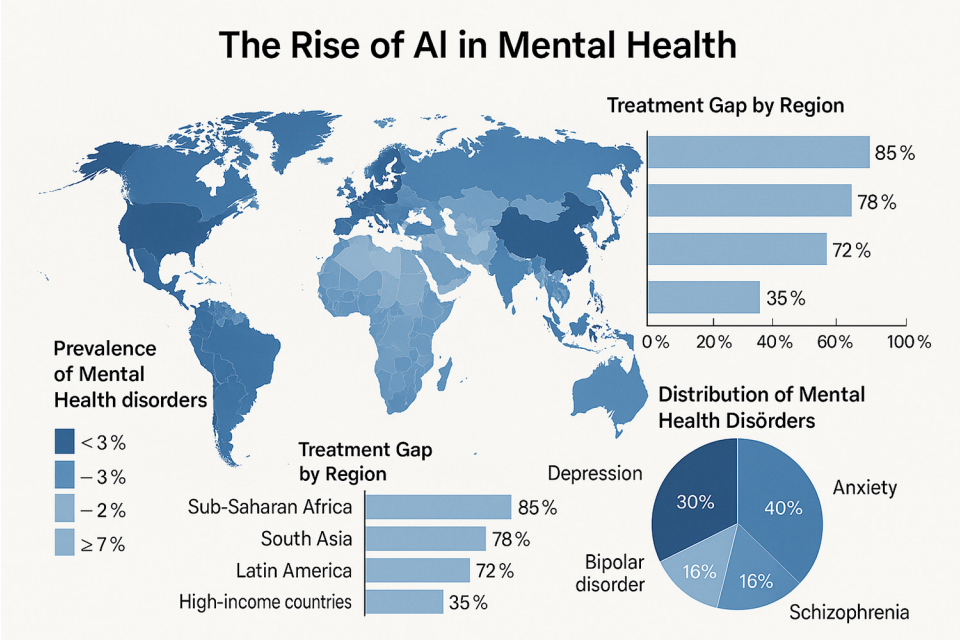
Figure 1. Global Challenges in Mental Health



1.1 The AI Revolution in Mental Healthcare

Artificial intelligence has evolved from theoretical exploration to practical implementation across multiple sectors. In mental healthcare, AI techniques including machine learning (ML), natural language processing (NLP), computer vision, and multimodal sensing are revolutionizing how we diagnose, predict, treat, and monitor mental health conditions. Recent breakthrough studies demonstrate the practical viability of these technologies. For instance, (Jiang et al., 2026) developed a novel non-contact screening tool using Vibraimage technology that achieved 95.7% overall accuracy in detecting depressive disorder among psychiatric outpatients, with sensitivity of 99.8% and specificity of 78.8%. This innovative approach quantifies head-neck micro-movements through 30-second video captures, offering rapid diagnosis without traditional time-consuming mental examinations.

Similarly, advances in wearable technology are enabling continuous mental health monitoring. (Subathra et al., 2025) introduced a wearable electronic band for stress understanding using machine learning algorithms, demonstrating how physiological sensors can provide real-time psychological assessment. These technological innovations create new possibilities for both clinical settings and digital platforms, enabling earlier interventions and expanding access for underserved populations.

1.2 Addressing Healthcare System Challenges

Traditional mental healthcare faces persistent obstacles: professional shortages, social stigma, lengthy wait times, and culturally misaligned services. AI offers meaningful solutions to these barriers