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The emergence of AI in mental health: A transformative journey

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Abstract

This paper traces the evolution of Artificial Intelligence (AI) in psychiatry, from early attempts like the ELIZA program to the integration of neuroimaging studies and the emergence of digital interventions. Utilizing deep learning models, AI now demonstrates high accuracy in classifying psychiatric disorders, such as schizophrenia based on functional connectivity patterns. The rise of AI chat/therapy bots, exemplified by Woebot and Tess, addresses mental health challenges, providing accessible and effective cognitive behavioral therapy tools. Innovative interventions like avatar therapy and intelligent animal-like robots contribute to broadening therapeutic perspectives. While AI-based interventions offer advantages in reducing stigma and increasing accessibility, challenges including diagnostic accuracy, legal responsibilities, and privacy concerns must be carefully considered. Despite challenges, the significant potential of AI in psychiatry calls for large, controlled trials, national standards, and responsible integration into clinical practice. The convergence of AI and psychiatry represents a technological revolution poised to transform mental health care delivery globally.

Keywords: Mental Health; AI emergence; Transformative journey; Evolution of AI

1. Introduction

The field of psychiatry has gone through a radical change in medical engineering where AI is the most recent technology and the most promising area by which the complex issues related to the mental health care could be addressed. This is because it becomes necessitated to deliver more tailor-made, efficient and accessible approaches to fill the gap of the unprecedented demand for mental health services worldwide. Through COVID-19 pandemic the crisis situation has been accentuated that existed previously and now computer science was utilized to improve the delivery of the treatment of mental health.

The area where AI is high is diagnosis support. AI-based algorithms are being designed to look through huge amounts of data (genetic markers, brain imaging scans and behavioral patterns) in order to find mental health disorders at an early age and make a recently correct diagnosis. These algorithms not only see what humans miss but also identify the correlations and patterns that are beyond the human eye. They are able to change the diagnostic process drastically, finding earlier interventions with the help from these new tools. In addition, AI is redefining the horizon of psychoeducation through the invention of the latest applied tools and software for delivering the information and interventions associated with psychotherapeutic activities. AI chatbots and therapy bots, which come with natural language processing abilities, can interact one-on-one with users, offering tips, strategies, psychoeducation, and encouraging the user. Such virtual agents provide not only a confidential, but also an extremely accessible way of receiving psychological support, mainly for those who can't get the traditional face to face therapy due to various reasons.

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Human-like AI-powered virtual agents as well as computer-generated avatars which are interactive tools are also put to use in psychotherapy sessions. These virtual avatars, which are created to imitate human kind of interaction, can function as virtual therapists and they give the guidance to the individuals, which is based on the evidence techniques and interventions. Implementing the cognitive-behavioral therapy approaches and other strategies, virtual avatar promises to be extending the therapy techniques and provide mental health services to the under resourced population.

The enhancement of the intelligent robots with animal-like souls leads to a new unexplored area in the AI assisted mental healthcare. Such robots imitating the behaviour and attributes of therapy animals, provide a special application of emotional care and support to individuals fighting mental illness. In this way, by interacting with users in an open-minded and sympathetic way, such robots can provide comfort, calm anxiety, and allow for emotional expression especially for those patients who are in hospitals, clinics, and nursing homes.

2. Navigating the Evolution of AI in Psychiatry: From ELIZA to Neuroimaging

AI is the domain of psychiatry, featuring a journey of computer systems intrinsically similar to intellect of humans. Proceeding from primitive attempts as simple as the ELIZA program in the 1960s which was based on imitating psychological dialog, AI has drastically developed throughout the years in terms of precision and effectiveness. The merging of AI for neuroimaging research over the last 20 years has propelled the diagnosis accuracy and understanding to an exceptional level. Via advanced deep learning algorithms researchers have been able to manipulate neuroimaging data, especially that of functional magnetic resonance imaging (fMRI) to unearth complex patterns that lie beneath psychiatric disorders. Among all is the very interesting use of deep learning algorithms in the classification of psychiatric conditions such as schizophrenia by construction of functional connectivity patterns from resting state fMRI scans. These advanced modeling that exploits extensive repositories of neuroimaging data, showcase an impressive performance in discriminating between different psychiatric phenotypes, which provide necessary assistance in the diagnostic process to clinicians. The integration of AI into the neuroimaging field sheds light on the complex neural network that is associated with psychiatric disorders, thus showing potential in the understanding of the cause behind the disease process and generation of patient-specific treatment protocols. Also, the increasing dominance of the digital gaming interventions and smartphone apps has brought about a new era of mental health care delivery. These innovative platforms utilize gamification principles and engaging interfaces to deploy evidence-based interventions, including the CBT (cognitive-behavioral therapy) and behavioral change techniques, in a compelling and interactive way. Through immersive game-playing that is designed as a skills-building tool, users are able to regulate their emotions and connect with others, which makes it a game-changer in challenging conventional barriers to engagement and compliance.

The fusion of AI with digital therapeutics not only extends the reach of mental health interventions but also augments their effectiveness through personalized feedback, progress tracking, and adaptive intervention delivery. By harnessing the power of technology to seamlessly integrate therapeutic principles into individuals' daily lives, these digital interventions empower users to cultivate resilience, manage symptoms, and foster long-term well-being. Moreover, the scalability and cost-effectiveness of these digital solutions render them particularly well-suited for addressing the burgeoning global demand for mental health support, especially in resource-constrained settings.

3. The Rise of AI Chat/Therapy Bots: A Digital Response to Mental Health Challenges

The perplexing and multi-dimensional nature of mental health difficulties, precipitated by the enormous repercussions of the COVID-19 pandemic, has propelled the adoption of AI-powered chatbots as core instruments that strive to ameliorate access to psychiatric care. An illustrative instance of such new technology is Woebot, a chatbot designed to provide CBT interventions utilising neuroscientific evidence. Whether it's through the Facebook Messenger or dedicated mobile apps, Woebot is the perfect illustration of the paradigm shift in mental healthcare by offering personalized tips and procedures at the users' convenience.

A landmark randomized controlled trial showed that Woebot achieved a better result in reducing the symptoms of depression, than the e-book reading had done as a therapy delivered by traditional methods. Woebot, using dialogues and exercises as a means, facilitates a therapeutic partnership with the users, inspiring them to spot unhealthy thought patterns, develop coping skills, and deal with life's inevitable stress with greater resilience. Digital platforms that Woebot leverages for scalability and accessibility facilitate overcoming location and logistical limitations and help more individuals, who utilized to face barriers, get access to the conventional mental health services.

Tess, similar, is another AI pioneering initiative in the mental health space, which interacts with the users through text interface and participates in therapeutic conversations and interventions. She combines the underlying principles of empathetic listening and psychotherapeutic techniques that are evidence-based into a virtual companion and guide, and she accompanies individuals through events of emotional turbulences and provides personalized approaches for self-care and emotional regulation. Through creation of a virtual human such as Tess, the distance between old-fashioned therapeutic modalities and the virtual world is being decreased using the powerful possibilities of technology to provide people in need with proper and well-timed support that is readily available and stigma-free.

Implementing AI-powered chatbots like Woebot and Tess in the mental health sphere will bring about a profound paradigm shift in how therapy is delivered. It makes therapy more democratic, allowing patients to benefit from evidence-based interventions and to take the lead in self-care. In addition to providing immediate comfort during crises situations, these virtual companions have the potential to erase mental health from the stigma list and hence urge a culture of self-care. Nevertheless, any AI-based intervention, like other technological innovations, one needs to remain vigilant of the ethical challenges, privacy assurances and ongoing monitoring for the best outcomes and protection of user safety, efficacy, and care. By continuing to work together between clinicians, scientists, programmers and users, we will be able to use to the full extend AI's potential and to the best of our abilities to reform mental health support and shape a more kind and inclusive world.

4. Avatar Therapy and Intelligent Animal-Like Robots: Broadening Perspectives

The blending of technology and mental health through pioneering interventions like avatar therapy demonstrated by applications like Replika represents a novel method to aid self-awareness and emotional self-discovery. Through these channels, people have therapeutic conversations with digital avatars that act as empathetic listeners and guides to encourage their personal growth and self-discovery. Virtual Therapy relies on state-of-the-art avatar technology to create authentic virtual characters that create a sense of interaction and acceptance between the users and their virtual friends.

For people dealing with such conditions as schizophrenia, the avatar therapy shows great potential in suppression of hallucinations and alleviating stress. Through delivery of a secure and controlled atmosphere where users can try and master difficulties thoughts and experiences, avatar therapy brings power to its users as they learn the skills of coping with their mental wellbeing. Additionally, these approaches are characterized by high level of interactivity, which is a source of comfort and support to people who struggle through the complicated nature of their mental health condition.

Intelligent robot-like animals, such as Paro and eBear, are another innovative area in AI-assisted mental health care, in the form of tangible comfort and companionship. Motivated by the curative strength of human-animal interaction, the robots have sensors and algorithms that allow them to respond to user's emotional cues and provide individualized support. They elicit warmth and affection of the living creatures and hence act as sources of emotional management as well as stress relief not only in the clinical settings where it may be impossible or inconvenient to have therapy animals available.

Additionally, robots like Kaspar and Nao are creating an innovative private sector for the treatment of ASD children which involves educational as well as therapeutic interactions. The robots will be entertaining and attractive to the children. These features will help them as social companions to teach children how to play games with structure and develop good communication skills. Through repeated, ordered social contacts, on the one hand, Kaspar and Nao give the opportunity for children with ASD to practice and improve their social competencies, and on the other hand, they aid independence and social integration within the communities.

The merging together of avatar therapy and smart robotic confidantes into mental health care is a new thinking within the field which has seen a transformational shift in the approach of delivering care. Through using technology to enhance the existing psychotherapeutic techniques, these creative interventions open up privileged opportunities for self-discovery, emotional support, and improvement of life skills. Nevertheless, just as is the case with any other technological innovation, it is indispensable to approach them in a responsible manner by taking into account ethical, privacy, and fairness issues which guarantee human decency, dignity, and well-being of all users. Through ongoing collaboration of clinicians, scientists, technologists and patients, we can channelize the opportunities of these interventions to enable a compassionate, inclusive and effective approach to mental health services.

5. Discussion: Navigating the Promise and Challenges

Although AI-powered systems are a very promising component of mental care treatments, however, it should be noted that they come with a set of difficulties related to their introduction. Despite the advantages this gig may have, like the decrease of stigma, cost-effectiveness, and improved accessibility, the main issue of which needs to be carefully balanced is that potential limitations and risks.

The issue that may come from AI-assisted interventions is that they often neglect the level of clinical judgment and empathy one is bound to look for in an expert psychotherapist. Virtual agents and chatbots serve as an important communication channel, we have to still be aware that it is hard for them to correctly identify complex psychiatric diseases and slightly expressive patients' emotions. Therefore, the risk of the misinterpretation or the mismanagement of symptoms remains, which underlines the significance of the integrated system, in which the role of human beings who are able to supervise the process and provide the treatment should be strengthened.

This too it is worth noting that the deployment of AI mental health interventions is further hampered by privacy issues as well as confidentiality of patients. It is compulsory for practices to follow the regulations like the HIPAA in order to protect the patient information and to ensure the integrity and security of the e-health records. Incorporating AI in healthcare to supplement clinicians in the care-giving responsibilities while still upholding the legal and moral accountability continues to be a major concern for clinicians and developers. However, the impact of AI in psychiatry is not negotiable, even in spite of its arising obstacles, especially with regards to the chronic deficiency of mental health care providers. AI-empowered tools are potent in giving impetus to the already-existing psychiatric resources, expanding the reach of the mental health services and offloading strained healthcare systems. Although this potential might be realized, the execution of the work calls for the allocation of resources to scientifically prove the performance of AI and its security through rigorous clinical trials, which should be done on a large scale.

Creation of national standards and guidelines relevant to the responsible use of AI in clinical practice is the biggest priority to be followed by all healthcare facilities to maintain the consistency, quality and safety requirements of their patients. By facilitating the cooperation of researchers, physicians, policy makers, and technology designers, we will have the chance of delineating and setting the best practices and guidelines for the ethical development, deployment, and evaluation of AI based mental health therapies.

As technology developments of mental health applications keep evolving, one thing remains vital: constant research and meticulous risk assessments. They are essential for a better understanding of the intricate relationship between technology and human welfare. As AI evolves, we should prioritize transparency, accountability, and patient-centered care. We can then use its capabilities to reshape mental health care while respecting the confidentiality and autonomy of the patients.

6. Conclusion: A Technological Revolution in Mental Health Care

Crossroad of artificial intelligence (AI) and psychiatry is worth mentioning as breakthrough of the solidarity approach to struggle with the epidemic of mental diseases that support peoples life continuity worldwide. The inevitable role of technology leads to a transformative phase which opens up many exciting opportunities to revolutionize how mental health care is delivered. As we are close to the turning point and the new paradigm we have to cope with, it is important to join in technological disruption, to remain attentive to the potential problems that accompany it, and to be vigilant about ethical considerations.

The adulteration of AI components in psychiatry has the potential to accentuate the availability, effectiveness and economies of mental health and social support worldwide. From diagnostic supports to therapeutic places, AI tools/platforms superintending on the human expertise, extending the service outreach for mental health as well as enabling individuals to play an active part in self-care process is the potentiality of the technology.

While the fast speed of technology progression provides a motor for the trendy changes in the way we communicate and work, this speed also assumes a certain set of issues and considerations which have the need to be considered with care. However, data privacy and security risk emerges about any such system that may lead to breached individual's confidentiality and might make the system be ineffective. What is needed is strong regulations, systems, and procedures that protect individuals' rights and to mitigate the risks associated with it. Notably, the built-in limitations of AI algorithms, for instance, biases and errors, add to the need of continuous assurance, refinement, and human supervision in formulations and application of AI-based interventions.

Regardless of these disadvantages, this multidisciplinary combination of AI and psychiatry may represent the powerful tool to transform mental health care in the future. Technological innovation can be leveraged to strengthen humans' abilities and to meet the needs of evidence-based interventions. This way, an approach to mental health support can be designed, in which everyone from anywhere has equal access to these facilities, irrespective of their location or income. As we are moving to a new mental health care system, a multidisciplinary approach acting together between mental health professionals, mental health researchers, mental health app developers, healthcare policymakers, and mental illness survivors, is the fundamental one. There is a great opportunity that the AI presents to us by moving together to do address the challenges and subtleties of mental health care delivery in the digital era. Through this we may harness a transformative effect of AI that can alleviate human suffering, promote resilience, and have holistic well-being by individuals and communities around the globe.

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