Artificial Intelligence (AI) and algorithms have become a fixture in our lives. Many organizations need to implement AI in order to stay competitive. In the brand-new AI book *"Data Science for Decision-Makers and Data Professionals"*, the author takes you through this field in ten chapters, covering the hallmarks of intelligent, data-driven organizations and the importance of AI Covered topics range from formulating an AI-first strategy to Big Data architecture, the many types of algorithms, privacy legislation, and ethics. A bright future for AI The author of this book envisions a bright future where artificial intelligence (AI) and business intelligence. (BI) can contribute to solving complex issues in business and society. He introduces the AI-first principle and describes how the latest developments in the field of data science and machine learning can benefit you, but not without casting a critical eye on them. This book also addresses the dark sides, pitfalls, and failure factors of this novel technology AI enables data-driven working Empower.

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AI enables data-driven working

Empowered by AI and many kinds of algorithms, organizations can now make essential improvement efforts and effectively innovate to stay ahead of the competition. The most essential algorithms and machine learning models are covered in this unique AI handbook, bringing data-driven working to life. From simple functions and business rules to regression models, random forests, cluster analyses, and Bayesian networks, including so-called genetic algorithms.

Artificial Intelligence book contributes to a better world

Entirely up-to-date and presented in beautiful hardcover, this edition of the AI book contains many practical examples. The author covers positive and inspiring AI stories that illustrate how AI can benefit people and society when it comes to health, safety, sustainability, and economics. Continuous improvement and innovation using data are two important themes that run through this essential book for ambitious (business) managers, project managers, executives, and their employees.

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Artificial Intelligence in Mental Health Examples, Benefits & Trends

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Abstract

Mental health disorders are on the rise globally. At least 10% of the population is affected, with almost 15% percent of adolescents experiencing a mental health condition and suicide being the fourth leading cause of death among those aged between 15 and 29. As a key contributor to morbidity and mortality, mental illnesses are projected to cost the world's economy around $16 trillion between 2010 and 2030. No one seems to know exactly why depression and anxiety are so common nowadays. The rise is attributed to multiple contributing factors, from the demands of modern society to the impact of the COVID-19 pandemic that has aggravated existing mental health issues. Some experts even argue that what we see is just an increasing awareness of mental health disorders resulting in a surge of people actively seeking treatment. Indeed, the number of adults receiving inpatient or outpatient care or counseling has been steadily rising in the US in the last two decades. At the same time, access to care is still limited, says Mental Health America in its 2023 report. Almost 30 million US adults with a mental disorder do not receive any treatment.

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1. Introduction and Background:

Recent research in social robotics has shown that the degree of anthropomorphism (human likeness) in a social robot can significantly impact how individuals perceive and interact with it. This study delves into how consumers respond to social robots in consumption settings, a topic that has gained increasing interest among consumer researchers. Meanwhile, the fields of marketing and psychology have provided extensive evidence on the persuasive effects of messages on target audiences. This study aims to bridge these areas of research by investigating how the degree of human likeness in a robot can influence the persuasiveness of the messages it conveys.

AI for mental health is gaining a foothold across clinical practice, already now. In particular, the following technologies have the most potential for an impact:

- Machine learning (ML) and deep learning (DL) that provide greater accuracy in diagnosing mental health conditions and predicting patient outcomes
- Computer vision for imaging data analysis and understanding non-verbal cues, such as facial expression, gestures, eye gaze, or human pose
- Natural language processing (NLP) for speech recognition and text analysis that is used for simulating human conversations via chatbot computer programs, as well as for creating and understanding clinical documentation

While ML algorithms and computer vision applications are quite mature fields, with universal use cases across industries, research on the use of AI for mental health treatment is in its infancy.

Unlike radiology or pathology, where AI demonstrates better accuracy than humans, mental healthcare is commonly described as an exclusively human field. There is scepticism among mental health practitioners that artificial intelligence solutions for mental health will ever be able to provide emphatic care, which they believe is vital.

However, people do like chatting with chatbots and can even develop an emotional connection with them. We are not talking here about the unsettling intimate bond developed between a lonely man and an AI operating system in the movie Her, but rather

about people's willingness to pour their hearts out anonymously to an AI companion. People tend to believe that robots don't judge, are unbiased, and can provide instant answers to health-related questions.Just as important, talking to technology might help.

Multiple meta-analyses have confirmed that computer-aided cognitive behavioral therapy (CBT) delivered via desktop or mobile apps is equivalent to or even more effective than standard CBT. The National Institute for Health and Clinical Excellence (NICE) in England first recommended computerized CBT packages for depression, panic, and phobias back in 2006 on the grounds of clinical and cost effectiveness.9Moreover, studies suggest that the AI chatbot experience of people struggling with mental health issues has been overwhelmingly satisfactory.

More research is definitely required on the adoption of AI for mental health treatment, but the Food and Drug Administration (FDA) in the US has already relaxed policies for a broader use of digital therapeutic tools for individuals with mental health conditions.

1.1. Analyzing patient data to assess the risk of developing mental health conditions, classify disorders, and optimize treatment plans

Today, AI is used to analyze electronic health records (alongside blood tests and brain images), questionnaires, voice recordings, behavioral signs, and even information sourced from a patient's social media accounts. Data scientists employ a variety of techniques, such as supervised machine learning, deep learning, and natural language processing, to parse patient data and flag mental and physical states — pain, boredom, mind-wandering, stress, or suicidal thoughts — associated with a particular mental health disorder. Researchers from IBM and University of California have recently analyzed 28 studies exploring the use of artificial intelligence in mental health and arrived at a conclusion that, depending on the choice of an AI technique and quality of training data, algorithms manage to detect an array of mental illnesses with 63-92% accuracy.

1.2. Conducting self-assessment and therapy sessions

This category is largely represented by keyword-triggered and NLP chatbots. They offer advice, track the user's responses, evaluate the progression and severity of a mental illness, and help cope with its symptoms — either independently or with the help of a certified psychiatrist waiting on the other end of the virtual line.

The most popular AI-powered virtual therapists include Woebot, Replika, Wysa, Ellie, Elomia, and Tess.

For instance, the artificial intelligence chatbot Tess delivers highly personalized therapy based on CBT and other clinically proven methods, along with psychoeducation and health-related reminders. The interventions are done via text message conversation, meaning that emotion identification relies solely on language processing. An international team of scholars has tested the chatbot among a group of students to find out that the individuals who conversed with Tess daily over a period of two weeks displayed a significant reduction in mental health symptoms compared to participants who had sessions less frequently.

Another AI chatbot example, Ellie, not only understands words but can also interpret non-verbal signs, such as facial expression, posture, or gestures to comprehend an individual's emotional state and choose the right words to alleviate stress and anxiety.

The category also includes AI-powered mental health tracking tools. They may work in tandem with wearable devices that measure heart rate, blood pressure, oxygen levels, and other vital signs indicating changes in the user's physical and mental well-being. One of such solutions is BioBase, a mental health app that leverages AI to interpret sensor data coming from a wearable. Designed to help companies prevent employee burnout, the mental health tracker reportedly helps reduce the length and number of sick days by up to 31%.

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1.3. Enhancing patient engagement

AI is becoming an integral part of patient engagement strategies adopted by healthcare organizations to improve and personalize patient experience.

Apart from helping users cope with their mental health conditions, AI chatbots are also used to make access to care as simple and frictionless as it is in many other service sectors. Healthcare organizations are embracing conversational AI to process phone calls, make appointments, provide patients with information on how to get to the provider, or deliver health education.

AI technologies are also incorporated into mobile apps and reminder systems to facilitate communication with a patient and assist interventions aimed at tracking their adherence to medication or treatment and empower them with knowledge on the importance of such adherence.

Implementing AI for improving patient outreach is another way to drive patient engagement. AI-powered tools can identify at-risk patients and automate outreach messages.

1.4. Equipping therapists with technology to automate daily workflows

Due to the very nature of mental health conditions, psychiatrists can seldom rely on legacy tech tools or other physicians' advice when interpreting medical data and devising treatment plans for patients. One way to lessen the administrative burden could be the implementation of AI-driven mental health platforms that automatically retrieve information from miscellaneous IT systems within a hospital and generate on-demand reports about every single patient's progress, current condition, and possible outcomes. An early example of such systems is OPTT, an AI platform that provides a rich selection of tools for mental health professionals looking to increase the capacity of their clinic. Preliminary research indicates that OPTT could improve access to quality mental healthcare by up to 400%.

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2. Persuasion and Source Credibility:

Studies in psychology have highlighted the importance of source credibility in message persuasiveness. One key factor influencing source credibility is the perceived similarity between the source and the message receiver. While it may be expected that higher perceived similarity between a highly anthropomorphic robot and a consumer would lead to more positive perceptions, this study challenges this assumption. Drawing from the concept of the uncanny valley effect, which suggests that a robot that is "too" humanlike may evoke feelings of eeriness, this study proposes that high levels of perceived similarity may actually reduce the persuasiveness of a message delivered by the robot.

3. Exploring Mechanisms:

This study also aims to delve into the underlying mechanisms that explain the relationship between a social robot's degree of human likeness and its impact on message persuasiveness. Specifically, the research posits that consumers may experience a sense of discomfort when interacting with highly humanlike robots, which in turn diminishes the persuasiveness of the messages they convey. This aligns with previous findings on out-group homogeneity in social psychology, suggesting that people are less sensitive to physical differences among individuals from different racial or ethnic groups.

The hopes pinned on artificial intelligence apps and platforms for mental health care can be attributed to the following benefits AI delivers:

- **Affordability**. Unlike traditional counseling where you need to schedule and travel for appointments, AI-based and other mental health apps allow users to access therapeutic help anywhere, anytime. Moreover, they provide help at little or no

cost, compared to costs associated with in-person therapy, missed work, the need to make other arrangements, and commute.

- **Accessibility**. AI-based apps remove such barriers to mental health treatment as staff shortages across the board and a lack of providers in rural and remote areas. This is important, since more than 100 million people in the US live in so-called Health Care Professional Shortage Areas. Location-agnostic AI chatbots and platforms can see you whenever you need and spend as much time with you as you need.
- **Efficiency**. Artificial intelligence algorithms for mental healthcare have already been proven to be successful in detecting symptoms of depression, PTSD, and other conditions by analyzing behavioral signals. Other studies have shown that algorithms can spot behavioral symptoms indicative of anxiety with over 90% accuracy and are 100% accurate at predicting who among at-risk teens are likely to develop psychosis. They also help patients struggling with mental distress: a randomized controlled trial conducted by AI chatbot Woebot researchers has revealed that participants experienced a substantial decrease in depression and anxiety after just two weeks of using the app.
- **Privacy and ease to open up**. AI-based therapists make people feel less self-restrained when they may need to share embarrassing details. This is especially important for those who can feel shame in face-to-face interactions because of stigma or fear of being judged. Actually, almost a quarter of people lie to doctors, with the most hushed topics being smoking, drinking habits, and sexual activity. For many, it's easier to admit the true extent of their behavior to a robot because the robot won't judge.
- **Support for therapists**. "AI could be an effective way for clinicians to make the best of the time they have with patients," says Peter Foltz, a research professor at the University of Colorado Boulder. This is because AI can track and analyze substantial amounts of data faster and even more efficiently than any human. As a result, algorithms help with more accurate diagnoses. They can also spot early signs of trouble by monitoring the patient's mood and behavior and alert clinicians so that they can quickly adjust treatment plans. This can be lifesaving for suicidal patients who need regular check-ins.

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3.1 Current AI trends in mental health

Mental health tech continues to be the best-funded space in digital health despite the ongoing impacts of macroeconomic factors like inflation, supply chain disruptions, and interest rates.

In the booming 2021, mental health tech companies raised $5.5 billion worldwide (324 deals), a 139% increase from the previous year that recorded 258 deals, according to CBInsights' State of Mental Health Tech 2021 Report."As the pandemic continued to exacerbate mental health issues (such as anxiety and depression), there was growth in demand and investor interest in digital tools that enhanced mental healthcare delivery," the report said.A number of startups that are using AI in mental healthcare have closed notable deals in 2022 as well. Among them is the AI chatbot Wysa (20$ million in funding), BlueSkeye that is working on improving early diagnosis (£3.4 million), the Upheal smart notebook for mental health professionals (€1.068 million), and the AI-based mental health companion clare&me (€1 million).An analysis of the investment landscape and ongoing research suggests that we are likely to see the emergence of more emotionally intelligent AI therapists and new mental health applications driven by AI prediction and detection capabilities.For instance, researchers at Vanderbilt University Medical Center in Tennessee, US, have developed an ML algorithm that uses a person's

hospital admission data, including age, gender, and past medical diagnoses, to make an 80% accurate prediction of whether this individual is likely to take their own life. University of Florida researchers are about to test their new AI platform aimed at making accurate diagnosis in patients with early Parkinson's disease. Research is also underway to develop a tool combining explainable AI and deep learning to prescribe personalized treatment plans for children with schizophrenia.

3.2 Tentative Methodology:

The study will employ experimental methods, utilizing images of three different types of social robots with varying degrees of human likeness. Pre-testing will establish the level of anthropomorphism for each robot. Established scales will be used to measure both message persuasiveness and participants' sense of discomfort. The specific context for the persuasion scenario (e.g., charitable donation, product recommendation) is currently under consideration. Additionally, participant demographics and technology readiness will be assessed as control variables

Conclusion: Like with many healthcare apps, there can be an issue of compliance with the GDPR, HIPAA, and other industry-specific guidelines. But there's much more to that with artificial intelligence. One of the most significant challenges of implementing AI for mental healthcare is the potential for bias in AI systems, which can come with insufficient and poor quality databases. Another challenge is the lack of transparency over the use of algorithms and their decision-making logic that can hinder AI adoption due to distrust. There are also concerns about data privacy and security, with AI system often requiring large amounts of sensitive patient data to function properly. Finally, integrating AI tools into existing healthcare systems can be difficult and time-consuming, especially when many medical professionals need training to effectively use AI-based tools.However, AI is a work in progress, and we know that we are making progress. There will be new developments for sure as we are making strides toward a future where AI can help us provide better mental healthcare for those who need it. The mental health crisis needs to be addressed, and AI can play a crucial role.

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