Chatbots as Therapy Support for Psychological Disorders and Mental Health: Chances and Challenges

Bachelorarbeit

zur Erlangung des akademischen Grades „Bachelor of Science (B. Sc.)“ im Studiengang Wirtschaftsingenieur der Fakultät für Elektrotechnik und Informatik, Fakultät für Maschinenbau und der Wirtschaftswissenschaftlichen Fakultät der Leibniz Universität Hannover

vorgelegt von

Name: Borchers **Vorname:** Finn

Geb. am: **in:**

Matrikelnummer: **Fachsemester:**

Adresse:

Prüfer: Prof. Dr. Michael H. Breitner

Betreuerin: M. Sc. Fenja Schulte

Hannover, den 08.10.2023

Table of Content

List of Figures **3**

List of Tables **3**

List of Abbreviations **3**

List of Appendixes **4**

1. Introduction **5**

1.1 Motivation and Relevance 5

1.2 Research Questions 7

1.3 Aim and Structure 8

2. Technical Background **9**

2.1 History of AI 9

2.2 Narrow vs. General AI 10

2.3 Statistical Language Models 11

2.4 Generative Pre-Trained Transformer 12

3. Methodical Procedure **14**

4. Results and Findings **23**

4.1 Literature Results 23

4.2 Case Study “Statsy – Virtual Companion” 37

5. Discussion **58**

6. Limitations and Further Research **62**

7. Conclusion **64**

8. References / Bibliography **65**

9. Appendix **69**

10. Declaration of Honor **84**

1. Introduction

1.1 Motivation and Relevance

Psychological disorders and mental health issues have become a significant global concern affecting millions or even billions of individuals worldwide. An estimated 29% of people may experience mental disorders in their lifetime, indicating the widespread nature of these conditions (Abd-Alrazaq et al., 2021).
Every year, one out of every four adults and one out of every ten children are at risk of experiencing mental health issues (Abd-Alrazaq et al., 2020). On a global scale, major depression holds the distinction of being the primary contributor to years lived with disability and ranks as the fourth leading cause of disability-adjusted life years (DALYs) (Narynov et al., 2021). Young people are particularly at risk, as suicide is the second leading cause of death worldwide (Koulouri et al., 2022).
Mental disorders have a substantial economic impact, with an estimated loss of $16 trillion in the global economy between 2011 and 2030 due to lost labor and capital output (Abd-alrazaq et al., 2019).

Despite barriers like perceived stigma, negative attitudes toward treatment options, poor experiences with caregivers and long waiting times, the access to mental health services remains a challenge, transcending borders and cultural boundaries. Mental health services are accessible to only 15% of individuals in developing countries and 45% in developed nations, which might be a significant contributing factor to the rise in suicidal behavior observed in recent decades (Abd-Alrazaq et al., 2020).
Also, there is a general global shortage of mental health professionals, with a significant disparity between developed and low-income countries in terms of the availability of psychiatrists. In developed nations, there are approximately 90 psychiatrists available for every 1,000,000 individuals. Conversely, low-income countries face a significant scarcity, with as few as 0.1 psychiatrists for every 1,000,000 people (Abd-alrazaq et al., 2019).

However, amidst these challenges, technological advancements, especially in the field of Artificial Intelligence (AI), offer potential avenues for providing support and addressing the mental health needs of individuals. One such emerging technology is chatbots, which have gained recognition as a promising tool for therapy support. Chatbots are computer programs designed to simulate human-like conversations, capable of interacting with users in natural language. These virtual agents can provide a range of support, for example psychoeducation and apply cognitive behavioral therapy.

The use of chatbots as therapy support holds significant potential benefits. They can offer accessible and cost-effective mental health services, reaching individuals who may face barriers in accessing traditional therapy.

Furthermore, chatbots can provide continuous support, they are available 24/7 everywhere and anytime, while ensuring immediate responses to individuals in need. They offer a non-judgmental and confidential environment that encourages users to express their emotions and concerns freely. More than 80% of the participants in a study indicated that it was easier to talk about sensitive questions with a chatbot than with a human (Lee et al., 2020).

However, the integration of chatbots into mental health support systems also presents various challenges. Ensuring the ethical use of personal data and maintaining user privacy and confidentiality are critical considerations in the development and implementation of chatbot-based interventions. Additionally, concerns about the ability of chatbots to truly replicate the empathetic and nuanced nature of human-to-human interactions in therapy remain.
Addressing these challenges requires careful research, development, and evaluation to optimize the effectiveness and acceptance of chatbots as therapy support tools.

This work aims to explore the chances and challenges of utilizing chatbots as therapy support for psychological disorders and mental health. By investigating the current state of research and examining real-world applications, this study seeks to contribute to the understanding of how chatbots can be effectively integrated into mental health interventions.

7. Conclusion

The main research question of this thesis, *"How does a state-of-the-art chatbot app for mental health potentially maximize user engagement?"*, can be answered in that there are a whole range of different functions and features to consider.

These include important aspects such as therapist engagement and connectivity to therapy services, high user-centricity, a well-designed intelligent chatbot system with high-quality communication capabilities, high personalization capabilities, distress detection features, science-based knowledge content, privacy and security transparency, explanation of the chatbot's purpose, chatbot embodiment, a well-designed user journey, and gamification elements.

With recent developments in AI technologies, the use of chatbots for therapy support is becoming even more realistic, with many studies already demonstrating their effectiveness in treating mental disorders. Challenging is the balancing act between high engagement and on the other hand avoiding overdependency of users.

On the one hand, the case study of *Statsy* shows how difficult it is to engage users to a chatbot with AI-generated responses.
On the other hand, *Statsy* lays the groundwork for future work and building a state-of-the-art chatbot app that uses a whole range of different features to promote user engagement and thus improve users' mental health.