



Building Personality-Adaptive Conversational AI for Mental Health Therapy

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Abstract

Many people with mental health problems cannot get professional help for various reasons such as lack of awareness, unavailability, unaffordability, etc. A virtual conversational agent can offer an alternative to deliver mental health care that is accessible, affordable, and scalable. However, building such agents using a one-size-fits-all approach may not be effective for everyone, as different individuals have different personality types that dictate how they communicate with chatbots. Therefore, developing therapy chatbots that can adjust to the user's personality is important. In this work, we present the important role of personality-adaptive conversational agents (PACAs) in the context of mental healthcare. We designed an architecture around traditional machine learning (ML) models and open-source large language models (LLMs) to build a PACA for mental health therapy, developed a working prototype based on it, and conducted a user study to conclude that personality-adaptiveness is indeed an important feature for mental health chatbots.

Our research was based on the iCare Project [1], and the associated development was meant to minimize the limitations of the project. We designed the PACA to adapt its responses according to the personality profile of the user created over time. The personality profiles were based on the results from a text classification model fine-tuned for the Big Five Personality Traits[2] with a classification accuracy of 96%. We self-hosted an open-source LLM which made use of accumulated personality information through prompt engineering. The final setup was able to generate adapted therapeutic responses with an average response time of 10 seconds using different hyperparameter tuning and fine-tuning approaches.

We conducted a user study among 20 subjects to compare the performance of the personality-adaptive chatbot with its non-adaptive counterpart and found that the adaptive feature almost doubled the number of users who found the chatbot relevant and helpful for their mental healthcare needs. 75% of users felt comfortable discussing any sensitive topic with the adaptive chatbot in comparison to 45% for the non-adaptive chatbot. The PACA prototype validated the feasibility of creating accessible personalized mental healthcare solutions using advanced ML techniques and the results from the user study highly recommend the implementation of PACA into mental health chatbots. The prototype is currently live and freely available for use.

CCS Concepts

• **Computing methodologies** → **Natural language processing; Supervised learning; Intelligent agents; Neural networks; Supervised learning by classification**; • **Applied computing** → **Health care information systems**.

Keywords

large language models, mental healthcare, chatbot, paca, conversational AI, personality, prompt engineering, fine-tuning

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References

- [1] Remya Mavila, Sugam Jaiswal, Raghav Naswa, Weichao Yuwen, Bill Erdly, and Dong Si. 2024. iCare - An AI - Powered Virtual Assistant for Mental Health. In *2024 IEEE 12th International Conference on Healthcare Informatics (ICHI)*. 466–471. <https://doi.org/10.1109/ICHI61247.2024.00066>
- [2] Sonia Roccas, Lilach Sagiv, Shalom H Schwartz, and Ariel Knafo. 2002. The big five personality factors and personal values. *Personality and social psychology bulletin* 28, 6 (2002), 789–801.