PsychSPT: A Novel AI System for Mental Health Assessment Using Large Language Models (LLMs)

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The global mental health crisis, affecting over 970 million people, presents significant societal and economic challenges, highlighting the urgent need for effective mental health assessment solutions. This research adopts a design science approach to decompose mental health assessment into three core tasks: representation learning, classification, and reasoning. Existing studies often fail to holistically address these tasks, neglecting key criteria such as practicability, scalability, and accessibility critical for healthcare information systems. Additionally, the absence of a loneliness detection dataset, standardized reasoning evaluation frameworks, and clear dataset design criteria hampers progress in unifying these tasks. To address these gaps, PsychSPT, a novel training framework, is proposed. It integrates document-level pre-training, strategic layer freezing, multi-task and multi-loss learning, and distilled narrative-reason training to advance all three tasks. PsychSPT achieves state-of-the-art performance. In addition, a publicly available Loneliness Detection dataset is introduced, developed based on proposed criteria, along with a reasoning evaluation framework. These contributions provide actionable solutions for mental health assessment while offering adaptability to other NLP domains. Additionally, a web application was developed based on the PsychSPT to provide an accessible, automated tool for multiple use cases, e.g. tracking individual mental health trends over time and assessing group mental health conditions.

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