Anxiliary: A Novel Wearable Body Sensor Based Machine Learning System for the Detection, Tracking, and Intervention of Anxiety Disorders

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Anxiety disorders affect 284 million people worldwide, yet anxiety diagnostic and intervention tools remain largely inaccessible, unaffordable, and stigmatized. Thus, there is an urgent need to create an accessible and personalized anxiety diagnostic and intervention system. To create such a system, a long-term wearable device that continuously monitors electrical impulses of the heart (ECG) and electrical properties of the skin (EDA) was utilized and wirelessly integrated with three machine learning algorithms and a mobile application. The first two algorithms utilized biomedical engineering methods to extract crucial features from ECG and EDA signals to detect real-time anxiety with a 93% accuracy and to categorize the severity of anxiety with a 78% accuracy. Information regarding the detected anxiety is stored in a retrievable database accessible to healthcare providers for diagnostic purposes. The third algorithm consisted of a conversational AI trained on recognizing cognitive distortions and administering auxiliary cognitive behavioral therapy (CBT-based convAI). The mobile application incorporated graphical representations of user anxiety patterns and encouraged users to partake in intervention activities and the CBT-based convAI when moderate-to-high anxiety is detected. This system was deemed successful as it encompasses accurate detection, intuitive tracking, and immediate intervention to provide an accessible and affordable tool for anxiety patients and has the potential to expand and mitigate other mental health disorders faced by 13% of the global population.

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