EPVR-AIM: Emotion Prediction and Virtual Reality AI Model

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Stroke survivors often face cognitive challenges and neurodegeneration due to stroke- induced secondary neurodegeneration (Ong). This project aimed to address this by developing and testing EPVR-AIM, an AI-driven model that combines EEG-based emotion prediction with personalized virtual reality (VR) environments and violin music to enhance cognition in stroke victims. It was hypothesized that the AI-driven virtual reality environments, therapeutic violin music, and emotion recognition code could effectively predict the stroke victim's mood and improve cognitive function. Participants engaged in a four-week study containing cognitive tasks, such as word searches and math quizzes, paired with VR and music therapy. EEG data was filtered, processed, and analyzed to extract band powers/features and predict emotions using a human-assisted prediction model and machine learning algorithms – k-nearest neighbors, random forest, and support vector machines. Among those, random forest demonstrated superior accuracy in predicting emotions (97.43% accuracy). Predictions made by the models ultimately aided the selection of personalized VR environments and violin music. Cognition was evaluated through puzzle completion times, error rates, and self-reported difficulty. A paired t-test and an ANOVA for word search times showed $t = 6.24$, $p = 0.0072$, and $f = 0.3541$. The same tests for the math quiz revealed that $t = 4.1445$, $p = 0.009$, and $f = 0.1647$ ($p<0.05$ indicates statistical significance). This indicates how improvements between weeks 1 and 4 are significant, but not between consecutive weeks. Ultimately, EPVR-AIM proves to be a useful addition in understanding how AI, VR, and music can combat neurodegeneration in stroke victims.

Awards Won: