NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE
School of Computer Science and Engineering
College of Engineering

EEG-Based Mental States Recognition

For Arousal Self-Regulation System

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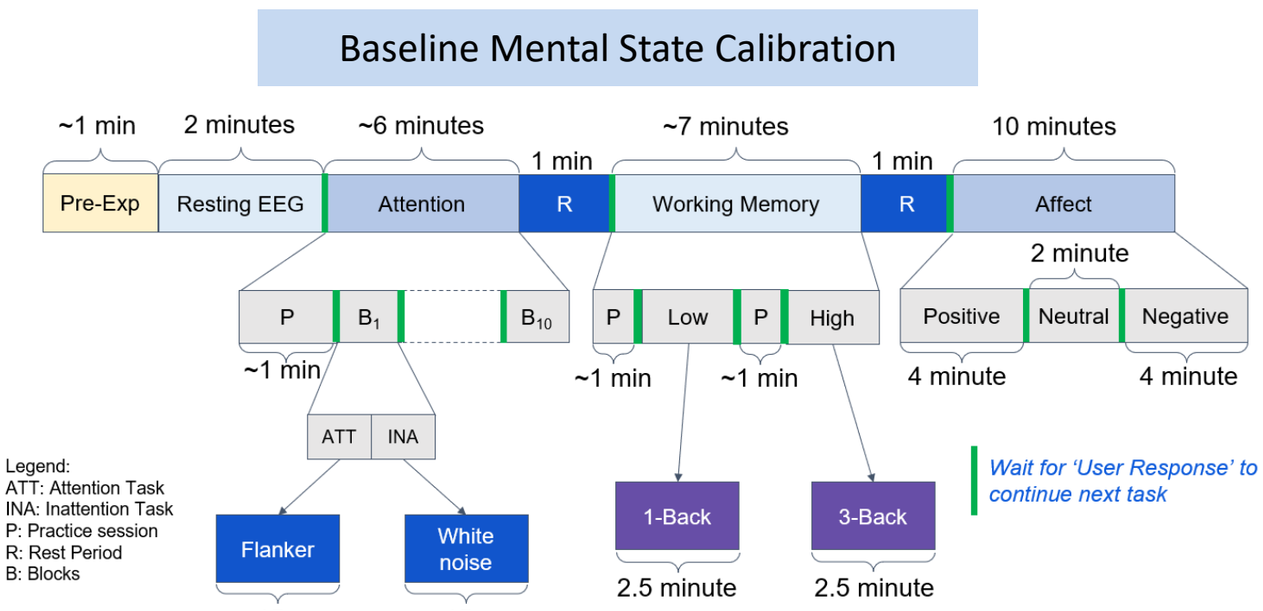
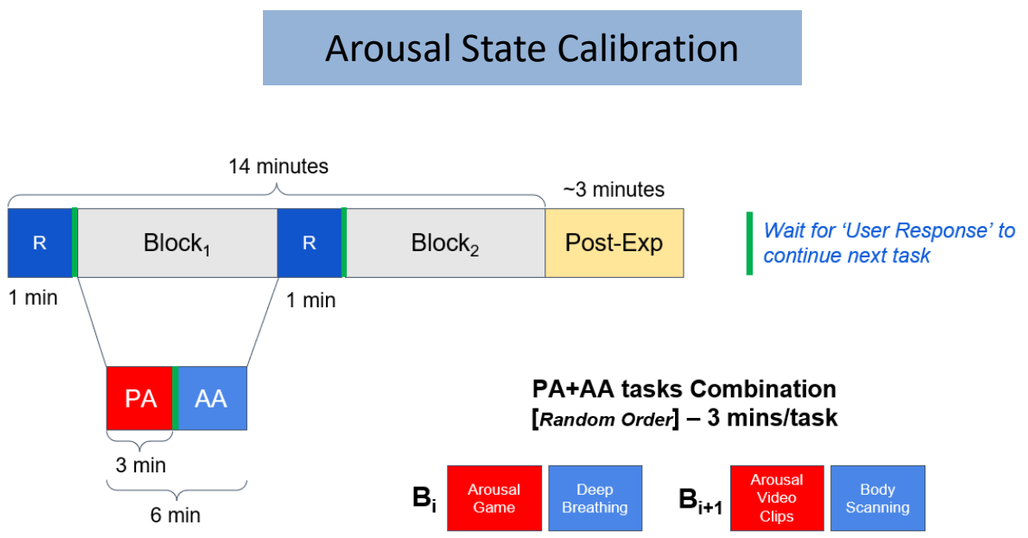
Research Goals

- To improve EEG-based arousal classification using personalized stimuli & tasks.
- To design a calibration protocol that includes Baseline Mental States (Attention, Working Memory and Affects) and Pro vs Anti Arousal States.
- To implement an online VR-based Arousal Management & Training system with EEG real-time neurofeedback in self-regulating arousal states.





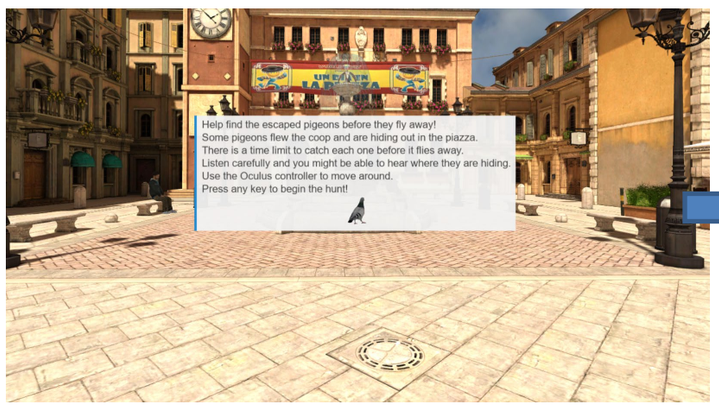
Technical Contribution

- Developed Calibration Protocol to train EEG-Based Classifier Models using CNN Deep Learning
- Incorporated Stimuli Personalization to improve elicitation of affective and arousal states
- Collected data from 35 subjects with subject independent cross-validation for model performance evaluation
- Developed VR-based Real-time Arousal Training to evaluate effectiveness of EEG-based neurofeedback training

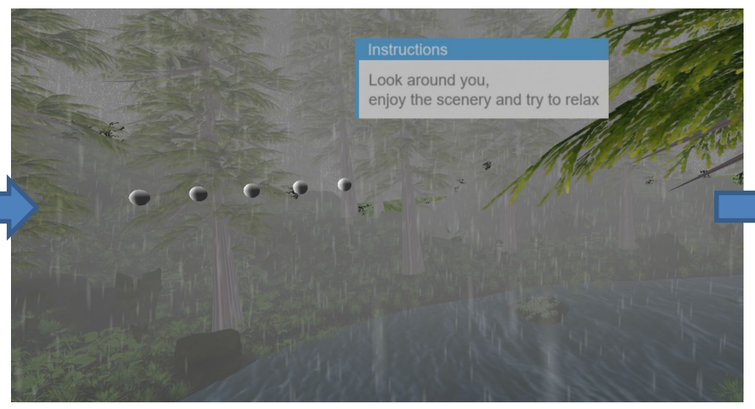
Results

- **Baseline models:** Attention, Working Memory and Affects using subject independent classification achieved accuracies of 67.77%,60.60% and 52.98% respectively
- **Arousal model:** Combination of Arousal Gameplay and Body Scanning using subject independent classification achieved accuracy of 88.1%

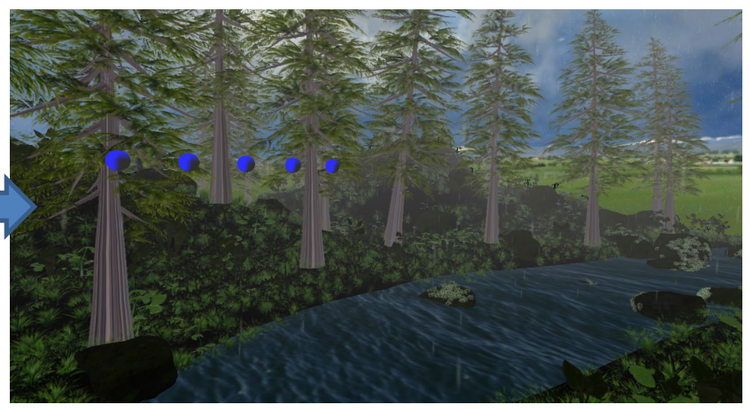
Proposed Arousal Management Training System



Arousal Inducing



Arousal Reducing



Incorporating Neurofeedback