REPPERGER RESEARCH INTERN PROGRAM

RESEARCH PROJECT #: AFRL-RHB-25-01

Neurotechnology-Enabled Cognitive Performance Monitoring and Enhancement

PROJECT DESCRIPTION: The aim of the research is to identify cognitive, ocular, physiological, and neural biomarkers that are predictive of immediate or future cognitive performance (decision making, specifically). Data will be collected through a combination of neural (e.g., EEG, fNIRS), peripherial (e.g., eye tracking), behavioral, and physiological sensors. The multimodal data will be fused and subsequently analyzed using sophisticated machine learning techniques to derive actionable insights about an individual's decision-making progress and quality. The goal is to eventually develop algorithms and tools leveraging relevant biomarkers to provide personalized interventions for maintaining and augmenting cognitive performance.

LEARNING OBJECTIVE: Depending on the student's interests, there will be an opportunity to experience aspects of cognitive neuroscience experiment development, data collection, data analysis and visualization, neural and physiological sensor testing and development, multi-sensor data fusion, and algorithm development. Coding experience (MATLAB, Python, or R) is preferred, but guidance will also be provided as appropriate.

ACADEMIC LEVEL: Undergraduate; Masters; Doctoral

DISCIPLINE NEEDED:

- Cognitive Neuroscience
- Biomedical Engineering
- Data Science

RESEARCH LOCATION: Wright-Patterson Air Force Base, Dayton, Ohio

RESEARCH MENTOR: William R Aue, Ph.D.
Experimental Psychology; Cognitive, Brian and Behavior, Syracuse University, 2014

Dr. William Aue is a Research Psychologist in the Cognitive Neuroscience Section of the 711th Human Performance Wing at the Air Force Research Laboratory (AFRL). Dr. Aue's current research is focused on the data-driven development of neurotechnology-enabled solutions to sense, assess, and augment warfighter cognitive performance. Current projects include work exploring the potential for neuromodulation and personalized interventions to enhance decision making performance; research exploring cognitive, neural, and physiological biomarkers of decision-relevant cognitive states; and collaborative work with industry partners developing cutting-edge neurotechnology and algorithms for real-time cognitive state classification for monitoring and augmenting warfighter decision making.

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