REPPERGER RESEARCH INTERN PROGRAM

RESEARCH PROJECT #: AFRL-RHW-26-06

Analysis of human perception of sound in different data collection paradigms

PROJECT DESCRIPTION: Listening in real-world environments involves complex signals, typically comprised of multiple complex signals that require time-critical judgements regarding acoustic generating objects' presence, identity, and location. Each of these judgements are required to act and react appropriately (e.g. sounds of traffic approaching a crosswalk encouraging a faster pace, looking "up" to see the Care Flight helicopter). Perception researchers have argued that human response times for these judgements reflect the time course of underlying cognitive processes and perception mechanisms. An individual's ability to consistently make these judgments, and the correctness of the responses, when applied to aircraft sounds, has been of particular interest to our team in the Air Force Research Laboratory. We have conducted studies measuring response times to explore decision-making with stimuli consisting of numerous aircraft signals from real measurement and simulated data. This effort applies common response time models (e.g., shifted wald distributions, drift diffusion, and linear ballistic accumulator) to explore the impact of changing stimulus and masker attributes on the perception of real and simulated aircraft signals.

LEARNING OBJECTIVES: Students will be exposed to data processing and cleansing, but the focus will be on the development of cognitive models of response time. A number of models used to describe and predict response will be fit to the human performance data to describe the response time. Further analysis of these models' parameters will provide opportunities to describe the impact of various acoustic parameters on human perception. Ultimately, the goal is to connect timbre features of the stimulus, masker, and stimulus-masker combinations to model the changes in human performance.

ACADEMIC LEVEL: Undergraduate; Masters; Doctoral

DISCIPLINES NEEDED: Data Science, Psychology, Physics

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

RESEARCH MENTOR: Frank S. Mobley, Ph.D.
Mechanical Engineering, University of Dayton, 2012

Dr. Mobley has been working with RH for 24 years and has focused on physical acoustics and descriptions of the aircraft sound emissions. Dr. Mobley completed a graduate certificate in Data Mining from The Ohio State University in 2019. With this knowledge, he has explored relationships between physical and psychophysical phenomenon and acoustic information, to understand how to build more accurate and robust models of human performance. He currently is focused on models of detecting, tracking, and classification of small unmanned aircraft systems.

Photo courtesy of Air Force Research Laboratory

The material was CLEARED on 10 Dec 2025; Reference Number: AFRL-2025-5591.