

REPPERGER RESEARCH INTERN PROGRAM

RESEARCH PROJECT #: AFRL-RHW-24-08

Speech Intelligibility through Low-Bandwidth, Non-Linear Communication Systems

PROJECT DESCRIPTION: The ability to communicate between team members is of critical importance to Air Force missions. This is often facilitated through communication systems that have a limited bandwidth, and that have non-linear signal processing (e.g., compression, clipping, and vocoding) to maximize the signal strength and the amount of speech information that is transmitted to the receiver. While there are good tools for predicting the effects of noise and reverberation on speech intelligibility (e.g., the Speech Transmission Index and the Speech Intelligibility Index), there are not yet good predictors of the effects of these non-linear systems on speech intelligibility. Such predictors are critical for the acquisition of new communication system components, which currently have to undergo extensive human subject testing to demonstrate that they meet requirements. In this project, the objective is to develop a model for predicting the intelligibility of speech transmitted through a non-linear communication system by comparing test signals that have been transmitted through the system to the input signals, and by applying knowledge of linguistics to determine how much useful speech information is transmitted. The student intern will learn how to collect audio recordings in a scientific environment. They will use basic audio signal processing and programming to develop a model through the application of phonetics and linguistics. The student intern will report research updates in weekly meetings and participate in team-based research efforts. They will present research findings through presentations and/or publications.

ACADEMIC LEVEL: Undergraduate; Masters; Doctoral

DISCIPLINE NEEDED:

- Computer Science
- Linguistics
- Electrical Engineering

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

RESEARCH MENTOR: Eric Thompson Ph.D.
Applied Hearing Research, Technical University of Denmark, 2009



Dr. Eric Thompson is a research engineer in the Cognition and Modeling branch (RHWE) of the Air Force Research Lab. His research interests have dealt with the interactions of sound and humans, including auditory perception and cognition, audio signal processing, spatial hearing and spatial audio, hearing protection, and speech communication.

RESEARCH MENTOR: Sarah Bibyk, Ph. D
Brain and Cognitive Sciences, University of Rochester, 2016



Dr. Sarah Bibyk is a Research Psychologist in the Air Force Research Laboratory (AFRL), within the Cognitive Models Branch. She leads efforts related to language adaptation and communication resiliency in both human-human and human-machine teams. Her work focuses on determining what kinds of linguistic behaviors make for effective communication between team members, and how teams establish and maintain “common ground” to accomplish their task. She also contributes to efforts investigating how we can measure, quantify, and evaluate whether or not members of a team have “mutual understanding” related to their team task. Dr. Bibyk received a PhD in Brain and Cognitive Sciences from the University of Rochester.