DEPARTMENT OF BIOMEDICAL ENGINEERING
COLLEGE OF ENGINEERING AND APPLIED SCIENCES

RESEARCH OPPORTUNITIES FOR UNDERGRADUATE students

APPLICATION DEADLINE: September 22, 2025

PROJECT TITLE: MRI Evaluation of Central Auditory Pathway Preservation Following Deafness

Physical Requirement :
Must be able to lift 10 pounds

Project's Technical Skills Requirement :
Python/MATLAB programming

Project's Available Positions : One Spring 2026 Co-Op

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Project Description

Outcomes following cochlear implantation vary widely, particularly among patients with long durations of deafness. This variability limits clinicians' ability to predict who will benefit from the procedure, complicating clinical decision-making. Neurobiological changes in the auditory pathway due to prolonged auditory deprivation (central auditory plasticity) are hypothesized to underlie this variability, but objective markers of these changes remain poorly characterized.

Diffusion tensor imaging (DTI), a magnetic resonance imaging (MRI) technique sensitive to white matter microstructure, offers a non-invasive avenue to assess subcortical auditory pathways. A robust DTI approach to examine potential structural biomarkers to differentiate "good" from "poor" adult cochlear implant candidates remains a goal for the community. We seek to develop a DTI processing pipeline to obtain tracts connecting several key auditory brainstem nuclei (e.g., cochlear nucleus, superior olivary complex, inferior, medial geniculate body) such that we may will quantify population-based variations in white-matter preservation or loss that may result after years of deafness. Such variations may provide a surgeons a potential guide for the potential benefit derived from cochlear implantation.