



Project Proposal for Ph.D.

Project Details	
Project Title	Analysis of the tongue movements in speech articulation using wearable ultrasound technology
Project Summary (Minimum 500 and maximum 2000 characters)	The project aims to investigate the dynamics of tongue movements during speech articulation--during the production of pitch or tone within identical segmental sounds. Scrutinizing the relationship between speech acoustic features and ultrasound signals, the research aims to illuminate the underlying mechanisms of tongue movements in speech production. The project will study how different vowels influence tongue positions when articulating the same consonant sound, as well as how the placement of the tongue varies when producing the same vowel with different consonants. The project will involve analyzing the tone pattern of a tonal language sound system to experiment with the research questions. The PI will help in selecting the language (a Trans-Himalayan language), based on his or her preference. Data will be recorded, both audio and ultrasound, from several native speakers. The research will also help us to understand the tonal patterns within the language, providing insights into the grammar of tongue movements. Through this multifaceted approach, the project will deepen our understanding of speech production processes and shed light on the complex relationship between articulatory gestures and linguistic structures. The PhD candidate will also work closely with the lab members in the development of a wearable ultrasound device for capturing tongue movements, which is an ongoing effort in the laboratory. The candidate will receive training in both acoustic phonetics and ultrasonic analysis at the beginning of the project.

Ph.D. Supervisors			
Role	Name of Faculty	Academic Unit in IITD/Institute/University	Email ID (Official)
Supervisor 1	Sahiinii L Veikho	HUSS	sahiinii@iitd.ac.in
Supervisor 2	Biswarup Mukherjee	CBME	bmukherjee@iitd.ac.in

Project requirements (Student qualifications, experience required, etc) *The candidate will be shortlisted based on common shortlisting criteria decided by ScRC (SIRe)
- B.Tech in Electronics and Communication/Electronics and Instrumentation/Electrical Engineering/Data Sciences or related disciplines. - M.Tech/M.S (Research) Electronics and Communication/Electronics and Instrumentation/Electrical Engineering/Data Sciences or related disciplines. - Strong background in digital and analog signal processing. - Experience in image processing, machine learning methods. - Must be proficient in MATLAB and/or Python. - Experience in electronic hardware design will be preferred.

Source of fellowship/funding (CSIR/UGC/DBT/ICMR/ICAR/NEET-PG/DST-INSPIRE/IRD/FITT Project details, if any)
Institute fellowship/ Project fellowship

Role of Faculty Members involved:	
Supervisor-1	Supervise the student in designing the project, acoustic phonetic analysis, data collection, tone analysis. Prof. Sahiinii Veikho leads the Speech Lab at IITD.
Supervisor-2	Design of wearable ultrasound probes, acquisition and processing of ultrasound signals, development of algorithms for real-time detection of speech using ultrasound. Prof. Biswarup Mukherjee leads the RISE Lab at IITD.