COMMUNICATION SCIENCES AND DISORDERS
COLLEGE OF ALLIED HEALTH SCIENCES

SUMMER RESEARCH OPPORTUNITIES FOR UNDERGRADUATE WOMEN

APPLICATION DEADLINE: 03/01/2021

PROJECT TITLE: <u>Developing a Smartphone App for Voice and Cough Monitoring</u>

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Project Description

In recent years, healthcare has transformed to involve at-home health monitoring for patient-centric care and empowerment. Although smartphone-based health monitoring applications (apps), smartwatches, and other wearable devices have become common place, there is a paucity of equivalent options in the fields of voice and cough monitoring. At present, only one voice monitoring app is available on the market, but it is costly and cumbersome. Moreover, the available app does not provide immediate biofeedback to patients, limiting the patient's ability to take an active role in their own health. Therefore, the primary objective of our work is to develop a smartphone app to collect and monitor voice and cough symptoms for clinical care purposes and to provide immediate biofeedback to patients.

We have an innovative research plan that includes the following: i) our app will be universally available at no cost, or, at most, for a one-time nominal fee (for administration purposes only), ii) we will develop a user-friendly interface with specific focus on older-adult usability (since voice and cough disorder prevalence increases with increasing age), iii) we will create multiple input modalities including subjective symptom reporting via standardized questionnaires, objective acoustic voice and cough analysis, and "free writing" space for journaling subjective experiences, and iv) our app will provide immediate biofeedback and tracking via questionnaire outcomes and acoustic measures for the patients. We believe our app will increase patient ownership, buy-in, and agency for their own health.

A wise scholar will be joining a research team with professionals from speech-language pathology, laryngology, biomedical engineering, computer science, and graphic design. The scholar will be working alongside other students and professionals to develop on-app acoustic processing and assess app usability

and accessibility during piloting with participants.

Qualifications
• Preferred academic background: biomedical engineering, electrical engineering, or computer science
• Preferred skills: familiarity with machine-learning (python-based Sikitlearn libraries) and deep-learning (either Tensorflow or Pytorch)
• Preferred skills: app development experience for Android or iPhone and/or programming abilities for app development (e.g., C, C++, JAVA)

Knowledge/Skills WISE scholar will acquire:
• Data ethics and integrity via CITI Training, IRB on-boarding, and lab on-boarding
• Working with research participants: how to discuss research consent, how to acquire and save data with a research participant
• Knowledge of voice and cough disorders (e.g., laryngeal anatomy and physiology)
• Acoustical data processing skills
• Cross-discipline collaboration skills: speech-language pathology, vocal health specialists, computer scientists, biomedical engineers, graphic designers, and physicians (laryngology)

Suggested Readings
Grillo EU. An Online Telepractice Model for the Prevention of Voice Disorders in Vocally Healthy Student Teachers Evaluated by a Smartphone Application. Perspect ASHA Spec Interest Groups. 2017;2(3):63-78. doi:10.1044/persp2.SIG3.63

Majumder S, Deen MJ. Smartphone Sensors for Health Monitoring and Diagnosis. Sensors. 2019;19(9). doi:10.3390/s19092164

Vhaduri, S. et al. (2019). Nocturnal cough and snore detection in noisy environments using smartphone-microphones. IEEE International Conference on Healthcare Informatics (ICHI). Pp 1-7.