Stony Brook University

Biomedical Informatics Special Seminar

Nil Gurel

Ph.D. Candidate, School of Electrical and Computer Engineering, Georgia Institute of Technology

Coping with Trauma: Noninvasive Vagal Nerve Stimulation for Acute Stress and Its Real Time Biomarkers in PTSD

Monday, April 13, 2020 11:30 am—12:30 pm

Abstract:

Exposure to traumatic events, from military combat to sexual assault, may generate strongly encoded intrusive memories. Trauma-related neuropathways have the opportunity to repeatedly activate in vulnerable individuals, and may eventually lead to posttraumatic stress disorder (PTSD) and autonomic imbalance associated with it. Electrical stimulation of the vagus nerve – the longest cranial nerve, which regulates the autonomic state – using an implantable device is a potential treatment method to address such imbalance. Noninvasive vagal nerve stimulation (nVNS) devices offer inexpensive and low-risk alternatives to surgical implants, but their effects on the physiology are not well understood. Continuous and noninvasively obtained biomarkers are required to tailor therapy and to close the loop for automated delivery.

In this talk, I will present my research on noninvasive sensing and neuromodulation with applications in stress and PTSD. First, I will discuss how noninvasive sensing modalities could be used in conjunction with signal processing methods to quantify a person's autonomic state. Second, I will present that pairing nVNS with traumatic reminders in patients with PTSD reduces the fight-or-flight response to emotional triggers, with investigations in multiple dimensions: downstream physiological effects, brain imaging, and biochemical biomarkers. I will particularly focus on acute physiological biomarkers of nVNS and their potential for closing the loop for personalized neuromodulation and titration of therapy. Finally, I will advocate how these biomarkers could be instrumental in a machine learning guided neuromodulation scheme, applicable outside of clinical settings.

Bio:

Nil Gurel is a Ph.D. candidate in the School of Electrical and Computer Engineering at Georgia Institute of Technology. She is particularly interested in the applications of wearable sensing, signal processing, and machine learning for mental health. She received her M.S. in Electrical and Computer Engineering from University of Maryland, College Park, MD where she was a Clark Fellow, and her B.S. in Electrical and Electronics Engineering from Bogazici University, Istanbul, Turkey. She is the recipient of Runner-up Best Paper Award from the 2018 IEEE Body Sensor Networks Conference, Best Paper Finalist Award from the 2018 IEEE Engineering in Medicine and Biology Conference, and Runner-up Best Poster Award from the 2019 IEEE Biomedical Health Informatics Conference. She was also named a Rising Star in EECS by MIT in 2018.

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Questions? Please call the Biomedical Informatics Department at 631-638-2590.