# University of Houston - Biomedical Engineering Seminar
# Friday, February 7 at 12 noon, Room Science 105


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# Signatures of Hypoxia; Detection and Relation of Subband EEG bursts


## Abstract

Hypoxia, caused by low oxygen at high altitudes, impairs cognitive and perceptual functions, posing risks for aircraft pilots. In this talk, I will be reviewing how hypoxia has been shown to affect neural activity and our current study, which detects these hypoxia-induced changes in EEG activity, focusing on burst dynamics across specific frequency bands during progressive oxygen reduction. Participants underwent cognitive tests under a normoxia (21% O2) and hypoxia (14.3% to 8.1% O2) condition. Using a dual-threshold, amplitude-based detector, bursting activity was detected. Significant increases in EEG burst features were observed in the θα and β bands, with δθ changes emerging during severe hypoxia, coinciding with task abandonment in some participants. Strong correlations were found between burst features and behavioral metrics like $SpO_2$, heart rate, and task performance. These findings show proper detection of novel neurological signatures of hypoxia, offering potential for real-time EEG monitoring in aviation to enhance warning systems and improve flight safety.


## Biosketch

Matthew J. Hall is a PhD Candidate in the Clinical Neural Engineering Lab at the University of Houston and Mayo Clinic Rochester. He specializes in signal processing and bioinstrumentation, developing novel methods for the detection of cognitive changes from neural activity in EEG. Currently, he works closely with the Naval Medical Research Unit within the Dept. of Defense, the Navy's designated research laboratory for environmental health effects and aerospace medical research. He has also worked with the Dept. of Neurosurgery at M.D. Anderson and Mayo Clinic, for accurate recognition and mapping of sensorimotor and language activity during awake craniotomies. His previous research in bioinstrumentation and computer science at the University of Texas (B.S. 2020) and spike classification at Carnegie Mellon (M.S. 2022) have given him experience in machine learning for fast and efficient interpretation of neural data. He continues to hone these skills alongside his PhD research, working on all stages of the engineering pipeline, from hardware to software design.