PURDUE UNIVERSITY | Department of Biological Sciences | 150 PURDUE BIOLOGY

NEUROSCIENCE AND PHYSIOLOGY SEMINAR SERIES

QIWEI DONG

PhD Student | Department of Biomedical Engineering | Purdue University

"Longitudinal Impedance Modeling of Ultramicroelectrode Arrays in Vivo"

Chronic neural implants often show changing impedance over weeks to months, but current impedance measurement approaches rarely explains why performance shifts or whether a device is truly stable. In this seminar, I will present a longitudinal, model-based methodology to evaluate chronic neural interface stability using full-spectrum in vivo electrochemical impedance spectroscopy (EIS) from ultramicroelectrode arrays. The method begins with consistency checks to identify measurements that cannot be reliably modeled, while the validated measurements are then fit with process models that map impedance features onto interpretable components. These components include solution/tissue contributions, charge-transfer pathways, and non-ideal capacitive behavior. This approach turns impedance spectra into a set of time-resolved parameters that can be compared across channels, stimulation conditions, and implant ages, providing quantitative stability metrics and potential early-warning indicators of failure. More broadly, impedance-based modeling offers a path toward mechanistic benchmarking of neural interface designs and a principled way to connect electrical measurements to biological and materials processes at the brain–electrode interface.

HOSTED BY:
NEUROSCIENCE AND PHYSIOLOGY (N&P)

LEARN MORE AT:
https://www.bio.purdue.edu/calendar/index/html

TUESDAY, MARCH, 3 | 12:30 PM | LILY 1-117