

Neural Prosthesis Seminar

“Emerging Translational Tools for the Exploration and Potential Treatment of Neurological Disease”

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Biomedical Research Building 105
Case Western Reserve University



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Abstract:

This talk will present reflections on the design challenges and potential opportunities of building translational tools to interface with the nervous system. The current state of device-based neural interfacing can be cast in a dynamic control intelligent agent framework such that the nervous system is the environment, the neural stimulator is the actuator, tools to collect clinical data are the sensors, and the physician's judgment is the state estimator and control policy. This model helps to frame the types of opportunities available to advance neuromodulation the treatment of disease by modulating neural information flow.

In particular, technology can potentially address two factors limiting the performance of current systems: “observability,” the ability to classify the state of the physiological system from sensor measurements, and “controllability,” the ability to steer the system to a desirable state using some form of physiological actuation. To address these factors, the field needs to create novel sensors, actuation methods, and algorithms and then synthesize them together. However, technology alone is probably not enough to fully address unmet needs; hardware innovations must be combined with better understanding the fundamental neural processes underlying disease, which is currently an evolving science.

From this perspective, we will discuss the challenges and opportunities of designing translational technology for interfacing with and studying the nervous system. By designing flexible systems to explore a broad set of physiological questions, we have an opportunity to cross-leverage scientific know-how across multiple biomedical applications. Examples of synergy will be taken from work in several animal models that highlight how novel research instrumentation is starting to help answer key questions about the dynamics of the nervous system relevant to chronic disease. A case study from a recently released responsive stimulator for chronic pain will illustrate the translation of these technology concepts to clinic.

For more information, please contact Cheryl Dudek at (216) 231-3257.

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