Training Hybrid ODE-ANNs for Model Discovery in Systems Physiology: Application to the Lower Urinary Tract

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12:00 – 1:00 PM
BMI Classroom 4004
Woodruff Memorial Research Building

or

Join us on Zoom link:
https://zoom.us/j/92563278126
Meeting ID: 925 6327 8126

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Abstract: Simulating physiological systems is a powerful tool for generating hypotheses and for rapid prototyping of experimental treatments, but we often lack a full mathematical description of the system, which stimies our ability to simulate it. This talk explores a new approach to fill the gaps of missing ordinary differential equations (ODE) with small artificial neural networks (ANN). The goal is to train the entire hybrid ODE-ANN such that the embedded ANNs become approximations to the missing ODEs that can infer important but unmeasured physiological states of the system. The hybrid model (mostly) preserves interpretability and can be used to simulate the physiological system, thereby restoring our ability to study it computationally despite incomplete knowledge. We will explore the framework we are developing to build and train such hybrid ODE-ANN systems and deploy it for studying the lower urinary tract.

Bio: Zachary Danziger is an Associate Professor at Emory University in the Department of Rehabilitation Medicine – Division of Physical Therapy and the W.H. Coulter Department of Biomedical Engineering. His research focuses on understanding how the nervous system controls the body and on developing quantitative models that facilitate design and optimization of neural interfaces to enhance or restore movement and control. He also works in biomedical ethics to improve and establish standards of scientific conduct.