Biomath Seminar

Date: Friday, February 6
Time: 11:00 AM

Speaker:
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Title: Physics-Informed Deep Learning for Modeling and Discovery in Biological Systems

Abstract:
Mathematical models provide a systematic framework for describing complex biological processes through equations, enabling both qualitative and quantitative analyses of system behavior. Such models play a crucial role in predicting outcomes, testing hypotheses, and guiding experimental design, particularly when direct measurements are difficult or infeasible. Biological dynamics are often modeled using ordinary and partial differential equations that describe the spatio-temporal evolution of key quantities such as infection levels, cell densities, viral loads, and signaling molecules under varying biological conditions. These models typically involve unknown parameters, including growth rates, interaction coefficients, and initial conditions, which need to be estimated accurately and efficiently from data. Consequently, parameter inference and reliable prediction of unobserved system behavior remain central challenges in computational biology. Another fundamental challenge is the identification of missing or unknown mechanisms from limited and noisy experimental data. In many biological systems, the governing processes are only partially understood, leading to incomplete models or simplifying assumptions that may omit essential dynamical interactions. In this talk, I will discuss physics-informed neural network (PINN) approaches for addressing both parameter estimation and missing physics identification in systems biology. Using representative benchmark models, I will demonstrate the accuracy and robustness of this neural network–based framework for inferring model parameters and discovering previously unknown dynamical terms.

Zoom Information:
Zoom Link:
https://texastech.zoom.us/j/93886533169?pwd=sJbJSi4BQsy2OM2ow8A4xsELJHgl22.1
Meeting ID: 938 8653 3169
Passcode: 883472