Old Dominion University
Data Science Colloquium

Monday, May 13, 2024

Dr. Jonathan Colen
Old Dominion University

"Learning Physical Models of Biological Materials"

Time: 10:15 am – 11:15 am
Venue: hybrid, in-person Monarch Hall 1113AB, or
Zoom Link: https://odu.zoom.us/j/95625502633?pwd=WnN4MTR4Tlk5RUQ4NHF1bmpGSUIvQT09
Meeting ID: 956 2550 2633
Passcode: 241147

Abstract:

Describing biological phenomena using physics is a difficult problem. Biological systems such as cells and tissues exhibit emergent behavior which is driven by genes, proteins, and the interplay and feedback loops between them. To capture biological behavior in a physical theory, one has to sort through this complexity, often by hand, and determine how to account for these sub-cellular interactions. This physical theory must then be connected to experimental reality, posing an even greater challenge. To reconcile the laws of physics with the complexity of nature, one must sift through large experimental datasets in order to find the critical details which enable connections between these two pictures. Here, we present machine learning as a tool to streamline this process. Our method of data-driven biophysical modeling combines physical theory, biological insight, and machine learning to characterize and understand diverse phenomena. Using experimental case studies on cell mechanics and fruit fly embryo development, we show how this approach can not only predict complex systems, but also help uncover interpretable rules governing their behavior.

Bio:

Jonathan Colen is a Research Assistant Professor at the ODU Joint Institute on Advanced Computing for Environmental Studies. He did his PhD with Vincenzo Vitelli at the University of Chicago, working at the intersection of machine learning, physics, and biology. Since joining ODU in Fall 2023, he has begun collaborating with partners at Hampton Roads Biomedical Research Consortium as well as Jefferson Lab.

All interested persons are cordially invited to attend.