BIOENGINEERING
Spring 2019 Seminar

Date: Thursday, February 21, 2019
Time: 12:00 pm - 1:00pm
Location: Krasnow, Room K229

Tyrus Berry, Ph.D.

Biography: Dr. Berry received his PhD in Mathematics at GMU in 2013 and worked as a postdoc in the Math departments of Penn State and GMU until 2017 when he was hired as an Assistant Professor in the Dept. of Mathematical Sciences at GMU. Tyrus' main research focus has been on overcoming model error by using the theory of manifold learning to build model-free methods of forecasting based on data and combining these data-driven models with imperfect or simplified parametric models of complex phenomena.

Title: Overcoming Model Uncertainty: Integrating machine learning tools into parametric models.

Abstract: Data assimilation is the process of merging a mathematical model with actual observations to estimate parameters and determine the state of a system. Classical methods of data assimilation assume perfect knowledge of the governing equations and the observation map, along with perfect specification of noise models, etc. In this talk, we will explore how these classical methods work and show how these idealized assumptions can be replaced using tools from machine learning combined with large data sets. Surprisingly, the classical methods contain natural `red flags' which indicate when the model and the data are not matching well, and the challenge is to use these indicators to learn a correction to the model. These corrections take the form a mapping which takes in the current observations and the state of the idealized model and outputs a model correction term. This black-box mapping can often be achieved with modern machine learning methods. We discuss several examples of this approach to biological datasets, including a recent work in collaboration with Timothy Sauer and Franz Hamilton which involves extracting intracellular potential from extracellular recordings without using any explicit mapping between these variables.

http://math.gmu.edu/~berry/