THE UNIVERSITY OF GEORGIA
DEPARTMENT OF STATISTICS
Colloquium Series

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4:00 PM, Room 204, Caldwell Building

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Inference of Dynamic Systems from Noisy and Sparse Data Via Manifold-Constrained Gaussian Processes

Parameter estimation for nonlinear dynamic system models, represented by ordinary differential equations (ODEs) or partial differential equations (PDEs), using noisy and sparse experimental data is a vital task in many fields. We propose a fast and accurate method, manifold-constrained Gaussian process Inference, for this task. Our method uses a Gaussian process model over system components, explicitly conditioned on the manifold constraint that gradients of the Gaussian process must satisfy the ODE/PDE system. By doing so, we completely bypass the need for numerical integration and achieve substantial savings in computational time. Our method is also suitable for inference with unobserved system components, which often occur in real experiments. Our method is distinct from existing approaches as we provide a principled statistical construction under a Bayesian framework, which rigorously incorporates the ODE/PDE system through conditioning.

About the Speaker

Dr. Shihao Yang is an assistant professor in the School of Industrial & Systems Engineering at Georgia Tech. Prior to joining Georgia Tech, he was a post-doc in Biomedical Informatics at Harvard Medical School after finishing his PhD in statistics from Harvard University. Dr. Yang's research focuses on data science for healthcare and physics, with special interest in electronic health records causal inference and dynamic system inverse problems