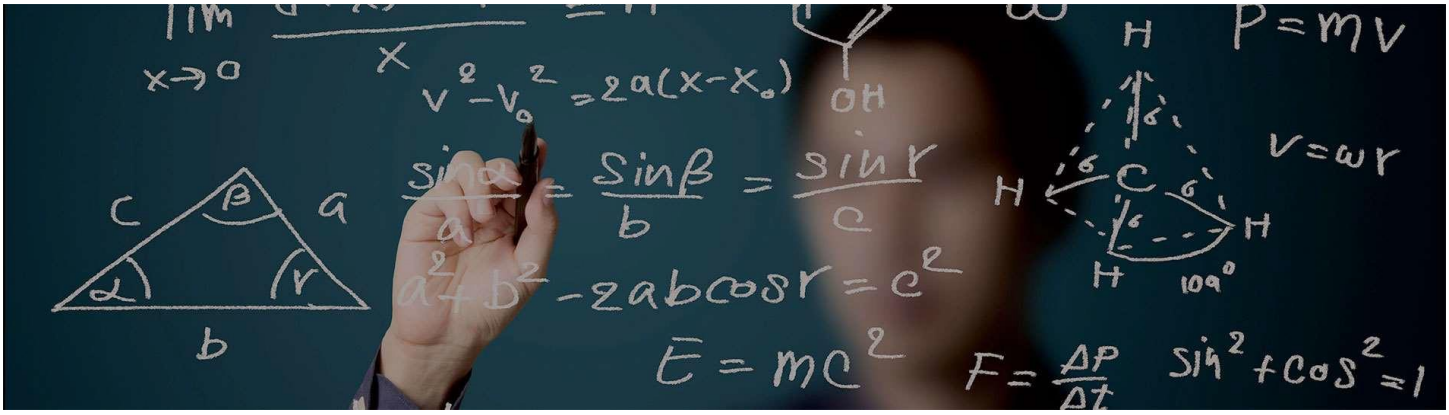


Spring 2024

RENSSELAER POLYTECHNIC INSTITUTE

DEPARTMENT OF MATHEMATICAL SCIENCES COLLOQUIUM

Annual SIAM Seminar

Xiu Yang (Lehigh University)

April 04, 2024 - 4pm

PITTS 4114

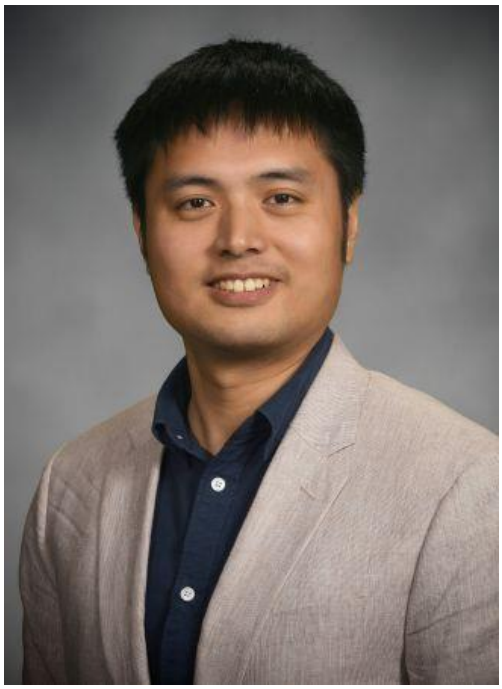
The Adaptive Spectral Koopman Method for Scientific Computing

We propose the adaptive spectral Koopman (ASK) method to solve nonlinear autonomous dynamical systems. This numerical method leverages the spectral-collocation (i.e., pseudo-spectral) method and properties of the Koopman operator to obtain the solution of a dynamical system. Specifically, this solution is represented by Koopman operator's eigenfunctions, eigenvalues, and Koopman modes. Unlike conventional time evolution algorithms such as Euler's scheme and the Runge-Kutta scheme, ASK is mesh-free, and hence is more flexible when evaluating the solution. Numerical experiments demonstrate high accuracy of ASK for solving both ordinary and partial differential equations. Further, I will show its connection with optimization, uncertainty quantification, and quantum computing.

Refreshments served at 3:30pm 4th floor Lounge – Amos Eaton

Biographical Sketch

Xiu Yang obtained his bachelor and master degree in Peking University, and his Ph.D. from Brown University. He joined Lehigh University from Pacific Northwest National Laboratory (PNNL) where he was a scientist since 2016. His research has been centered around modern scientific computing including uncertainty quantification, multi-scale modeling, physics-informed machine learning, and data-driven scientific discovery. Xiu has been applying his methods on various research areas such as fluid dynamics, hydrology, biochemistry, soft material, climate modeling, energy storage, and power grid system. Currently, he is focusing on uncertainty quantification in quantum computing algorithms and machine learning methods for scientific computing. He received a Faculty Early Career Development Program (CAREER) Award from NSF in 2022 and Outstanding Performance Award from PNNL in 2015 and 2016.



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