Colloquium 2021-2022

Unless stated otherwise, colloquia are scheduled for Thursdays 4:15-5:15pm in WH-100E with refreshments served from 4:00-4:15 pm in WH-102.

Organizers: Vladislav Kargin, Cary Malkiewich, Anton Schick, and Adrian Vasiu

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Spring 2022

Friday May 6, 3:45-4:45pm, WH-100E (NOTE SPECIAL DATE AND TIME)
Speaker: **Minghao W. Rostami** (Syracuse University)
Topic: ***Biofluid as a big data challenge***

Abstract: The simulation of a fluid around dynamic biological structures, such as bacteria and cilia, entails solving large systems of Partial Differential Equations (PDEs) and Ordinary Differential Equations (ODEs). This boils down to working with large-scale, dense matrices with very few zero entries. We first show that these matrices are “data sparse”, that is, the large amount of data stored in them can be significantly compressed. We then present fast algorithms for matrix-vector multiplication and linear solves involving these matrices. Our methods do not require constructing the large dense matrices and can achieve huge savings in storage and time. We also show how parallel-in-time methods can further speed up the simulation of a biofluid when spatial parallelization “saturates”. In addition, a data-driven, reduced order model discovered by deep learning will be discussed. It allows us to describe the movement of a fluid without using complex PDEs.

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