Industrial & Systems Engineering Seminar

Partial Differential Equation Continuum Limits for Discrete Sorting Problems

Wednesday, January 25

3:15 PM - Refreshments, 3:30 - Graduate Seminar

Lind Hall Room 305

Professor Jeff Calder

Assistant Professor

School of Mathematics

University of Minnesota- Twin Cities

Many problems in science and engineering involve the sorting, or ordering, of large amounts of multi-variate data. A common sorting technique is to arrange the data into layers by repeatedly removing the set of extremal points. Different notions of extremality lead to different sorting algorithms. Two common examples are non-dominated sorting, and convex hull peeling, which are widely used in multi-objective optimization, machine learning, and robust statistics. In this talk, I will present a Hamilton-Jacobi equation continuum limit for nondominated sorting, and a conjectured partial differential equation (PDE) continuum limit for convex hull peeling. I will also present some new numerical schemes for the Hamilton-Jacobi equation, and show how to design very fast approximate sorting algorithms based on numerical solving the continuum PDE.

BIO:

Calder received his Ph.D. in Applied and Interdisciplinary Mathematics from the University of Michigan in 2014, and was a Morrey Assistant Professor of Mathematics at the University of California Berkeley from 2014-2016. Calder's research interests include partial differential equations and applied probability, with applications to machine learning. He is also interested in mathematical problems in computer vision and image processing.