THE UNIVERSITY OF CHICAGO

Department of Statistics

STATISTICS COLLOQUIUM

JOINT SEMINAR WITH THE COMMITTEE ON COMPUTATIONAL AND APPLIED MATHEMATICS (CCAM)

FRANCA HOFFMANN

Department of Computing and Mathematical Sciences
California Institute of Technology

Gradient Flows: From PDE to Data Analysis.

MONDAY, February 3, 2020 at 4:00 PM
Jones 303, 5747 S. Ellis Avenue

ABSTRACT

Certain diffusive PDEs can be viewed as infinite-dimensional gradient flows. This fact has led to the development of new tools in various areas of mathematics ranging from PDE theory to data science. In this talk, we focus on two different directions: model-driven approaches and data-driven approaches. In the first part of the talk we use gradient flows for analyzing non-linear and non-local aggregation-diffusion equations when the corresponding energy functionals are not necessarily convex. Moreover, the gradient flow structure enables us to make connections to well-known functional inequalities, revealing possible links between the optimizers of these inequalities and the equilibria of certain aggregation-diffusion PDEs. In the second part, we use and develop gradient flow theory to design novel tools for data analysis. We draw a connection between gradient flows and Ensemble Kalman methods for parameter estimation. We introduce the Ensemble Kalman Sampler - a derivative-free methodology for model calibration and uncertainty quantification in expensive black-box models. The interacting particle dynamics underlying our algorithm can be approximated by a novel gradient flow structure in a modified Wasserstein metric which reflects particle correlations. The geometry of this modified Wasserstein metric is of independent theoretical interest.

For further information and inquiries about building access for persons with disabilities, please contact Jonathan Rodriguez at 773.702.8333 or send him an email at jgrodriguez@galton.uchicago.edu. If you wish to subscribe to our email list, please visit the following website: https://lists.uchicago.edu/web/subscribe/statseminars.