DEPARTMENT of ISE
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FRIDAY SEMINAR SERIES
BROADEN HORIZONS | EXTEND MINDS

Dr. Yao Xie, Coca-Cola Foundation Chair and Professor
H. Milton Stewart School of ISyE
Georgia Tech
Atlanta, GA

**Date**: Friday, April 11, 2025

**Time**: 1 - 1:50 pm

**Location:** D2 Lect2

# *Learning high-dimensional distributions via flow-based generative models*

**Abstract:** We consider the problem of learning a continuous probability density function from data, a fundamental problem in statistics known as density estimation. It also arises in distributionally robust optimization (DRO), where the goal is to find the worst-case distribution to represent scenario departure from observations. Such a problem is known to be hard in high dimensions and incurs a significant computational challenge. In this talk, I will present a machine learning approach to tackle these challenges, leveraging recent advances in generative models, which have become popular recently due to their competitive performance in high-dimensional data. We show that flow-based generative models provide a flexible computational framework for such problems, and they can be cast as particle-based iterative algorithms in probability space with the Wasserstein metric. Based on this simple and general framework, we can prove the convergence of the iterative algorithm and show the generative guarantee, meaning identify suitable conditions, the learned density is close to the true distribution. We demonstrate the utility of this framework for density estimation, distributionally robust optimization (DRO), and posterior sampling.

**Biography:** Yao Xie is the Coca-Cola Foundation Chair and Professor at Georgia Institute of Technology in the H. Milton Stewart School of Industrial and Systems Engineering, and Associate Director of the Machine Learning Center. From September 2017 until May 2023, she was the Harold R. and Mary Anne Nash Early Career Professor. She received her Ph.D. in Electrical Engineering (minor in Mathematics) from Stanford University in 2012 and was a Research Scientist at Duke University. Her research lies at the intersection of statistics, machine learning, and optimization in providing theoretical guarantees and developing computationally efficient and statistically powerful methods for problems motivated by real-world applications. She received the National Science Foundation (NSF) CAREER Award in 2017, the INFORMS Wagner Prize Finalist in 2021, the INFORMS Gaver Early Career Award for Excellence in Operations Research in 2022, and the CWS Woodroofe Award in 2024. She is currently an Associate Editor for IEEE Transactions on Information Theory, Journal of the American Statistical Association-Theory and Methods, the American Statistician, Operations Research, Sequential Analysis: Design Methods and Applications, INFORMS Journal on Data Science, an Area Chair of NeurIPS, ICML, and ICLR, and Senior Program Committee of AAAI.