Title: No-Regret Generative Modeling via Parabolic Equations

Speaker: Prof. Nabarun Deb, University of Chicago

Area: DS

Date: 03.07.2025, Venue: P21 @ 2.30PM

Abstract:

This talk will provide a brief introduction to Euclidean mirror descent, score matching methods, the "classification trick", and methods for regret analysis. We will introduce a novel generative modeling framework based on a discretized parabolic Monge-Ampère PDE, which emerges as a continuous limit of the Sinkhorn algorithm commonly used in optimal transport. Our method performs iterative refinement in the space of Brenier maps using a mirror gradient descent step. We establish theoretical guarantees for generative modeling through the lens of no-regret analysis, demonstrating that the iterates converge to the optimal Brenier map under a variety of step-size schedules. As a technical contribution, we derive a new Evolution Variational Inequality tailored to the parabolic Monge-Ampère PDE, connecting geometry, transportation cost, and regret. Our framework accommodates non-log-concave target distributions, constructs an optimal sampling process via the Brenier map, and integrates favorable learning techniques from generative adversarial networks and score-based diffusion models. As direct applications, we illustrate how our theory paves new pathways for generative modeling and variational inference.

Speaker Profile:

Nabarun Deb is an Assistant Professor in the Econometrics & Statistics Group at the University of Chicago Booth School of Business, joining in July 2023 . He earned his Ph.D. in Statistics from Columbia University (2017–2022 and completed postdoctoral work at UBC's PIMS Kantorovich Initiative (2022–23). His research interests include nonparametric inference, theory of optimal transport and its applications in statistics, kernel methods and nearest neighbor graphs, network (Ising) models, fluctuations and theory of dependent data

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