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CHICAGO

THE COMMITTEE ON
COMPUTATIONAL AND
APPLIED MATHEMATICS

COLLOQUIUM

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Hamiltonian Dynamics for Accelerated Optimization and Sampling

THURSDAY, October 22nd at 4:00 PM

Jones 303, 5747 S. Ellis Ave. Chicago, IL 60637

ABSTRACT

Optimization and sampling are fundamental computational tasks. Gradient flow and Langevin dynamics give a familiar connection between the two, while acceleration raises a more subtle question. In this talk, we explore how Hamiltonian dynamics provides an alternative common approach to accelerated optimization and sampling. Concretely, evolving Hamiltonian dynamics with periodic zero-velocity resets yields a descent method for optimization, while Gaussian velocity refreshment yields Hamiltonian Monte Carlo for sampling. In this scheme, short integration times lead to non-accelerated convergence rates analogous to those of gradient descent. Longer integration times, combined with suitable averaging or randomization, give a mechanism for acceleration in optimization, in both continuous and discrete time. By translating the optimization proof to the space of probability distributions, we then prove continuous-time mixing bounds for randomized Hamiltonian Monte Carlo with smooth log-concave targets, with accelerated rates analogous to those in optimization.

Organizers:

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