

Mixing times and cover times for Markov chains

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Abstract:

Convergence of finite Markov chains to their stationary distributions is an extremely active research area. Many of the arguments are both beautiful and accessible, and the field interacts closely with both theoretical computer science and statistical physics. The main goal of this minicourse is to introduce this exciting topic to students. Some of the material presented is related to recent research in the area. For a Markov chain with a large state space, we study the number of steps needed to get the distribution close to the limit (stationary) distribution. This number is known as the mixing time of the chain, and there are now many methods for determining its behavior as a function of the geometry and size of the state space.

Planned topics include:

Simulation and Markov Chain Monte Carlo
Coupling and Strong Stationary Times
Lower Bounds via bottlenecks and test functions
Mixing Times and Hitting Times: new connections
The Cut-off Phenomenon
Cover times
Dynamics for the Ising Model, and Its Mixing Time