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Spectral Telescope: Convergence Rate Bounds for Random-Scan Gibbs Samplers Based on a Hierarchical Structure

Wednesday, October 26, 2022
11:50 AM

110 Frelinghuysen Road
Hill Center, Room 552

Zoom Meeting: Meeting ID: 99075124232
Password: 952486

<https://rutgers.zoom.us/j/99075124232?pwd=UDdPVjRncXZFcXpvbFE0OWJyMVdSUT09>

Abstract: In this talk, we describe a simple but intriguing hierarchical structure found in random-scan Gibbs samplers, or Glauber dynamics. This structure connects Gibbs samplers targeting higher dimensional distributions to Gibbs samplers targeting lower dimensional ones and leads to a quasi-telescoping property concerning their spectral gaps. Based on this property, we derive three new bounds on the spectral gaps and convergence rates of Gibbs samplers on general domains. The three bounds relate a chain's spectral gap to, respectively, the correlation structure of the target distribution, a class of random walk chains, and a collection of influence matrices. Notably, one of our results generalizes the technique of spectral independence, which has received considerable attention for its success on finite domains, to general state spaces.

Bio: Qian Qin is an assistant professor at the School of Statistics, University of Minnesota. He obtained his PhD in statistics at the University of Florida under the supervision of Jim Hobert. His research interest lies in Markov chain theory, especially analysis of Markov chain Monte Carlo.

