Analysis Seminar

Best Mean Ergodic Averages via Optimal Graph Filters in Reversible Markov Chains

By

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Abstract: In this talk, we address the problem of using graph filters to find the best ergodic or Birkhoff averages in the mean ergodic theorem to ensure rapid convergence to a desired value. Our approach begins by representing a function on the state space as a graph signal, where the transition probabilities of a reversible Markov chain form the (directed) graph. We introduce a concept of graph variation, enabling the definition of the graph Fourier transform for graph signals on this directed graph. Viewing the iteration in the mean ergodic theorem as a graph filter, we recognize its non-optimality and propose three optimization problems aimed at determining optimal graph filters. These optimization problems yield the Bernstein, Chebyshev, and Legendre filters. Numerical testing reveals that while the Bernstein filter performs slightly better than the traditional ergodic average, the Chebyshev and Legendre filters significantly outperform the ergodic average, demonstrating rapid convergence to the desired value.

Date: Tuesday, November 19, 2024
Time: 14:00-15:00
Place: SA141 - Mathematics Seminar Room