

Exponential Ergodicity, Spectral Gap, and their Applications

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Abstract: In this talk, firstly we will give some reason to ergodic theory from our knowledge. Secondary, we will give a characterization of spectral gap of positive operators and positive C_0 -semigroup in the L^p -space with $1 < p < +\infty$, and describe a equivalent relation between spectral gap and exponential ergodicity of Markov chains or Markov processes. We will also give the applications of the existence of spectral gap to Donsker's invariance principle and Strassen's strong invariance principle of Markov chains or Markov processes, and give some results for the existence of spectral gap of Schroedinger operators and Girsanov semigroups. Finally, we will introduce the background and mathematical framework of mass gap (or spectral gap) problem on loop spaces, and give a survey of this problem and some important open problems on loop spaces concerning with this problem.