

Recent methods in the study of metastability

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In this lecture series, we review recent developments in the quantitative analysis of metastable behavior. The first lecture briefly reviews classic potential theoretic approach of Bovier, Eckhoff, Gaynard and Klein and then explain how this approach can be extended to the non-reversible models. We remark that these methods are based on the estimation of the so-called *capacity* between metastable sets which is carried out via variational principles such as *Dirichlet principle*. We will also explain alternative approach to estimate the capacity that does not use variational principles and hence is particularly suitable in the analysis of non-reversible case.

In the second and third lecture, we explain the Markov chain model reduction method in the quantitative analysis of metastability developed by Beltran and Landim. We first connect this approach with the potential theoretic computations explained in the first lecture. Then, we introduce completely brand new methodology based on the analysis of certain form of resolvent equations. This new method does not use potential theory. We review several applications of this method to the existing open questions.