Invariance Principle for Random Walk in Dynamic Markovian Environment

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Abstract:
In this talk we will consider a model of discrete time random walks in dynamical random environments on the integer lattice in d-dimension, first introduced by Boldrighini, Minlos and Pellegrinotti (1997, 2000). In this model, the environment changes over time in a Markovian manner, independently across the sites, while the walker uses the environment at its current location in order to make the next transition. Boldrighini, Minlos and Pellegrinotti (2000) used the cluster expansion approach to establish quenched CLT when dimension $d > 2$.

In a joint work with Ofer Zeitouni (2006), we used a probabilistic argument based on regeneration times to prove an annealed SLLN and an invariance principle (IP) for any dimension, and a quenched IP for dimension $d > 7$. In a more recent work with Ofer Zeitouni, we proposed a different "regeneration time" which is more intuitive and proved all the results (annealed SLLN, annealed and quenched IP) in any dimension d under the same assumptions. In addition, we obtained new results for dimensions $d = 1$ and $d = 2$ when the environment chain is a non-trivial Markov chain. In this talk, we will discuss in detail the construction of this new "regeneration time" and sketch the proofs for the annealed and quenched IP.