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Two applications of semiclassical techniques to condensed matter: quantum multifractality and Anderson localisation on random graphs

The semiclassical physics usually deals with studying a quantum system in the large quantum number regime. Over the last decades this has lead to a large number of techniques, which can be used in many areas of physics. I would like to focus on how to use them to study the Anderson localization transition due to disorder through two problems. First recent results have yield to both a very precise numerical estimate and an experimental characterization of Anderson model at the critical point. I studied an analogue of it via a quantum map, which a has intermediate level statistics. I will present how the nontrivial structure of the eigenstates, revealed by a multifractal analysis, can change under the effect of a perturbation and generalize it for several other models. Second I will mention a more recent work about Anderson localization in random graphs. The main goal is to assess whether there is a delocalized non-ergodic phase and to describe the Anderson transition. I will present a numerical argument using finite size scaling approach. Last I will mention some suggestions for my future research.