FIM Nachdiplomvorlesung

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Delocalization of Schrödinger eigenfunctions

2 October to 18 December 2017
Mondays, 14:15 - 16:00
HG G 19.1, ETH Zürich, Rämistrasse 101

Abstract

A paper of Einstein published in 1917 asks the question of finding quantization conditions for ergodic hamiltonian systems. At the time, there were only a few rules prescribed by Bohr, allowing to find the quantum spectrum of completely integrable systems, as well as the localization of the various states of the system.

Since the introduction of the Schrödinger equation, the question may be reformulated as follows: what does the spectrum of a Schrödinger operator look like, if the associated classical dynamical system is ergodic? And what about the (de)localization properties of the eigenfunctions? Whereas the first question is widely open, there is ongoing progress on the second. Various techniques are currently merging, coming from microlocal analysis, from the study of Anderson models, as well as from Random Matrix Theory.

This course will focus on the delocalization of eigenfunctions for Schrödinger operators associated with „chaotic“ dynamical systems. We will start with continuous Schrödinger operators and the celebrated „Quantum Ergodicity theorem“ of A. Shnirelman, as well as other more recent delocalization results obtained through microlocal analysis. We will then move to delocalization properties for eigenfunctions of certain discrete Schrödinger operators on large (finite) graphs.

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