# Abstract

Schrödinger operators with random potentials are very important models in quantum mechanics, in the study of transport properties of electrons in solids. In this talk, we study the approximation of eigenvalues via the landscape theory for some random Schrödinger operators. The localization landscape theory, introduced in 2012 by Filoche and Mayboroda, considers the landscape function u solving Hu=1 for an operator H. The landscape theory has remarkable power in studying the eigenvalue problems for a large class of operators and has led to numerous “landscape baked” results in mathematics, as well as in theoretical and experimental physics. We first give a brief review of the localization landscape theory. Then we focus on some recent progress of the landscape-eigenvalue approximation for operators on general graphs. We show that the maximum of the landscape function is comparable to the reciprocal of the ground state eigenvalue, for Anderson or random hopping models on certain graphs with growth and heat kernel conditions, as well as on some fractal-like graphs such as the Sierpinski gasket graph. There will be precise asymptotic behavior of the ground state energy for some 1D chain models, as well as numerical stimulations for excited

states energies. The talk is based on recent joint work with L. Shou and W. Wang.