Title: Random gradient models

Abstract: Consider the well-known phenomenon of first-order phase transitions, when several phases are thermodynamically stable at the same value of the relevant thermodynamical parameters (temperature, pressure, etc.). Then it is possible to have different regions of space occupied by different phases, and separated from each other by sharp boundaries, the interfaces. Since interfaces are difficult to locate and to analyze, it is useful to consider the properties of the so-called effective interface models. In this class of models, the interface is modeled as the graph of a random function $\phi : \mathbb{Z}^d \to \mathbb{Z}$ (discrete interface models) or $\phi : \mathbb{Z}^d \to \mathbb{R}$ (continuous interface models). The quantity ϕ_i is interpreted as the height of the interface above (or below) site $i \in \mathbb{Z}^d$. The distribution of the interface is given by a Gibbs measure with an interaction V depending only on the height differences (called gradients) of the field.

We will explain these notions, focusing in particular on the proofs of existence and uniqueness of the (gradient) Gibbs measure for various types of potentials V.