Abstract

Percolation theory has its origin in an applied problem. But apart from its numerous applications in statistical mechanics, electrical engineering, computer science etc., it has really intriguing problems to offer for mathematicians, the kind of problems which require minimum mathematical preparation to be stated but have really difficult solutions which require some interesting techniques. This dessertation gives a glimpse of various such techniques. It introduces the percolation theory in discrete as well as continuous setting. The whole dissertation has been divided into three parts. The rst part introduces two classical discrete models- bond and site percolation on d-dimensional cubic lattice and a continuum percolation model- the random Voronoi percolation model which is based on randomly distributed points in the continuous space R2 according to a homogeneous Poisson point process. One of the most basic but really hard problem in percolation theory is to establish the critical probability above which percolation occurs. The next part investigates the behaviour of the critical probability in high dimensions for bond and site percolation model on d-dimensional cubic lattice. We outline the proof of the result that the critical probability for bond or site percolation on Zd is asymptotically equal to 1 2d as d ! 1. The last part gives the proof of the result that for random Voronoi percolation, the critical probability is 1 by 2