

Percolation in Random Resistor Networks

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1 Introduction

1.1 The Basic Percolation Problem

Consider a finite cubic lattice where neighboring sites are not yet connected. At every potential edge, place a bond with a probability or **concentration** p . As we increase the concentration from 0, clusters that connect from the top of the lattice to the bottom will begin to form. As the size of the lattice increases, the point at which a percolating cluster forms becomes more sharply defined and in the infinite limit we can define a critical concentration p_c

1.1.1 Bond vs. Site Percolation

1.2 Critical Exponents

1.3 Physical Correspondences

2 Exact Solutions

2.1 One-Dimension

2.2 Bethe Lattice

3 Mean-Field Techniques

3.1 Effective Medium Theory

3.2 Mean Field Theory

4 Scaling Relations

5 Renormalization

6 Extensions