Problem: Percolation on various lattices

The goal

To generate randomly occupied 2D or 3D lattices and to determine the threshold (critical probability) for which an infinite (percolating) cluster appears in the infinite lattice.

Details

Modify the Hoshen-Kopleman algorithm for the square lattice to work properly on the triangular, honeycomb (hexagonal) or simple cubic lattice (you can choose one or try more of them). Write a program which generates many configuration of a chosen lattice of various sizes $n \times n$ for $n = 32, 64, 128, \ldots$ with randomly occupied sites for probabilities $0 < p < 1$ and, using the Hoshen-Kopelman algorithm, it determines probabilities $P_{\text{span}}(p)$ that a spanning cluster appears in the lattice as a function of p. From a point where these functions for various sizes of the lattice cross each other, try to estimate the threshold probability p_c for which the infinite cluster appears in the infinite lattice.

Output

To fulfill the task, provide your own code which calculates $P_{\text{span}}(p)$ for a chosen lattice together with an output file containing dependence $P_{\text{span}}(p)$ for several sizes of the lattice and a plot of these functions around the threshold probability p_c.