1 Simulating percolation

There are two limits to approach the problem of percolation through a lattice: in the limit of *site percolation* two neighboring sites on the lattice enable percolation. Thus, the only information needed to determine if a system is percolating is the *lattice decoration*, i.e., the occupancies of all sites. The second limit is *bond percolation*, in which each connection between two neighboring sites of the lattice can either be percolating or non-percolating.

1.1 Site percolation

For an infinite lattice with a concentration p of the conducting species, the *percolation probability* $P_\infty(p)$, i.e., the probability that an occupied site is part of a percolating (infinite) cluster is given by

$$P_\infty(p) = \begin{cases} \hat{B}_p \left(\frac{p}{p_c} - 1\right)^{\beta_p} & \text{for} \quad p > p_c \\ 0 & \text{else} \quad , \end{cases} \tag{1}$$

where the critical concentration p_c is the *site percolation threshold*. The prefactor $\hat{B}_p$ and the exponent β_p both depend on the lattice and the concentration.