Abstract

In this paper we test the hypothesis that \( q \)-exponential distribution fits better on distributions arising from lattices with a heterogeneous topology than a homogeneous topology. We compare two lattices: the first is the typical square lattice with a constant occupation density \( p \) (the lattice used in standard percolation theory), and the second is a lattice constructed with a gradient of \( p \). In the homogeneous lattice the occupied number of neighbors of each cell is the same (on average) for the full lattice, otherwise in the \( p \)-gradient lattice this number changes along the lattice. In this sense the \( p \)-gradient lattice shows a more complex topology than the homogeneous lattice. We fit the \( q \)-exponential and the stretched exponential distribution on the cluster size distribution that arises in the lattices. We observe that the \( q \)-exponential fits better on the \( p \)-gradient lattice than on a constant \( p \) lattice. On the other hand, the stretched exponential distribution fits equally well on both lattices.

Keywords

\( q \)-exponential distribution, gradient lattices, stretched exponential, topology