Phase transition in a stochastic geometry model with applications to statistical mechanics

O. Kazemi¹, A. Pourdarvish¹, and J. Sadeghi¹

¹University of Mazandaran

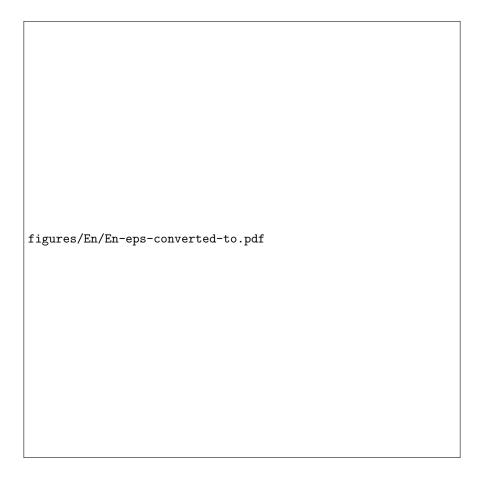
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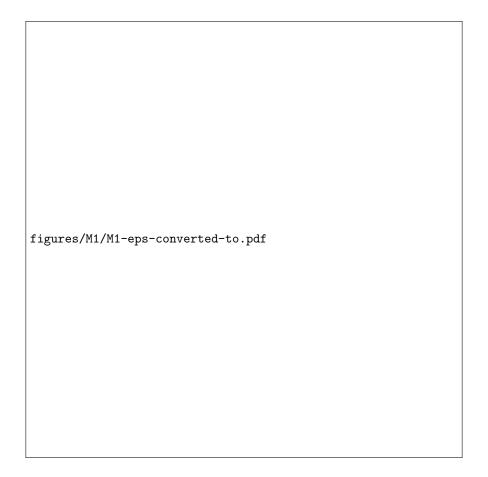
Abstract

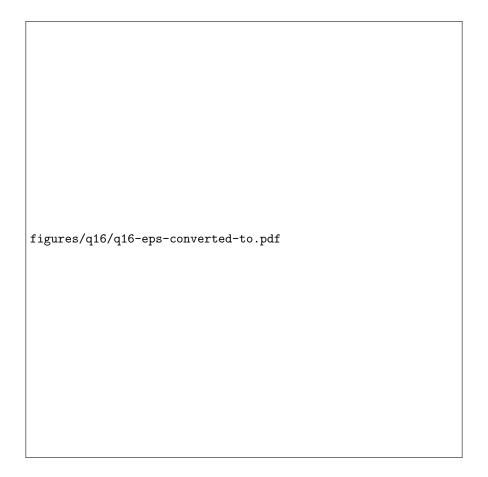
We study the connected components of the stochastic geometry model on Poisson points which is obtained by connecting points with a probability that depends on their relative position. Equivalently, we investigate the random clusters of the ran- dom connection model defined on the points of a Poisson process in d-dimensional space where the links are added with a particular probability function. We use the thermodynamic relations between free energy, entropy and internal energy to find the functions of the cluster size distribution in the statistical mechanics of extensive and non-extensive. By comparing these obtained functions with the probability function predicted by Penrose, we provide a suitable approximate probability function. More- over, we relate this stochastic geometry model to the physics literature by showing how the fluctuations of the thermodynamic quantities of this model correspond to other models when a phase transition (10.1002/mma.6965, 2020) occurs. Also, we obtain the critical point using a new analytical method.

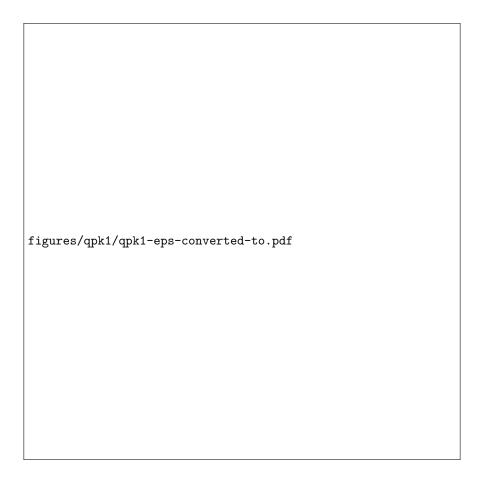
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