Percolation for Gibbs point processes, old and new results.

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The Gibbs point processes constitute a large class of point processes with interaction between the points. The interaction can be attractive, repulsive, depending on geometrical features whereas the null interaction is associated to the so-called Poisson point process. There are two parameters, the activity $z > 0$ related to the intensity of the process and the inverse temperature $\beta \geq 0$ related to the strength of the interaction. In a first part of the talk, we recall briefly general results ensuring the existence, uniqueness and non uniqueness of such processes in the infinite volume regime [4]. Then we consider graphs based on the vertices of such Gibbs processes and for which an edge between two points is present if their distance is smaller than $R > 0$. Standard percolation results are presented for large/small activity z or inverse temperature β.

In a second part of the talk we will focus on the sharpness of phase transition for the special Widom-Rowlinson model (or Area-interaction model). It is a joint work in progress with Pierre Houdebert [2]. First, for any $R > 0$, we show that this model exhibits a sharp phase transition at a critical point $z_c(R)$ in the spirit of [3]. The size of clusters are exponentially decreasing for activities strictly smaller than the critical percolation threshold $z_c(R)$. Secondly we show that for a special value R the critical percolation threshold $z_c(R)$ corresponds to a liquid-gas phase transition. That means that for a fixed value of the inverse temperature β (chosen large enough), the non-uniqueness of Gibbs measures is only observed for the activity $z = z_c(R)$. The non-uniqueness result for $z = z_c(R)$ was known since long time [1]. Our contribution is to prove that $z = z_c(R)$ is the only one value for which the non-uniqueness occurs.

Références

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