Maxima of two-dimensional discrete Gaussian free field

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In this talk, I will present progresses on the maximum/maxima of the 2D discrete Gaussian free field. On one hand, we have now developed good understanding on the single maximum due to efforts over more than a decade. I will survey a line of works which established its asymptotics and fluctuation, as well as the tail behavior. Nevertheless, the limiting law of the centered maximum remains a challenge at the moment. On the other hand, our understanding for the joint behavior of the maxima is still preliminary, compared to the analogous picture obtained for Branching Brownian motion. I will report a recent work (with Ofer Zeitouni) along this direction, which particularly shows that the particles of large values are either close or far away from each other. The question on the scaling limit of the maxima remains open.

The talk is based on works by Bramson, Bolthausen, Chatterjee, Deuschel, Giacomin, Zeitouni and myself in various combinations.