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Random point processes in the plane and applications to birds of prey

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Random point processes including determinantal ones are popular models in ecology. In this talk I will put the two-dimensional Coulomb gas at general inverse temperature $\beta \geq 0$ in a such a perspective. Away from the integrable point beta=2, corresponding to the Ginibre ensemble of random matrices with complex normal entries, the Poisson point process at beta=0, very little is known about the local statistics. We therefore resort to numerical simulations to determine the nearest and next-to nearest spacing to model data from biology. An alternative, approximate description is based on a 2x2 random matrix β-ensemble. Annual ensembles of nests of three different birds of prey in the area of the Teutoburger Wald close to Bielefeld are modelled by such a simple random point process, in fitting an effective β to the data. In such a way repulsion strength can be quantified, comparing the inter and intra-species repulsion, as well as their change over time.

This is joint work with Adam Mielke, Patricia Paessler and the group of Oliver Krueger

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