Stochastic analysis for strongly correlated, infinite particle systems

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A strongly correlated infinite particle system in Euclidean space is typically an infinite number of particles interacting through the Coulomb potential. Conventionally, a Coulomb point process in two-dimensional space is known as the Ginibre point process only when the inverse temperature $\beta $ is 2. The Coulomb point process for each inverse temperature $\beta >0 $ has been recently constructed. A more strongly correlated model is the set of the zero points of the planar Gaussian analytic function (GAF).

These point processes have different geometric properties from Gibbs measures and Poisson point processes, reflecting their strong correlation. Namely, the Ginibre point process has the small variance property of the number of particles in disks, the dichotomy of the reduced Palm measures, and the number rigidity. The planar GAF has the mean and number rigidity.

In this talk, we will clarify how the rigidity reflects the global dynamical behavior of each tagged particle and overview a general theory of stochastic analysis of infinite particle systems. This theory is necessary for that purpose and can be applied to strongly correlated, infinite particle systems.