## Mathematics and CS Seminar

# Determinantal point processes and quasi-free states on the CAR algebra

**Eugene Lytvynov**
Swansea University, Wales

Host: Lorenzo Dello Schiavo

A quasi-free state over the algebra of the canonical anticommutations relations (CAR) is a state with respect to which the moments of the field (Segal-type) operators are calculated similarly to the expectation of a Gaussian random field (when one additionally takes into account the sign of a partition). An important subclass of quasi-free states is given by gauge-invariant states. For a given representation of the CAR, one formally defines its particle density as the product of the creation and annihilation operators at point, and again formally the smeared particle density is a family of commuting Hermitian operators. For a class of quasi-free states, we show that its particle density can be rigorously realised as a family of commuting self-adjoint operators and its joint spectral measure is a determinantal point process, i.e., a point process whose correlation functions are determinants built upon a correlation kernel $K(x,y)$. In the case of a gauge-invariant quasi-free state, the correlation kernel $K(x,y)$ is Hermitian. We also consider the particle-hole transformation in the continuum as a certain Bogoliubov transformation of a gauge-invariant quasi-free state, which leads to a non-gauge-invariant quasi-free state. For the corresponding particle density, the joint spectral measure is a determinantal point process with a correlation kernel $K(x,y)$ that is J-Hermitian. The latter means that the integral operator with integral kernel $K(x,y)$ is self-adjoint with respect to an indefinite inner product.

**Tuesday, January 16, 2024 04:15pm - 05:15pm**
Heinzel Seminar Room (I21.EG.101), Office Building West, ISTA

---

This invitation is valid as a ticket for the ISTA Shuttle from and to Heiligenstadt Station.
Please find a schedule of the ISTA Shuttle on our webpage:
https://ista.ac.at/en/campus/how-to-get-here/ The ISTA Shuttle bus is marked ISTA Shuttle (#142) and has the Institute Logo printed on the side.