

Chez Pierre

Presents ...

Tuesday, April 1, 2025
12:00 pm - 1:00 pm
Duboc room – 4-331



Special Chez Pierre Seminar

Yi Teng, Max Planck Institute for the Physics of Complex Systems

“Solving fractional quantum Hall states with self-attention neural networks.”

We use an attention-based fermionic neural network (FNN) to variationally solve the problem of two-dimensional Coulomb electron gas in magnetic fields, a canonical platform for fractional quantum Hall (FQH) liquids, Wigner crystals and other unconventional electron states. Working directly with the full Hilbert space of N electrons confined to a disk, our FNN consistently attains energies lower than LL-projected exact diagonalization (ED) and learns the ground state wavefunction to high accuracy. In low LL mixing regime, our FNN reveals microscopic features in the short-distance behavior of FQH wavefunction beyond the Laughlin ansatz. For moderate and strong LL mixing parameters, the FNN outperforms ED significantly. Moreover, a phase transition from FQH liquid to a crystal state is found at strong LL mixing. Our study demonstrates unprecedented power and universality of FNN based variational method for solving strong-coupling many-body problems with topological order and electron fractionalization.