The Mathematics of Many-Body Quantum Systems

Abstract: This course will have two parts. In the first part we discuss some classical results about bosonic and fermionic many-body quantum systems, introducing effective theories such as Thomas-Fermi and Hartree-Fock theory. We will also rigorously introduce the method of second quantization for the description of many-body systems. In the second part I will discuss more recent results, with a focus on scaling limits for bosonic and fermionic systems. Here we will discuss dynamical and spectral properties of Bose-Einstein condensates, as well as recent results on the Fermi gas. If time permits we will conclude by discussing recent results obtained through bosonization methods.