

TRANSFER OF CERCIGNANI'S CONJECTURE-TYPE INEQUALITIES FROM THE CLASSICAL TO THE FERMIONIC BOLTZMANN EQUATION AND AN APPLICATION

THOMAS BORSONI

Sorbonne Université, Paris, France

The fermionic Boltzmann (Boltzmann-Fermi-Dirac or fermionic Nordheim) equation is a kinetic description of rarefied gases of fermions (e.g. electrons). The setting is similar to the classical Boltzmann equation, with a modification of the collision operator, in order to take into account the Pauli exclusion principle. As a result, the corresponding equilibrium distributions (Fermi distributions) and the relevant entropy (Fermi entropy) do also differ from their classical analogues (Maxwellian distribution and Boltzmann entropy).

Entropy methods are at the core of quantitative studies on relaxation to equilibrium. For the classical Boltzmann equation, the quantitative decay of the relative entropy to equilibrium is provided by a relationship between the relative entropy to equilibrium and its dissipation in time. These relationships are called «Cercignani's conjecture-type» inequalities.

In this talk, I present a method of «transfer» of inequalities, which establishes an (almost) equivalence, in terms of entropy inequalities, between the classical and the fermionic Boltzmann cases, hence providing a large class of such results for solutions to the fermionic Boltzmann equation, and therefore, quantitative rates of convergence towards equilibrium. I present an application of this result, in which explicit polynomial convergence to equilibrium is rigorously obtained.