22-26 January 2024

WORKSHOP

Aula Dini
Via del Castelletto
Scuola Normale Superiore
PISA

MODELING, ANALYSIS, AND CONTROL OF MULTI-AGENT SYSTEMS ACROSS SCALES

Complex systems of many interacting particles are ubiquitous in nature and account for several interesting phenomena. A powerful tool for the understanding of such systems and for the taming of their remarkable intrinsic complexity is the introduction of macroscopic descriptions: the Boltzmann equation and mean-field limits of particle systems are prominent examples of this point of view, which, originating from statistical physics, has indeed proved to be a strikingly effective instrument with a large scope of possible applications in other branches of science and societal problems.

The mathematical challenges related to this approach are actually manifold, as they not only involve the rigorous validation of the limit process, but also the effective simulation of large systems through the introduced approximations, as well as the designing of suitable control strategies to steer the system towards some desired state.

The desired impact of these theories is not only confined to the theoretical understanding or the computations issues of these complex systems, but aims at suggesting viable and targeted interventions for improving real-life scenarios. The investigation of these systems lies at the interface among modelling, analysis, probability, and numerics. It may also require some advanced theoretical techniques which were developed independently of these applications in contexts such as measure theory, functional analysis, or differential geometry.

The aim of this workshop is to bring together leading experts and young researchers in this fields, taking advantage in a synergic fashion of the different backgrounds and domains of expertise. Attention will be given both to up-to-date applications to physical, biological, and social systems, and to cutting edge theoretical advances in the rigorous mathematical formulation of the theory.

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