Mean-field control and new types of games

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Timetable: 16 hrs. First lecture on March 12, 2018, 14:30 (dates already fixed, see the calendar), Torre Archimede, Room 2BC/30.

Course requirements:

Examination and grading:

SSD: MAT/05, MAT/06, MAT/08

Aim:

Course contents:
This series of informal lectures presents novel results on modeling, control, and game playing of multi-agent dynamics. We focus in particular on three topics:

- sparse control, i.e., steering a large group of interacting agents by influence parsimoniously only few of them;

- mean-field control, i.e., the control of the mean-field equations describing the evolution of the probability distribution of a large population of agents;

- mean-field differential and evolution games.

The lecture series starts with basic results and it requires knowledge of relatively standard functional analysis (mainly basics of metric and Banach spaces and Bochner integration).
The analysis content of the lecture series follows:

- Existence and uniqueness solutions of the Caratheodory differential equations
- Classical examples of multiagent dynamics
- Wasserstein distances and optimal transport
- Existence and uniqueness of mean-field equations
- Introduction to optimal control and first order optimality conditions
- Introduction to Gamma-convergence
- Sparse stabilization and optimal control of multiagent dynamics
- Smooth relaxation of sparse mean-field optimal control
- Sparse mean-field optimal control
- Mean-field Pontryagin maximum principle
- Mean-field differential games
- Mean-field evolution games