

Stochastic control, games and mean field games via forward-backward SDEs and applications in economics and finance.

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Abstract:

Stochastic optimal control theory deals with problems in which an agent wants to optimize a certain performance criterion by acting in a random environment which evolves in continuous time. When several agents want to optimize a performance criterion, depending also on the action of the other agents, a strategic interaction arises and we refer to the problem as to a stochastic game. Also, taking inspiration from models of interacting particle systems, the recent theory of mean field games (MFGs) has been developed in order to study the (approximate) equilibria in games with a large number of players under suitable symmetry assumptions. The intuition is to replace the problem of a large number of identical players solving symmetric optimization problems, by the problem faced by a representative player, which plays against a limit distribution, describing state of the other players at equilibrium. In this course, we are going to give an introduction to the theory of stochastic control, games and MFGs and we are going to discuss how to solve these problems via forward-backward stochastic differential equations (FBSDEs). By mean of the stochastic maximum principle, the problem of finding an equilibrium in a stochastic game is reduced to solving a much simpler game on a finite dimensional space, and then to searching for a solution to an associated system of FBSDEs. Finally, we are going to present some existence results for such a system, and to illustrate applications in economics and finance.

Lectures:

- 27 March, 8:30 - 10:00. Ferrari. (online)
- 28 March, 8:30 - 10:00. Ferrari. (online)
- 29 March, 14:30-16:00. Dianetti (Room Laboratorio didattica della Matematica and online)
- 30 March, 14:30-16:00. Dianetti (Room Laboratorio didattica della Matematica and online)
- 3 April, 14:30-16:00. Dianetti (Room Laboratorio didattica della Matematica and online)
- 4 April, 14:30-16:00. Dianetti (Room Laboratorio didattica della Matematica and online)
- 5 April, 14:30-16:00. Dianetti (Room Laboratorio didattica della Matematica and online)

Data for online meetings:

Zoom Meeting per le lezioni del 27 e 28 marzo:

<https://uni-bielefeld.zoom.us/j/62477900582?pwd=Qm00c29DRU1kZ1ZUc2g1UGFZZk92Zz09>

Meeting ID: 624 7790 0582

Passcode: 495248

Zoom Meeting per le lezioni del 29, 30 marzo e 3, 4, 5 aprile

<https://uni-bielefeld.zoom.us/j/68173046734?pwd=a1V1SDBwamtMN0QxbjdiR3Z0QnFYZZ09>

Meeting ID: 681 7304 6734

Passcode: 279779