MINI CURSO

"A brief introduction to Mean Field Games"

Sepaker: Francisco Silva, Université de Limoges

Title: A brief introduction to Mean Field Games.

Abstract: Mean Field Games (MFG) is a theory recently introduced by J.-M. Lasry and P.-L. Lions in order to approximate Nash equilibria of symmetric stochastic differential games when the number of players is very large. This theory has found several applications in mathematical economics and congestion models.

The aim of this course is to introduce the theory from the very basics. In the three lectures we will address the following topics:

Lecture 1: The case of static games. In this lecture we will discuss the relation between games with a finite number of players and mean field games in the static case. The main tool to relate both types of games will be the Hewitt and Savage Theorem.

Lecture 2: The dynamic case: Introduction of the MFG system by means of a probabilistic approach. Starting with the basics about the variational approach in stochastic optimal control theory and following Carmona&Delarue 2012, we analyze the MFG problem in terms of a system of Forward-Backward Stochastic Differential equations (FBSDEs). The main result is the existence of a solution of the system by a fixed point argument and estimates for the solutions of stochastic differential equations (SDEs).

Lecture 3: The dynamic case: Introduction of the MFG system by means of a analytic approach. In this lecture we first review some basic results about linear and quasilinear parabolic equations. Then, using the dynamic programming principle for stochastic optimal control problems, we introduce the MFG problem in terms of a system of two coupled Partial Differential Equations (PDEs). The first equation is a Hamilton-Jacobi-Bellman (HJB) equation and the second equation is a Fokker-Planck (FP) equation. Using classical fixed point arguments and tools about PDEs, we will prove the existence of a solution of the MFG system.

LUNES 19 y MARTES 20 A LAS 16:15 HRS.
MIÉRCOLES 21 A LAS 14:30 HRS.

SALA DE SEMINARIOS JOHN VON NEUMANN CMM, SÉPTIMO PISO, BEAUCHEFF 851, TORRE NORTE.