



香港中文大學
The Chinese University of Hong Kong



香港大學
THE UNIVERSITY OF HONG KONG



FIRST IN
CHANGE

Analysis and PDE Seminar

Professor Phillip Yam

Department of Statistics, The Chinese University of Hong Kong

TITLE: Mean Field Games, their FBSDEs and Master Equations

This is a hybrid event that the audience can join either physically in CUHK or via ZOOM; please see the details as follows:

Date : Apr 20th, 2023 (Thursday)

Time : 4pm-5pm (Hong Kong time)

5pm-6pm (Korea time)

Venue : Science Center L2,

The Chinese University of Hong Kong
(CUHK), Hong Kong



Link to ZOOM : <https://unist-kr.zoom.us/j/3170659442>

Meeting ID : 317 065 9442

Password : APDE21

Abstract. Modeling collective behaviors of individuals in account of their mutual interactions arisen in various physical or sociological dynamical systems have been one of the major problems in the history of mankind. To resolve this matter, a completely different macroscopic approach inspired from statistical physics had been gradually developed in the last decade, which eventually leads to the primitive notion of mean field game theory. In this talk, we shall introduce a theory of global-in-time well-posedness for a general class of mean field game problems, which include as an example settings with quasi-convex payoff functions as long as the mean field sensitivity is not too large. Through the stochastic maximum principle, we adopt the forward backward stochastic differential equation (FBSDE) approach to investigate the unique existence of the corresponding equilibrium strategies. This FBSDE is first solved locally in time, then by controlling the sensitivity with respect to the initial condition of the solution to the backward equation via

studying its Jacobian flow, the global-in-time solution is warranted. Further analysis of the Jacobian flow of the solution to the FBSDE will be discussed so as to establish the regularities of the value function, including its linear functional differentiability, that also leads to the classical well-posedness of the complicated one-directional master equations on \mathbb{R}^n . In contrast to the recent approach with an emphasis on the well-posedness of the master equations, we solve the whole problem by tackling the mean field game equilibrium problems directly; indeed, we extend the well-posedness result in [1], which founds their theory on a torus in a Hölder space, to the whole unbounded domain \mathbb{R}^n via the Sobolev space language.

[1] P. Caradaliaguet, F. Delarue, J.-M. Lasry, and P.-L. Lions. The master equation and the convergence problem in mean field games:(ams-201). Princeton University Press, 2019.

All are welcome

This is a joint activity organized by Department of Mathematics, The Chinese University of Hong Kong, Hong Kong; Department of Mathematics, Institute of Mathematical Research, Research Division of Mathematical and Statistical Science, The University of Hong Kong, Hong Kong; and Department of Mathematical Sciences, Ulsan National Institute of Science and Technology, Korea. More details can be found in https://hkumath.hku.hk/~imr/event/CUHK_HKU_UNIST_Analysis_and_PDE/index.php.

