

## ***Dynamic Games and Stochastic Optimization I***

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The aim of this session is to give a general view on the state-of-the-art in the areas of stochastic dynamic optimization and dynamic games. In particular, it enables researchers, academics, and students to shape a general picture of novel results, models, and applications with a large social impact. This series of talks is part of the annual event organized by the Mexican School of Stochastic Control.

### **Some results on potential games**

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In this talk, we will follow a development line about potential games. Starting with potential static games, then passing through discrete-time and continuous-time potential dynamic games and finishing with potential mean field games. We will show some relationships between potential classic games and potential mean field games.

### **Markov-Feller processes with controlled discontinuities**

Hector Jasso Fuentes, Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional  
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In this talk we will give a main overview of some impulsive and switching control problems when the state of the system evolves as a general Markov-Feller process. Under the dynamic programming method we shall see that the value function associated to each of these problems, turns out to be a solution of certain type of quasi-variational inequalities.

### **The Mitra-Wan forestry model analyzed under a mean field optimal control problem**

Carmen Geraldí Higuera Chan, Universidad de Sonora  
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In this talk we analyze the Mitra-Wan forestry model as a discrete-time control problem. Such a control problem consists of to find the best forest management policy for a large population of trees,  $N \sim \infty$ . We assume that the trees are classified according to their ages, ranging from 0 to  $s$ , and there is certain probability a tree death. The problem is studied by applying the mean field theory. That is, instead of analyzing each singly tree, which is almost impossible, we consider the proportion of trees at each age, then, letting  $N \rightarrow \infty$  we obtain the corresponding mean field control model.

### **Optimal transport and one-side matching games**

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We present how extend the one-sided matching market where goods are indivisible, introduced by Shapley and Scarf. In our setting the sets of agents and goods are measure spaces, which allows presenting a unified model in which both sets can be continuous or finite. We present two models. The first one introduces a concept of assignment as a measurable function that assigns to each type of agent a type of good. The second model introduces a concept of assignment as a probability distribution, which assigns a mass of agents to a mass of goods. We establish the relationship between the search of a Pareto assignment and its core property and use optimal transport theory to establish conditions for the non-emptiness of the core in both models. Finally, we study the relation between the core and a Walrasian equilibrium in an one-to-one matching market.