``Evolutionary Implementation in a Public Goods Game'' (jointly written with Ratul Lahkar)

Abstract:
We consider the implementation of the efficient state in a large population public goods game. Due to positive externalities, the efficient state is different from the Nash equilibrium of the game. We apply a variable externality price to the public goods game equal to the externality in the game. The externality adjusted public goods game is a potential game with a unique Nash equilibrium, which is the efficient state of the original game. The pure externality price scheme does not satisfy budget balance at the efficient state. A modified scheme, however, does while implementing the efficient state as equilibrium. The original public goods game, as well as the externality adjusted ones, belong to the class of aggregative games. We introduce the best response dynamic as our model of evolutionary implementation in these games. Agents converge to the efficient state under this dynamic. Finally, we establish conditions under which evolutionary implementation does not require the planner to face a budget deficit.

``Introduction to implementation theory: dominant strategies vis a vis undominated strategies''

Abstract:
Implementation theory aims to characterize the outcomes of group decision- making processes under various information structures. The group's collective objectives are specified by a social choice correspondence that selects a set of alternatives from the available set in every possible "state of the world". Implementation theory attempts to structure the interactions amongst the agents by designing a game-form such that in every state, equilibrium actions of agents according to some pre-specified equilibrium notion, lead to outcomes that are socially desirable, i.e. belong to the image of the social correspondence in that state.
The literature on implementation is vast and considers various equilibrium notions. In this lecture, we consider a private information setting. Each agent has private information about her type and a state of the world is a collection of types, one for each agent. In what follows, an agent's type will be her preference ordering over a finite set of alternatives. Thus each agent knows her own preferences but is ignorant of the preferences of others. The mech- anism designer has no information regarding the state. In such a model, equilibrium notions such as the iterated elimination of dominated strategies or Nash implementation are inappropriate. We discuss two robust solution concepts in this setting- dominant strategy implementation and implementation in undominated strategies. We state the main results and provide examples.