Title and Abstract of the Speakers

Dr. Siddharth Barman
IISc, Bangalore

Date : January 11, 2016
Time : 09:30 - 10:30

Title: An Introduction to Non-cooperative Game Theory

Abstract: Non-cooperative game theory is used to study of the behavior of self-interested entities such as human players and organizations run by human agents. Results in this field employ theoretical models and solution concepts, like equilibria, to understand and predict economic, social, political, and biological phenomena. This talk will serve as an introduction to non-cooperative game theory and, in particular, present basic game-theoretic solution concepts and results. Specifically, the talk will cover definitions and illustrative examples of key equilibrium concepts along with the Minimax theorem, Nash's theorem, and complexity of equilibrium. No prior knowledge of game theory will be assumed.

Dr. Ramasuri Narayanam
IBM Research, Bangalore

Date : January 11, 2016
Time : 11:00 - 12:00

Title: Foundational Concepts in Cooperative Game Theory

Abstract :This talk will first introduce cooperative games with transferable utilities. Then the key scientific problem in the cooperative games will be presented. Towards this end, this talk starts with describing the imputations. Later certain important solution concepts in cooperative games such as the core, the Shapley value, Nucleolus and the Kernal will be discussed along with their formal definitions. Several examples will be given to illustrate the above concepts. The final part of this talk introduces convex games and gives a brief overview of the key results for this class of games. At the end of this talk, several potential relevant references as well as further reading materials will be highlighted.

Dr. Dinesh Garg
IBM Research, Bangalore

Date : January 11, 2016
Time : 12:00 -13:00

Title: Introduction to Mechanism Design

Abstract : The theory of mechanism design is concerned with settings where a policy maker (or social planner) faces the problem of aggregating the announced preferences of multiple agents

into a collective (or social) decision when the actual preferences are not publicly known. Mechanism design theory uses the framework of non-cooperative games with incomplete information and seeks to study how the privately held preference information can be elicited. In fact, mechanism design can be viewed as reverse engineering of games or equivalently as the art of designing the rules of a game to achieve a specific desired outcome. The main focus of mechanism design is to design institutions or protocols that satisfy certain desired objectives, assuming that the individual agents, interacting through the institution, will act strategically and may hold private information that is relevant to the decision at hand. This talk will serve as an introduction to mechanism design. Specifically, in this talk, we will introduce various fundamental concepts of mechanism design including social choice functions, agents' types, Bayesian games, Bayesian Nash equilibrium, implementation concept, incentive compatibility, impossibility results, and possibility results.

Prof. T Parthasarathy
ISI, Chennai

Date : January 11, 2016
Time : 14:30 - 15:30

Title : Rational field property for Stochastic Games

Abstract : It is well known that the minimax value and every coordinate of a pair of optimal strategies lie in the same order field as that of the entries of the matrix game. It is known that this result fails to hold in stochastic games in general. In this talk we will identify certain classes of games where a solution lies in the field of rational numbers when the data defining the stochastic game comes from the rational field. We will point out some instances where it is still not known how to give efficient algorithm even if we know rational field property holds.

Dr. Rahul Sami
Google, Bangalore

Date : January 11, 2016
Time : 16:00 - 17:00

Title: Information Aggregation in Prediction Markets

Abstract: Prediction markets are markets deployed specifically for the purpose of aggregating information dispersed among a group of people to predict future events. For example, the Iowa Electronic Markets forecasts election results, and the Hollywood Stock Exchange forecasts movie box office returns. The underlying principle is that the market mechanism provides incentives for informed persons to reveal their information through trade. In this talk, I will present an overview of theoretical results on incentive-compatibility and informational efficiency of a popular family of market mechanisms, called market scoring rules. I will also briefly describe some experiments to test these mechanisms in a laboratory setting.

Prof. Anirban Dasgupta
IIT, Gandhinagar

Date : January 11, 2016
Time: 17:00 - 18:00

Title: Approximate Modularity

Abstract: A set function on a ground set of size n is approximately modular if it satisfies every modularity requirement to within an additive error; approximate modularity is the set analog of approximate linearity. In this work we study how close, in additive error, can approximately modular functions be to truly modular functions. While approximately linear functions have been extensively studied in the literature, there has been no study on approximate modularity to the best of our knowledge.

We first obtain polynomial time algorithms that, given any approximately modular function, reconstructs a modular function that is $O(n^{1/2})$ close. We also show an almost matching lower bound. In a striking contrast to these near-tight computational reconstruction bounds, we then show that for any approximately modular function, there exists a modular function that is $O(\log n)$-close.

Dr. Umang Bhaskar
TIFR, Mumbai

Date : January 12, 2016
Time : 09:30 - 10:30

Title : Optimal Signaling in Bayesian Games

Abstract: In a Bayesian game, the payoffs and hence strategies of the players depend on the state of nature, which may be hidden. Instead, players receive a signal regarding the state of nature, which they use to form beliefs on the state of nature and choose their strategies. While classical work has focused on analysing the effect of information on equilibria, the computational problem of designing an optimal signaling scheme, to optimize a given objective, has recently received much attention.

In this talk, I survey and present some recent work on the hardness of designing and approximating optimal signaling schemes in two fundamental classes of games: (1) two-player zero-sum games, where the signaling objective is to maximize the expected utility of the row player at equilibrium, and (2) network routing games, where the objective is to minimize the expected latency at equilibrium.

Prof. Sayan Bhattacharya
IMSc, Chennai

Date : January 12, 2016
Time: 11:00 - 12:00

Title: Price of Anarchy using LP duality

Abstract: Designing approximation algorithms for NP-hard problems is a deep and vibrant area of research within Theoretical Computer Science. This framework, however, is ill-suited for the recent applications driven by the internet, which involve dealing with the strategic interactions between multiple rational entities. To address this concern we need to revisit, from a game-theoretic standpoint, the problems of network-connectivity, routing, scheduling and many other classical topics in the field of optimization. The question is: What happens when the input to an algorithm is controlled by rational agents, and they are themselves affected by the algorithm's output?

The notion of ``price of anarchy" was introduced to address precisely this question. The idea is to treat every algorithm as a ``game": the players in this game control the input to the algorithm, and each of these players incurs a cost which depends on the algorithm's output. A ``Nash equilibrium" is a stable outcome where no player can decrease its cost by changing the part of the input to the algorithm it controls. The ``price of anarchy" is now defined as the worst possible ratio between the objective at any Nash equilibrium of the induced game, and the optimal objective of the underlying computational problem. Intuitively, it measures the degradation in overall system-performance due to the presence of selfish players. The goal is to design algorithms with small price of anarchy.

We will present some recent work in algorithmic game theory that give general techniques for deriving price of anarchy bounds by using the linear (and convex) programming relaxations of the underlying optimization problems.

Dr. Siddharth Barman
IISc, Bangalore

Date : January 12, 2016
Time : 12:00 - 13:00

Title : Approximating Nash Equilibria via an Approximate Version of Caratheodory's Theorem

Abstract: In this talk I will present algorithmic applications of an approximate version of Caratheodory's theorem. The theorem states that given a set of d-dimensional vectors vectors X, for every vector in the convex hull of X there exists an epsilon-close (under the p-norm, for p finite and larger than or equal to 2) vector that can be expressed as a convex combination of at most b vectors of X, where the bound b is independent of the ambient dimension d depends on epsilon and the norm p and is independent of the dimension d. This theorem can be obtained by instantiating Maurey's lemma (c.f. Pisier 1980/81 and Carl 1985).I will describe how this

approximate version of Caratheodory's theorem leads novel additive approximation algorithms for finding (i) Nash equilibria in two-player games (ii) dense subgraphs.

Prof. Chung Piaw Teo
NUS, Singapore

Date: January 12, 2016
Time: 14:30 - 15:30

Title: Robust Multi-Product Pricing Optimization using Experiments

Abstract: In this talk, we provide an overview of a recent approach in consumer choice modeling using the theory of moments and extension. We apply this technique on a principal agent model in multi-product pricing, and show how the model can be used to learn and price optimally through a series of pricing experiments, without knowing the underlying consumer choice model.

Prof. Chung Piaw Teo
NUS, Singapore

Date: January 12, 2016
Time: 16:00- 17:00

Title: Robust Sequential Attacker-Defender Game with Redeployment

Abstract: We use recent progress in the theory of co-positive cone to study a robust version of the sequential Blotto game with resource deployment, and show preliminary results on the computational performance of this approach.

Prof. Neeldhara Misra
IIT, Gandhinagar

Date: January 12, 2016
Time: 17:00 - 18:00

Title: Recent Advances in Computational Social Choice

Abstract: Computational social choice is a rapidly evolving research trend concerned with the design and analysis of methods for collective decision making. In this talk, we will survey some recent algorithmic developments in the context of problems that arise in voting; including issues such as winner determination, manipulation, control and bribery. Specifically, we will discuss the use of computational intractability as an effective workaround in the light of axiomatic impossibility results. On the other hand, we will also provide an overview of positive algorithmic efforts for winner determination problems, with a focus on voting rules that are NP-hard to compute.

Prof. Debasis Mishra
ISI, New Delhi

Date: January 13, 2016
Time: 09:30 - 10:30

Title: Foundations of Multidimensional Mechanism Design: Part I

Abstract: In this talk, we survey the foundations of multidimensional mechanism design. We first revisit the classic results from the one dimensional setting. Then, we see how much of these results extend to the multidimensional setting. In particular, we show the complicated nature of incentive constraints has enough structure to extend most of the results to a reasonable class of multidimensional problems. However, doing optimization with these extensions is harder than in one dimensional setting. The talk will expose graph theory techniques and convex analysis techniques used in such problems.

Dr. Ramasuri Narayanam
IBM Research, Bangalore

Date : January 13, 2016
Time : 12:00 - 13:00

Title: Game theoretic Approach to Measure Social Capital

Abstract: Although the notion of social capital has been extensively studied in various bodies of the literature, there is no single definition or measure that captures all facets of this concept. This talk presents a new approach to measure social capital which builds upon cooperative game theory. The new approach not only turns out to be a natural tool to model social capital, but also quantifies various aspects of this phenomenon that are not accounted for by other approaches. Several real problem settings over networks will be given to demonstrate the above conceptual aspects.

Prof. Ravi Kannan
MSRI, Bangalore

Date : January 13, 2016
Time : 14:30 - 15:30

Title: Arrow-Debreu Markets with constant number of goods

Abstract: We describe a polynomial time algorithm for finding equilibria in markets with production and consumption provided the number of goods is constant and the utilities are piecewise linear and concave. This builds on earlier work with N. Devanur on pure exchange markets.

Joint work with Jugal Garg.

Prof. Boi Faltings
EPFL, Lusanne, Switzerland

Date: January 13, 2016
Time: 16:00 - 17:00

Title: Mechanisms for truthful information elicitation: Part I

Abstract: Modern networked information systems often rely on information provided by other agents, whether it is for learning or decision--making. However, in most cases they have no way of verifying that this information is correct and relevant. In this tutorial, we will present game-theoretic techniques that allow to verify and incentivize accurate information by exploiting the multi-agent nature of information elicitation. This will be a two part talk.

Prof. Boi Faltings
EPFL, Lusanne, Switzerland
Date: January 13, 2016
Time: 17:00 - 18:00

Title: Mechanisms for truthful information elicitation: Part II

Abstract: This is Part II of the talk. See abstract of Part I.

Prof. Debasis Mishra
ISI, New Delhi

Date: January 14, 2016
Time: 09:30 - 10:30

Title: Foundations of Multidimensional Mechanism Design: Part II

Abstract: In this talk, we survey the foundations of multidimensional mechanism design. We first revisit the classic results from the one dimensional setting. Then, we see how much of these results extend to the multidimensional setting. In particular, we show the complicated nature of incentive constraints has enough structure to extend most of the results to a reasonable class of multidimensional problems. However, doing optimization with these extensions is harder than in one-dimensional setting. The talk will expose graph theory techniques and convex analysis techniques used in such problems.

Dr. Sujit Gujar,
EPFL, Lausanne, Switzerland

Date : January 14, 2016
Time : 11:00 - 12:00

Title: Redistribution Mechanisms for Assignment of Heterogeneous Objects

Abstract: In many real world strategic situations, the mechanism designer's goal is to achieve social efficiency in resource allocation rather than revenue optimization. This calls for designing a redistribution mechanism, a sub-class of the celebrated Groves mechanisms. In the first part of this talk, we provide a brief introduction to redistribution mechanisms.

The second part of the talk is devoted to redistribution mechanisms when the objects to be allocated are heterogeneous (rather than homogeneous). In this case, the information that agents possess needs to be represented in multi-dimensional spaces. This makes the allocation problem non-trivial. We measure the performance of such mechanisms by a redistribution index.

We first show an impossibility theorem which rules out linear redistribution mechanisms with a non-zero redistribution index in heterogeneous object assignments. Motivated by this theorem, we explore two approaches to get around this impossibility. In the first approach, we show that linear redistribution mechanisms with non-zero redistribution index are possible when the valuations for the objects have scaling based co-relationship and design a linear redistribution mechanism that is optimal on worst case analysis. In the second approach, we design a novel redistribution mechanism HETERO by relaxing linearity. HETERO is an optimal redistribution mechanism for allocation of heterogeneous objects with unit demand and posses a non-zero redistribution index.

Dr. Dinesh Garg
IBM Research, Bangalore

Date : January 14, 2016
Time : 12:00 -13:00

Title: PAC Learning from a Strategic Crowd

Abstract: In many real life applications involving statistical learning, it is quite expensive and time consuming to acquire experts' labels for the purpose of model training. However, acquiring labels from non-experts in an inexpensive and quick manner is now possible due to the emergence of crowdsourcing platforms such as Amazon Mechanical Turk. The data labels obtained through such platforms could be typically noisy and further, the annotators could even be strategic in reporting the labels if that yields better rewards for them. A key challenge in such settings is to train highly accurate and cost effective statistical models relying upon noisy and strategic labeled data. Motivated by this, we will be discussing the problem of Probably Approximately Correct (PAC) Learning of a Binary Classifier. In this problem, noisy labeled examples are acquired from multiple annotators (each characterized by a respective noise rate).

We begin with a complete information setting, where we assume that the learner knows the noise rates of all the annotators. For such a setting, we derive a sample complexity bound for the Minimum Disagreement Algorithm (MDA) on the number of labeled examples to be obtained from each annotator. Next, we consider a more realistic scenario of incomplete information, where the learner does not know the noise rates and thereby, the annotators may potentially take unfair advantage of the situation. We show that the learner can solicit noise rate information by means of an auction mechanism which not only minimizes the cost but also avoid manipulations on the part of the annotators.

Prof. Boi Faltings
EPFL, Lusanne, Switzerland

Date: January 14, 2016
Time: 14:30 - 15:30

Title: The Price of Anonymity

Abstract: When multiple agents access a common resource, efficient equilibria require that a single agent access the resource and are thus very unfair. Symmetric equilibria are fair but inefficient, but can be made more efficient using correlation devices. We propose the Price of Anonymity as a measure to compare fair mechanisms, and show how distributed learning algorithms can achieve good efficiency even without a central authority. Finally, we consider how participation in such learning can be made rational.

Prof. Manipushpak Mitra
Indian Statistical Institute, Kolkata

Date: January 14, 2016
Time: 16:00 - 17:00

Title: Balanced implementability of sequencing rules

Abstract: We address the balanced implementation issue for sequencing problems under incomplete information. We show that sequencing rules for which any agent's job completion time is non-increasing in own waiting costs, are the only sequencing rules that are implementable. We call such rules NI sequencing rules. We prove that any affine cost minimizer sequencing rule is an NI sequencing rule but the converse is not true. Our main contribution deals with balanced implementability of NI sequencing rules. For two agent sequencing problems we identify the complete class of NI sequencing rules that are implementable with balanced transfers. For sequencing problems with more than two agents we identify an important priority based sufficient class of NI sequencing rules that are implementable with balanced transfers.

Prof. Mrinal K. Ghosh
IISc, Bangalore

Date : January 15, 2016
Time : 09:30 - 10:30

Title: Stochastic games with risk-sensitive costs.

Abstract: We address stochastic games with risk-sensitive costs. In the usual stochastic games one considers expected additive costs and then determines Nash and saddle point equilibria. This approach does not address the variance of the costs and other risk factors. Hence such stochastic games may be referred to as risk neutral stochastic games. We study stochastic games with exponential cost criterion with appropriate risk-aversion parameters. Due to the exponential nature of the cost criterion, the total cost becomes multiplicative rather than additive. This leads to multiplicative dynamic programming. We will address discounted and average cost criteria on the infinite horizon. We will establish Nash and saddle point equilibria for relevant cases.

Prof. K. S. Mallikarjuna Rao
IITB, Mumbai

Date : January 15, 2016
Time: 11:00 - 12:00

Title: Anti-coordination games and graph coloring

Abstract: In this talk, we present game theoretic view of graph colouring problem. Our formulation of the game involves an altruistic term which helps in obtaining minimal colouring by playing the game. This talk is based on a joint work with Arko Chatterjee.

Dr. Ankur Kulkarni,
ITB, Mumbai

Date : January 15, 2016
Time: 12:00 - 13:00

Title : Leader-follower and coupled-constraint games

Abstract: This talk will be of tutorial nature covering games with coupled constraints and games involving multiple leaders and followers. We will survey several results from the area, concentrating on results on the existence and nature of equilibria in these games.
In games with coupled constraints, players are bound by a common constraint. In multi-leader multi-follower games multiple Stackelberg leaders compete in a game constrained by the equilibrium conditions of another game among the followers. The resulting problems are plagued by the nonuniqueness of follower equilibria and nonconvexity of leader problems. We present some approaches to this problem, inspired by the theory of coupled constraint games.

Prof. N. Hemachandra
IIT, Bombay

Date : January 15, 2016
Time: 14:30 - 15:30

Title: Equilibria and optima of some constrained stochastic games.

Abstract: We show one-to-one correspondence between the set of stationary Nash equilibria of general sum N-player constrained stochastic games with independent state processes and the set of global minima of certain non-convex optimization problems.