Workshop on Information and Decision Making

Wednesday July 10th 2019, 3 p.m. - 6 p.m. Institut Henri Poincaré, Paris, France.

The Workshop on Information and Decision Making is a satellite activity of ISIT to be held at the Institut Henri Poincaré (IHP) in Paris on Wednesday July 10 from 3p.m to 6 p.m. Three speakers will present tutorial-style talks on mathematical tools related to information processing for decision making. It specifically encompasses theoretical and certain applied aspects of coordination, saddle point methods and partially observable Markov decision processes.

Program

15h - 15h45 **The Saddlepoint Approximation Method with Applications to Statistical Inference and Information Theory -** Josep Font-Segura, Universitat Pompeu Fabra, Spain.
The Saddlepoint approximation has, since its introduction by Daniels in 1954, been a valuable tool to study the asymptotic of quantities described by random variables. Yet having had substantial impact in some specific areas such as multivariate testing or stochastic systems, saddlepoint methods are perhaps the least appreciated and most exceptional tool in statistics and probability. Implementing saddlepoint approximations involves the ambitious tools of Edgeworth expansions, Hermite polynomials, and analytic complex integration. In this talk, the saddlepoint method is presented using the more familiar tools of Fourier and Laplace transformation, and Taylor expansions of cumulant generating functions. The derivation of the saddlepoint density for univariate and multivariate, lattice and nonlattice random variables provides an accurate and efficient approximation to important topics in statistical inference and information theory such as hypothesis testing and random coding.

15h45 - 16h30 **Partially Observable Markov Decision Processes with Finite Memory** -
Bruno Ziliotto - CNRS, France.
A Partially Observable Markov Decision Process (POMDP) is a discrete-time repeated decision-problem where at each period, the stage payoff depends both on the stage action and on the current state of the world. The state evolves stochastically from one stage to the other. The decision-maker does not know the state, but receives a stream of signals about it. One example is an investor, that does not know exactly the state of the economy, but learns it while taking investment decisions. We consider a long interaction, and prove that the decision-maker has approximately optimal strategies that have finite memory, and thus can be implemented by a computer.

16h45 - 17h30 **Strategic Communication and Persuasion** - Maël Le Treust, CNRS, France
What information one has to transmit when the receiver has a different objective from the sender ? Originally in the Economics literature, the problem of ``Strategic Communication'' arises in decentralized networks when the users are considered as players, that choose autonomously a transmission scheme in order to maximize their own utility function. The key difference with conventional communication paradigm is that the meaning of the information symbol has to be considered carefully. Indeed, each information might have a different impact on the utility functions of the users, hence it has to be compressed and transmitted accordingly. Instead of ensuring reliable transmission, the goal of the encoder is to manipulate the posterior beliefs of the decoder in order to influence its action. We provide a unified approach to this problem by generalizing the Rate-Distortion results in Information Theory and the Persuasion results in Game Theory. By using the tool of "Empirical Coordination", we characterize the optimal "Strategic Communication" in terms of a concavification over the space of the posterior beliefs, under a mean entropy constraint.

17h30 - 18h **Cocktail**

Speakers

Josep Font-Segura received the PhD degree in electrical engineering from Universitat Politècnica de Catalunya, Barcelona, in 2014. In 2008-2009, he was research assistant with the information signal processing group at Columbia University, New York. Since 2014 he is research associate at Universitat Pompeu Fabra, Barcelona, with the information theory and coding group. Dr Font-Segura is a member of the IEEE. He is recipient of a "la Caixa" savings bank fellowship for graduate studies in the United States, a best paper award at the IEEE International Conference on Communications, and a Juan de la Cierva postdoc fellowship from the Spanish government. He was member of the organizing committee of the IEEE International Symposium on Information Theory in 2016, and he is currently vice-chair of the Spanish chapter of the IEEE Information Theory Society. He also contributed as reviewer in several journal and conference publications of the IEEE and the EURASIP societies. Dr Font-Segura's research interests are in the areas of information theory, digital communications and signal processing.

Maël Le Treust is a CNRS researcher at the ETIS laboratory, a joint research laboratory   between the Université Paris Seine, the Université Cergy-Pontoise, ENSEA and CNRS, in Cergy, France, since Oct. 2013. He received the M.Sc. degree in Optimization, Game Theory & Economics (OJME) from the Université de Paris VI (UPMC), France in 2008 and the Ph.D. degree from the Université de Paris Sud XI in 2011, at the Laboratoire des signaux et systèmes UMR 8506, in Gif-sur-Yvette, France. In 2012, he was a post-doctoral researcher at the Institut d'électronique et d'informatique Gaspard Monge (Université Paris-Est) in Marne-la-Vallée, France. In 2012-2013, he was a post-doctoral researcher at the Centre Énergie, Matériaux et Télécommunication (Université INRS) in Montréal, Canada. From 2008 to 2012, he was a Math T.A. at the Université de Paris I (Panthéon-Sorbonne), Université de Paris VI (UPMC) and Université Paris Est Marne-la-Vallée, France. His research interests lie in the overlap of information theory, wireless communications, game theory, economics and optimization.

Bruno Ziliotto received his PhD in Game Theory from the Toulouse School of Economics, Toulouse, France in 2015. He was granted a postdoctoral fellowship from the "Fondation Sciences Mathématiques de Paris - FSMP" during 2015 and 2016. Since October 2016 he has been a CNRS researcher at Paris Dauphine University and works at the laboratory of CEREMADE. His research focuses on continuous-time and discrete-time Repeated Games, such as Stochastic Games, Differential Games and Mean-Field Games. His work was awarded with a distinguished plenary lecture (Shapley lecture) at the last World Congress of the Game Theory Society, the PGMO PhD prize and the Théodore Ozenne PhD prize from the "Académie Sciences et Belles Lettres de Toulouse".

Venue
Institut Henri Poincaré, 11 rue Pierre et Marie Curie, Paris. Maps: http://ihp.fr/en/guide

Registration
This event is free to all participants at ISIT2019 but **registration is mandatory**. Send an email to samir.perlaza@inria.fr with full name and your institution. Note that for security issues, an identification document might be asked at the entrance of the IHP. Only 30 places are available.

Organizers
Meryem Benammar (ISAE - Supaero, France) and Samir M. Perlaza (INRIA, France).