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Editorial

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Introduction to the Special Section on Logic and the Foundations of Game and Decision Theory (LOFT12)

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This special section of the *B.E. Journal of Theoretical Economics* contains a selection of papers presented at the 12th *Conference on Logic and the Foundations of Game and Decision Theory* (LOFT12), which took place in Maastricht (The Netherlands), July 20–22, 2016. While this special section collects papers that have a stronger epistemological and game-theoretic content, a second set of papers – which are more focused on logic – can be found in a companion special issue of *Studia Logica*.

The LOFT conferences have spanned a period of 22 years: the first took place in 1994 in Marseille (France) and, since then, LOFT has become a regular bi-annual event.[1]

The LOFT conferences are interdisciplinary events that bring together researchers from a variety of fields: cognitive psychology, computer science and artificial intelligence, economics, game theory, linguistics, logic, mind sciences, philosophy and social choice. In its original conception, LOFT had as its central theme the application of logic, in particular modal epistemic logic, to foundational issues in the theory of games and individual decision-making. The LOFT initiative arose from the realization that the tools and methodology that were used in game theory were closely related to those used in other fields, notably computer science, logic and philosophy. Modal logic turned out to be the common language that made it possible to bring together different professional communities.

New and active areas of research have sprung from the interdisciplinary exposure provided by the LOFT events. Over time the scope of the LOFT conferences has broadened to encompass a wider range of topics, while maintaining its focus on the general issue of rationality and agency. Topics that have fallen within the LOFT umbrella include epistemic and temporal logic, theories of information processing and belief revision, models of bounded rationality, non-monotonic reasoning, theories of learning and evolution, social choice theory, the theory of social networks, etc. A complete list of publications that have sprung from the past LOFT conferences is given in the References section at the end of this Introduction.

This special section consists of five articles, which are briefly summarized below.

Theory of mind is the topic of “Estimating the use of higher-order theory of mind using computational agents” by Harmen de Weerd, Denny Diepgrond and Rineke Verbrugge. The authors use a combination of computational agents and Bayesian model selection to determine to what extent people make use of higher-order theory of mind reasoning in a particular competitive game known as matching pennies. This method allows them to consider a population with differences among individuals in use of theory of mind, in contrast to the existing estimation methods in the behavioral economics literature, which determine which level of theory of mind reasoning best describes the population as a whole. The paper’s goal is to test the effectiveness of the Bayesian estimation procedure, as well as to determine to what extent human participants make use of theory of mind in simple competitive games. To do so, they apply this method to two empirical studies in which participants play the matching pennies game. They find that while many children and adults appear to make use of theory of mind, participants are also often classified as using a simpler strategy based only on the actions of the directly preceding round. This may indicate that human reasoners do not primarily use their theory of mind abilities to compete with others.

The paper “Beyond coincidence: the reasoning process underlying utility proportional beliefs process” by Christian Tobias Nauerz provides new insights into a solution concept for strategic-form games introduced by Bach and Perea (2014), namely the concept of “utility proportional beliefs” (UPB). The main idea behind

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UPB is to restrict players' beliefs in such a way that the differences in probabilities assigned by a player to his opponent's choices should be equal to the differences in the opponent's utilities for these choices. Nauerz's contribution is threefold. First, it provides an explicit characterisation of the unique beliefs that players can hold under common belief in UPB. Second, the paper re-interprets the resulting expression as the outcome of an iterative reasoning process. This process starts with an initial belief that is formed using the utility proportional correction assuming that your opponent does not reason about your own strategic incentives. The reasoning process is then defined iteratively. The belief over the other player's choice resulting from the previous step is used to correct your beliefs about the other player's beliefs about yourself (via the utility proportional correction), which – in turn – are used to correct your own beliefs about the other player (again via the utility proportional correction). In the limit, this reasoning process converges to the unique UPB beliefs. Finally, the paper uses this interpretation to make reaction-time predictions for the games implemented in the experiments of Nauerz Christian, Collewet, and Meyer (2015).

In the paper "Non-congruent views about signal precision in collective decision", by Addison Pan, Simona Fabrizi and Steffen Lippert, the authors look at a class of voting problems in which a number of jurors must judge whether the defendant is guilty or not. Before making a decision, every juror receives an imprecise signal about the defendant's guilt or innocence, and the final decision is reached by some collective decision making rule such as simple majority or unanimity. Contrary to the standard approach, different jurors may receive signals with different degrees of precision. Nevertheless, every juror believes that everyone else receives signals with the same precision as he does.

Voting power is the topic of the article "Structural control in weighted voting games" by Anja Rey and Jörg Rothe. The authors explore voting situations where every voter has a certain weight, and a coalition of voters is winning if the sum of the associated weights exceeds a given quota. Several power indices, such as the Shapley-Shubik index or the probabilistic Penrose-Banzhaf index, can be used to measure the power of every individual voter. The main purpose of this paper is to investigate whether the power index of a distinguished voter can be increased, or decreased, by adding, or eliminating, voters from the game. The focus in this investigation is on the computational complexity. That is, how difficult is it – from a computational perspective – to verify whether the desired increase or decrease in power can be achieved by adding or eliminating a certain number of voters from the game?

As the title suggests, in "Agreeing to disagree with conditional probability systems" Elias Tsakas extends Aumann (1976) seminal result on the impossibility of "agreeing to disagree" to a framework in which beliefs are modelled by means of conditional probability systems (CPS). He proves two results. The first states that if – given a single conditioning event – the agents' posterior beliefs are commonly believed, then these posteriors necessarily coincide (as long as the conditioning event receives positive prior probability). The second result states that if two agents have possibly differing conditioning events (but the union of all conditioning events for each player is the same) and the conditioning events satisfy a "balancedness" condition, then if the agents' conditional beliefs given each of the conditioning events are commonly believed then these beliefs coincide. A corollary is that agents cannot agree to disagree in dynamic games (with CPS beliefs), where the conditioning events satisfy a natural "tree-like" property in that setting. It is worth noting that Tsakas uses the weaker notion of "common (full) belief of the posterior" rather than the stronger notion of "common knowledge of the posterior" employed by Aumann.

The editors of the special section would like to thank the authors for their submissions, the LOFT participants for their lively discussions and the many reviewers for their invaluable help during the thorough reviewing and editorial process. Last but not least, our thanks go to Burkhard Schipper, Editor-in-Chief of the *B.E. Journal of Theoretical Economics*, for making this special section possible.

Notes

1 The first conference was hosted by the Centre International de Recherches Mathematiques in Marseille (France), the next four took place at the International Centre for Economic Research in Torino (Italy), LOFT6 was hosted by the Graduate School of Management in Leipzig (Germany), LOFT7 took place at the University of Liverpool (United Kingdom), LOFT8 at the University of Amsterdam (The Netherlands), LOFT9 at the University of Toulouse (France), LOFT10 at the University of Sevilla (Spain) and LOFT11 at the University of Bergen (Norway).

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