FOREWORD: SPECIAL ISSUE
"EURO 2019: GAMES IN ECONOMICS,
FINANCE AND BIOLOGY"

Game theory is a mathematical framework developed to address problems with conflicting or cooperating parties who are able to make rational decisions. The theory primarily deals with the finding the optimal rational decision in various scenarios. Game theory is a relatively new discipline. Modern game theory was introduced in the 1920s by _John von Neumann_. He along with _Oskar Morgenstern_ and _John Nash_ were the main contributors to the development of game theory. The theory offers a wide number of applications in different fields, including economics, political science, finance, psychology, biology, etc.

The host journal of this special issue, _Journal of Dynamics and Games_, is a pure and applied mathematical journal that publishes high quality peer-review and expository papers in all research areas of expertise of its editors. The core focus of _JDG_ is in the interface of Dynamical Systems and Game Theory. It is devoted to the development and the diffusion of mathematical ideas and techniques that arise from the analysis and the modelling of systems where agents (whether they be rational players, markets, plants, animals, ecosystems, communication systems, etc.) interact dynamically over time.

We invited papers challenging mathematical questions occurring in such systems or provide a rigorous mathematical analysis of models where tools from dynamics and games prove to be useful. Areas covered include dynamic games, stochastic games, differential games, evolutionary games, models of learning and evolution, repeated games, mean field models, voting, auctions, matching, assignment games and other research areas of cooperative and non-cooperative game theory, preferentially where dynamics play a role, as well as the associated applications in social, economic, biology, life, physical and computer sciences.

The objective of this special issue was to explore latest development of mathematical ideas and techniques in modeling, and simulation related with Game theory applied in economics, finance and biology. Papers in newly evolving topics were especially welcomed. We have invited researchers and experts worldwide to submit high-quality innovative research papers and critical review articles on the subsequent potential topics.

As we all know very well, many problems of our modern society yield to mathematical descriptions and solutions, complex problems being susceptible to mathematical formulations. Game theory is a mathematical framework developed to address problems with conflicting or cooperating parties, thus playing an important role in numerous decision-oriented real-life problems. The objective of this special issue is to explore latest development of mathematical ideas and techniques in modeling, and simulation related with Game theory applied in economics, finance and biology, ideas that offer insights into certain problems of the real world and techniques for solving some of these problems.

In the first paper, the authors *Petrosyan and Yeung* present a time-consistent dynamic Shapley value imputation for a class of differential network games. A novel form for measuring the worth of coalitions called *cooperative-trajectory characteristic function* is developed for the Shapley value imputation. This new class of characteristic functions is evaluated along the cooperative trajectory. It measures the worth of coalitions under the process of cooperation instead of under min-max confrontation or the Nash non-cooperative stance. The resultant dynamic Shapley value imputation yields a new cooperative solution in differential network games.

The second paper authored by *Bobrik, Bobrik, and Sukhorukova* presents a pricing model for the commodity markets. The model describes the behavior of the Order Book, consisting of orders from producers and consumers only. The paper explores the external impact on this model in the form of large operations by new market participants, who at high speeds begin to push forward their orders. The potential vulnerability to external influences is thus shown: The swinging of prices through large purchases and sales leads to systematic profits of the entrants at the expense of the traditional market participants.

In the third paper, the authors *Palancı, Ekici, and Alparslan* focus on the equal surplus sharing interval solutions for cooperative games, where the set of players are finite and the coalition values are interval numbers. An application based on transportation interval situations is given.

The fourth paper authored by *Inc, Partohaghighi, Akinlar, and Weber* propose a new method based on unification of fictitious time integration and group preserving methods. The group preserving method is applied in discrete ordinary differential equations obtained from application of fictitious time integration method to given PDE. The algorithm is applied to hyperbolic Telegraph equation in a Minkowski space. The technique is tested on three specific examples. Efficiency of the method is determined by an error analysis which was achieved by comparing computational solutions with exact solutions.

The paper of *Bhaumik, Roy, and Weber* is concerned with Game Theory (matrix game) problems with imprecise/vague information, such as neutrosophic, that can be formed with multiple objective functions. The authors develop and analyze a matrix game with multiple objectives, and solve the problem under a single-valued neutrosophic environment in linguistic approach. In fact, we here, introduce a problem-oriented (application) example to justify our designed methodologies with real-life implications. A matrix game with multiple objectives is developed, analysed, and the problem under a single-valued neutrosophic environment in linguistic approach is solved. The designed methodologies are used in an application to tourism management.

The conceptual and empirical manuscripts in this Special Issue represent significant contributions in which different research perspectives of analysis have been adopted developing specific topics, such as differential network games, interval solutions for cooperative games, matrix game problems with imprecise information with multiple objective functions, unification of fictitious time integration and group preserving methods, pricing model for the commodity markets, thus the special issue evidencing a multidisciplinary research approach, in which several research areas have been involved.

As the Guest Editors, we hope that the selected topics display a core selection of international research coping with the emerging and complex problems of Dynamics and Games and their fields in Economics, Finance, Science, Engineering and

Medicine, with links to the results and methods of Operational Research. We are very thankful to the *Journal of Dynamics and Games (JDG)* and the publishing house of *AIMS Press* for the honor of hosting this Special Issue as a pioneering scientific project. Particular thanks are extended to the Editors in Chief of *JDG, Alberto Pinto* and *Michel Benaim*, for their interest, confidence and support spent on our Special Issue from the very first moment of the project, and to Editorial Manager *Liwei Ning* for her steady advice and guidance in every respect. We express our gratitude to the Organizers of *EURO 2019* Dublin and notably PC Chair *Luis Eduardo Neves Gouveia*, for approving and endorsing our Special Issue. We thank all the authors for their hard work and readiness to share their newest results with our whole community. Now we very much hope that their research will stimulate cooperation and advances at a worldwide and highest level.

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