Modelos de decisión estratégica: fundamentos y aplicaciones

Equipo organizador
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Descripción

Esta sesión reúne contribuciones recientes que abordan problemas de decisión estratégica desde una perspectiva matemática, combinando herramientas de teoría de juegos cooperativa y no cooperativa. Las ponencias exploran aplicaciones en contextos económicos, sociales y organizativos tan diversos como la gestión aeroportuaria bajo acuerdos de código compartido, la clasificación automática con características dependientes, la planificación territorial con criterios de equidad, la cooperación en mercados agrícolas con compromisos mínimos de exportación, la gestión de inventarios y el intercambio de información en mercados digitales, así como la evolución de convenciones sociales bajo incertidumbre. Además, se presenta un modelo de juego señalizador sobre el proceso de evaluación académica, destacando cómo los incentivos individuales pueden afectar al comportamiento colectivo. En conjunto, la sesión pone de relieve la utilidad analítica de los modelos formales para entender dinámicas estratégicas complejas y ofrecer soluciones con propiedades deseables de equidad, eficiencia o estabilidad.

Palabras clave: Teoría de juegos; Optimización y equidad; Redes de cooperación; Procesos evolutivos; Aplicaciones económicas y sociales.

Programa

Jueves, 22 de enero

11:00 – 11:30	Alejandro Saavedra-Nieves (Universidade de Santiago de Compostela) *On cost allocation in airport operations under code-sharing: a game-theoretical approach*
11:30 – 12:00	Laura Davila-Pena (University of Kent) *A game-theoretic approach to quantifying the influence of dependent features in classification problems*
12:00 – 12:30	Joaquín Sánchez Soriano (Universidad Miguel Hernández) *Mathematical optimization and social choice in land reparcelling problems*
12:30 – 13:00	Ana Meca (Universidad Miguel Hernández) *Minimum Quantity Commitments in Cooperative Agri-Food Export* **(Chairwoman)**
15:30 – 16:00	J.C. Gonçalves-Dosantos (Universidad Miguel Hernández) *Demand Information Sharing in Online Retail Marketplaces*
16:00 – 16:30	José A. García-Martínez (Universidad Miguel Hernández) *Rejected: Career concerns in the refereeing process*
16:30 – 17:00	Juan Francisco Blázquiz Pulido (IMT School for Advanced Studies Lucca, University of Milan-Bicocca, Universidad de Alicante) *Evolution of Conventions in Uncertain Environments*
17:00 – 17:30	Luis A. Guardiola (Universidad de Alicante) *The Shapley value and the influence of weak players in Big Boss games* **(Chairman)**

On cost allocation in airport operations under code-sharing: a game-theoretical approach

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Resumen. An important operational aspect in airport management is the allocation of fees to aircraft movements on a runway, whether operated by separate operators or under code-sharing agreements. In this talk, we analyse the problem of determining fees under code-sharing of the movements at an airport from a game theoretic perspective. In particular, we propose the configuration value for games with coalition configuration as the mechanism for allocating operating costs. We provide the exact expression of this game-theoretic solution for airport games, which depends only on the parameters of the associated airport problem. For this purpose, we consider a new and natural game-theoretic characterization of the configuration value. Finally, for the specific context of airport games, we apply it to a real case.

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A game-theoretic approach to quantifying the influence of dependent features in classification problems

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Resumen. We present a novel measure to analyze the influence of features in classification problems, explicitly accounting for dependencies among them. Building on concepts from cooperative game theory, we propose an axiomatic characterization and show that our measure generalizes the Banzhaf-Owen value for games with a priori unions. To enable scalability, we introduce a sampling-based method for estimating the measure in large datasets. We demonstrate the practical value of our approach through a range of applications, highlighting its relevance in real-world classification tasks.

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Mathematical optimization and social choice in land reparcelling problems

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Resumen. This paper addresses the urban planning problem of land redistribution from a mathematical perspective. The mathematical optimization problems that may arise in this type of problem are analyzed and attempted to be solved by introducing principles of justice and equity. This, in turn, leads to an analysis from the perspective of social choice theory and game theory to design allocation mechanisms that satisfy relevant properties in the context of the problem and are related to these principles of justice and fairness.

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Minimum Quantity Commitments in Cooperative Agri-Food Export

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Resumen. International trade offers significant opportunities for agri-food communities. However, accessing these markets can be costly, especially for small and medium-sized enterprises (SMEs), and trade policies that impose minimum quantity commitments (MQCs) on export volumes, such as licensing tariff rate quota (TRQ) mechanisms, further complicate matters. We demonstrate how cooperation among agri-food exporters can help overcome these barriers and enhance market access for SMEs. By formulating a framework of cooperative games, we identify a gain-sharing mechanism that produces allocations within the corresponding cores, enabling stable grand coalitions of exporters. Our allocation rule exclusively benefits "essential" exporters—those with sufficient cost efficiency. As a result, less cost-efficient "complementary"players, necessary for meeting MQCs, receive no direct benefits from collaboration and must participate altruistically. To address this, we propose two modifications: one based on egalitarian principles and the other on revenue-based rates, both of which allocate a portion of the export surplus to complementary players through taxes on essential exporters. We evaluate these modifications through a case study and discuss their practical implications

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Demand Information Sharing in Online Retail Marketplaces

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Resumen. In this paper we make use of game theory tools to address a specific type of problems that arise in inventory management in multi-agent markets. In particular, we study which market characteristics are able to generate incentives for agents to buy and share information that help them to improve the prediction of their demands and, thus, to improve their inventory policies. We modeled the retailers' decisions regarding demand information acquisition and sharing as a biform game. Our findings demonstrate that, for any set of demand information acquisition strategies, there are clear incentives for cooperation among retailers. Moreover, no coalition of retailers has an incentive to abandon cooperation in pursuit of a better outcome independently. We introduce a family of benefit distribution rules that are coalitionally stable. Additionally, we show that demand information acquisition can always reach equilibrium, irrespective of the value of the information. We further analyze the equilibria in scenarios with specific characteristics. Finally, we compare the equilibria derived from our model with those obtained in a centralized setting.

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Rejected: Career concerns in the refereeing process

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Resumen. We study how career concerns influence the refereeing process, modeling it as a signaling game. Our framework involves a journal editor and two referees who may differ in both reputation and ability. A referee's reputation is public information, while a referee's ability is private information. We identify an incentive for low-ability referees to reject good papers —a phenomenon we call over-rejection— and find that this incentive increases with the referee's reputation. We show that over-rejection decreases with competition, referee homogeneity, and the anonymity of the refereeing process. In contrast to low-ability experts, high-ability referees are sincere in equilibrium. Since a referee with a higher reputation is ex-ante more likely to be high-ability, our results suggest that the probability of rejection is inverted U-shaped in the referee's reputation. We empirically test this result. We use data from Card and DellaVigna (2020) for submissions to four top economic journals in the period 2003-2013 and use the referee's publication record as a proxy for the referee's reputation. We find that the probability of sending a negative recommendation increases with the referee's reputation in the early stages of the career and decreases thereafter, suggesting an inverted U-shaped form in line with our theoretical results.

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Evolution of Conventions in Uncertain Environments

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Resumen. We study the role of uncertainty in the evolution of conventions in coordination games when agents are myopic best responders. We introduce uncertainty of the choice environment by means of an ergodic Markov process ruling the switching across a collection of 2-player symmetric coordination games with the same strategy sets but different payoffs, referred to as scenarios. We apply stochastic stability analysis to study the selection of equilibria in the long run when there are multiple scenarios with diverse characteristics. We show that the stochastically stable states may be entirely determined by one or more scenarios that are played very rarely, so changing dramatically any prediction based exclusively on the most likely scenarios. Moreover, we show that the error model determines which scenarios play such crucial role, indicating that any abstraction from low probability scenarios should be evaluated in the light of the considered error model. Finally, we show how to compute the radius and the coradius of a convention in this setup.

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The Shapley value and the influence of weak players in Big Boss games

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Resumen. Big Boss Games represent a specific class of cooperative games where a single veto player, known as the Big Boss, plays a central role in determining resource allocation and maintaining coalition stability. In this work, we introduce a novel allocation scheme for Big Boss games, based on two classical solution concepts: the Shapley value and the τ-value. This scheme generates a coalitionally stable allocation that effectively accounts for the contributions of weaker players. Specifically, we consider a diagonal of the core that includes the Big Boss's maximum aspirations, the τ-value, and those of the weaker players. From these allocations, we select the one that is closest to the Shapley value, referred to as the Projected Shapley Value allocation (PSV allocation). Through our analysis, we identify a new property of Big Boss games, particularly the relationship between the allocation discrepancies assigned by the τ-value and the Shapley value, with a particular focus on the Big Boss and the other players. Additionally, we provide a new characterization of convexity within this context. Finally, we conduct a statistical analysis to assess the position of the PSV allocation within the core, especially in cases where computing the Shapley value is computationally challenging.

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