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Editorial: Real-world applications of game theory and optimization

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Editorial on the Research Topic
Real-world applications of game theory and optimization

Researching real-world applications of game theory and optimization is crucial due to its significant impact on decision-making, efficiency, and innovation across various sectors. Game theory provides valuable insights into strategic interactions among rational agents, aiding businesses in developing competitive strategies and assisting governments in policy design. Optimization techniques enhance operational efficiencies in industries such as logistics and manufacturing, leading to cost reductions and productivity gains. These fields are fundamental in technological advancements, particularly in artificial intelligence and machine learning, where they underpin many algorithms. Additionally, they play a vital role in addressing social and environmental challenges by optimizing resource management and promoting sustainable practices. In healthcare, they improve resource allocation and patient outcomes. By fostering interdisciplinary collaboration and theoretical advancements, research in these areas drives innovation and provides comprehensive solutions to complex problems. Ultimately, studying real-world applications of game theory and optimization not only enhances academic understanding but also delivers practical solutions that significantly benefit economic, technological, social, and environmental domains.

This Research Topic centers on the practical application of game theory and optimization methods to address complex challenges in real-world contexts. At its core, game theory provides a framework for analyzing strategic interactions among rational decision-makers, while optimization techniques seek the most favorable outcomes. These tools have proven to be powerful assets across a wide range of domains, from economics and computer science to social sciences and engineering. The goal of this Research Topic in Frontiers in Physics is to produce a comprehensive understanding of the real-world applications of game theory and optimization, highlighting their practical impact and potential for future use. It will provide valuable insights for professionals and researchers working in fields where these techniques can be applied and contribute to the body of knowledge in game theory and optimization.

Within this Research Topic, Wu et al. employ a game-theoretic approach to explore the dynamics of status transitions and the enhancement of employee performance in organizations. Zhang et al. utilize evolutionary game theory to examine the role transitions of employees in family businesses. To investigate the evolutionary game rules of strategic interactions between enterprises and employees during deviant

innovation, Zheng et al. construct a 2 × 2 asymmetric payoff matrix and use numerical simulations to demonstrate the influence of varying decision parameters and initial conditions on evolutionary outcomes. Sang et al. employ reinforcement learning algorithms to identify the optimal policy or equilibrium solution. Li et al. conduct an in-depth study on maritime area detection, proposing a cloud-edge cooperative-based scheme to address communication limitations by deploying edge computing nodes on the ship side of the gateway. Zhao and Yang establish a three-party evolutionary game model comprising an agricultural product data sharing platform, agricultural data providers, and agricultural data consumers. Zhou et al. propose a coupled disease-behavior model to describe the dynamic evolution of vaccination behavior during the spread of infectious diseases. Kan et al. explore a mixed updating strategy for vaccination decisions, where some individuals, termed intelligent agents, update their decisions based on a reinforcement learning strategy, while others, termed regular agents, use the Fermi function. Finally, Ma et al. investigate the decision-making behaviors of opinion leaders and netizens in the context of uncertain information dissemination, aiming to effectively manage online public opinion crises triggered by major sudden events.

Based on the contributions of these papers, it is evident that this Research Topic is highly valuable for understanding social systems. We hope that the theoretical models and practical applications presented in this research will inspire further exploration and development of real-world applications of game theory and optimization in social systems.

Author contributions

DH: Validation, Writing–original draft, Writing–review and editing. JrW: Validation, Writing–original draft, Writing–review and editing. JbW: Validation, Writing–original draft, Writing–review and editing. MP: Supervision, Validation, Writing–original draft, Writing–review and editing.

Conflict of interest

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The author(s) declared that they were an editorial board member of Frontiers, at the time of submission. This had no impact on the peer review process and the final decision.

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