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Editorial for "Recent advances and applications of multi-objective optimization"

In today's complex business landscape, effective decision making is central to the success of management organizations confronting trade-offs between multiple, often conflicting, objectives. Therefore, multi-objective optimization and decision making have been included in the fastest-growing subfields of operational research with their applications in diverse domains such as healthcare, sustainability, energy, logistics, and supply chain.

On the occasion of the 26th International Conference on Multiple Criteria Decision Making (MCDM), this Special Issue is planned as a collection of original research articles on recent advances and applications of multi-objective optimization for improved decision-making processes. We targeted methodological developments, practical applications involving multi-objective modelling and optimization, and papers developing new theories, algorithms, and real-life applications in the context of multi-objective optimization that address today's decision process challenges.

This special issue comprises the following four papers that address different aspects of MCDM and several applications of multi-objective optimization.

The first paper, "Reflections on 50 years of MCDM: Issues and future research needs," by Simon French was crafted from his speech at the 26th International Conference on MCDM when he was awarded the Society's Gold Medal. The paper reviews the evolution of methodologies and contextualizes MCDM within the broader landscape of decision-making processes for the past five decades. It offers valuable insights by addressing the gaps in the literature and advocating for research efforts that align MCDM methodologies with today's global challenges.

In "Proposing a bi-objective model for the problem of designing a resilient supply chain network of pharmaceutical-health relief items under disruption conditions by considering lateral transshipment," Soheil Javaheri Fazel, Mohammad Rostamkhani, and Mehdi Rashidnejad delve into the critical aspect of resilience in the pharmaceutical-health relief sector. They develop a bi-objective mathematical model to minimize the total cost and time required to deliver relief items to the demand points. Their study underscores the importance of adaptive strategies, particularly lateral transshipment, in mitigating disruptions and optimizing resource allocation. It provides insights that guide efforts toward more robust and sustainable supply chain practices.

In the domain of urban water management, Yi Zhen, Kate Smith-Miles, Tim D. Fletcher, Matthew J. Burns, and Rhys A. Coleman propose a comprehensive multi-objective optimization strategy for managing rainwater storages within urban water systems in "Multi-objective optimization in real-time operation of rainwater harvesting systems". Their approach represents a significant advancement in real-time urban water management, offering practical solutions to determine when and how much water to release from the storages to mitigate flood risk, augment water supply, and restore baseflow to protect the stream ecosystem.

Lastly, in the field of explainable artificial intelligence, Wellington Rodrigo Monteiro and Gilberto Reynoso-Meza introduce a surrogate generation method using a multi-objective optimization design in "A multi-objective optimization design to generate surrogate machine learning models in explainable artificial intelligence applications". Their study bridges the gap between complex black-box algorithms and human understanding by prioritizing interpretability alongside accuracy. By offering transparent surrogates that maintain high levels of accuracy, their approach enhances decision making processes across various industries, with potential applications in healthcare, logistics, and supply chain management.

We hope that this Special Issue attracts the attention of researchers from different fields interested in methodological developments and practical applications of multi-objective optimization and inspire further advancements, paving the way for innovative solutions to challenges in decision processes. As we conclude this Special Issue, we express our deepest gratitude to the authors for their valuable contributions. We are also thankful to the reviewers for their time and constructive comments. We extend our sincerest appreciation to the editorial team of the EURO Journal on Decision Processes for their help and support throughout the editorial process.

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