

Department Statements

IISE Transactions: Focused Issue on Operations Engineering and Analytics

Application Innovations

The Application Innovations department publishes papers on innovative applications of industrial and systems engineering methods to real world problems. It also welcomes survey papers of innovative methods to a given area of application. All successful submissions are expected to meet the following criteria.

- (1) The research problem must be clearly defined before the paper starts to propose how to solve it.
- (2) Existing methods for solving the problem must be thoroughly reviewed.
- (3) Proposed methods for solving the problem must be clearly described and rigorously tested. Whenever possible, the performance of the new method should be presented in comparison with those of existing methods.
- (4) The paper must be well written and the major contributions must be clearly articulated.
- (5) Whenever possible, data should be made publicly accessible for verification.

Innovations of a publishable application paper can be demonstrated in multiple ways. For example, if a well-known problem (e.g., traveling salesman problem) is to be addressed, then the proposed solution techniques should demonstrate methodological innovations. High expectations will be set on the elegance of model formulation, efficiency of algorithm design, quality of computational performances, and generality of methodological contributions. If existing methodology (e.g., mixed integer linear programs solved by CPLEX) is applied to solve a problem, then innovation could be demonstrated by the superior quality of the solution. Novel problem domain of industrial engineering applications are particularly welcome. High expectations will be set on the clarity of problem statement, fidelity of model formulation, credibility of data, and significance of impact.

Decision Analysis and Analytics

Decision Analysis studies normative (how decisions should be made), descriptive (how decisions are made) and prescriptive (how decisions can be improved) decision making. Normative foundations of Decision Analysis include the subjective expected utility model and Bayesian inference whereas the descriptive perspective studies actual decision making behavior and may draw on models such as prospect theory. The prescriptive perspective focuses on improving decision making by using normative models however realizing the need to make assumptions and perhaps approximations.

Decision Analysis area invites papers that focus on the normative and prescriptive perspectives and contribute to our understanding of the theory and implementation of Decision Analysis. Papers may offer methodological contributions or may study a specific problem relevant to industrial and systems engineering practice. Papers may consider individual and group decisions, game theoretic analysis of strategic interactions and sequential decision making under uncertainty. We also look for papers that integrate data analytics to Decision Analysis

practice. In all cases, contribution must be significant and must be of interest to the Decision Analysis and IISE communities.

Energy Systems

As one of the largest industrial sectors, the energy sector consists of industries such as petroleum, natural gas, electric power, coal, nuclear power, and renewable energy. Recently, energy systems have expanded rapidly and are undergoing significant transformation, especially integration with other systems. Industrial and systems engineers have accordingly become more involved in all aspects of the energy sector, with the primary objectives of improving the system and operational efficiency and reliability.

The objective of the Energy Systems department is to become a premier department for researchers and practitioners to publish high-quality energy-related papers. These papers should advance excellence in innovative modeling and exploring ISE techniques, including deterministic and stochastic optimization, applied statistics and simulation, and game theory, customized to solve upcoming new challenges for energy system related topics. This department encourages paper submissions in broader areas of energy systems including but not limited to market analysis, planning, operations, and reliability studies for oil, gas, electricity, industrial and building energy efficiency, energy storage, and renewable energy, among others.

Manuscripts addressing practical problems with sufficient technical depth are strongly encouraged. Meanwhile, the authors are discouraged from submitting papers that use standard, off-the-shelf methods with numerical experiments. Manuscripts with less rigorous analysis are considered only when a brand-new area in energy systems is studied and practical usefulness is demonstrated through actual implementation.

Financial Engineering

Financial Engineering studies the design of mathematical models for improving the operations of financial services. Solution techniques rely on fundamental tools of applied probability, optimization, stochastic simulation, stochastic control, and game theory. The financial services industry is undergoing a period of remarkable transformation, and is being heavily affected by advances in technology and computational infrastructure.

We welcome papers that advance the state-of-art of modeling and computation in finance. We encourage submissions of classical financial engineering topics, including but not limited to portfolio optimization, market microstructure, systemic risk, and inventory modeling in finance. We are also very interested in studies on financial technology, including but not limited to robo-advising, cryptocurrencies, peer-to-peer lending and payment systems. Novelty is an important criterion for publication. Papers should provide contributions that offer new insights in either the theory or practice of financial engineering.

Government, Policy, and Society

This department intends to publish papers that describe innovative operations research models

and methodologies that address problems of societal benefit. While the department broadly defines government, public policy, and society, the focus is on advanced quantitative and analytical methods to design processes and systems, make better decisions, and solve problems of public concern. The department's scope includes the protection of critical infrastructure; border, maritime, and port security; transportation security; food safety; emergency preparedness and response; humanitarian logistics; evacuation modeling; recovery efforts; public sector and public services operations research; decision making for homeland security; and non-profit and community-based operations research, among other related topics in government, public policy, and society. Papers submitted to this department must clearly motivate the problem's relevance to society and should make substantive and innovative contributions to solving the problem with analytical methods. Papers that describe collaborations and applications of the research and papers that evaluate public policy alternatives are particularly desired.

Health Care

Health care research within the Industrial and Systems Engineering community has a history that goes back decades, but it would be fair to state that there has been a renewed and intensified interest in the area over the last decade. This coincided with or more likely was fueled by health care practitioners' growing openness to utilize analytical tools and make better use of their data in order to achieve better patient health outcomes and operational improvements. While this increased attention has resulted in significant academic and practical advancements there remain countless opportunities for researchers for making contributions.

The Health Care department in IISE Transactions seeks high-quality manuscripts that make significant contributions to our understanding of problems that arise within health care as it is broadly understood or theory that supports the development of such understanding. Any area within health care (e.g., operations, medical decision making, public health policy, emergency response) is acceptable.

For papers with more of a practical focus, there needs to be a substantial contribution in at least one modeling/analytical/methodological domain and a very clear articulation and demonstration of the practical relevance and usefulness of the work. While the authors are discouraged from submitting papers that use standard, off-the-shelf methods, exceptions can be made in cases where practical usefulness is demonstrated through actual implementation. Papers with more of a theoretical focus should clearly articulate the relevance of the work to health care as well as the novelty and significance of the methodological or analytical contributions. Authors are discouraged from submitting papers with only tenuous connection to health care.

Optimization and Computation

The Optimization and Computational Science Department considers submissions that emphasize the advancements and benefits of optimization and computational methodologies in any area of industrial and systems engineering. Manuscripts focused on applications will be evaluated based on the novelty of the proposed optimization models and the importance of the considered

applications. More theoretical works will be evaluated based on their originality, depth and rigor. We also encourage submission of empirical computational studies, which will be evaluated based on the value of the insights they provide and their potential practical impact. Submitted manuscripts should make meaningful contributions to the optimization and computational fields in the context of industrial and systems engineering.

The Department invites survey articles that highlight novel and interesting applications of optimization and computations in emerging areas of industrial and systems engineering. We also invite reasonably short tutorials and annotated bibliographies. The authors are encouraged to contact the Department Editors with a short proposal on the chosen topic before the submission.

Stochastic Models and Simulation

The Stochastic Modeling and Simulation Department seeks to publish high-quality research papers that advance the theory and practice in the modeling, analysis, control, and optimization of stochastic systems.

Stochastic modeling focuses on research contributions in applied probability and random processes for engineering systems. We invite papers with rigorous methodological emphasis, e.g., stochastic process modeling, stochastic dynamic programming, and decision-making under uncertainty. While many papers in the area tend to have a flavor of queueing, inventory, scheduling, or reliability, we absolutely welcome papers on other topics as well. In particular, emerging issues in domains such as (but not limited to) smart manufacturing, transportation, energy systems, computer-communication networks, information systems, healthcare and other service systems are of interest. We also welcome papers in the intersection of stochastic operations research, data science, and computation with potential applications in a variety of domains and a significant methodological contribution.

Simulation papers may pertain to all aspects of stochastic simulation. We welcome papers with strong methodological elements, e.g., developing new simulation methods and tools for general problem classes that have applications in many areas. We also welcome well-executed papers that study important applications arising in, for example, engineering design, manufacturing, communications, and finance, where new or existing simulation techniques are developed or creatively applied. In addition to the conventional topics in stochastic simulation, of particular interest are contributions that address the integration of simulation techniques with other emerging technologies and applications such as high performance computing, data analytics, artificial intelligence, healthcare, and energy systems.

When preparing the manuscript, the authors are advised to clearly explain to the general audience of IISE Transactions the novelty and significance of their work. A methodologically oriented paper should generally contain a rigorous justification of the proposed methodology, an explanation of the usage of the method, and a demonstration of its potential practical value. Papers that deal with important applications should clearly describe problems, develop novel models and analysis, and highlight the practical impact of the obtained results.