Decision Analytics Journal 12 (2024) 100497

Contents lists available at ScienceDirect

Decision Analytics Journal

journal homepage: www.elsevier.com/locate/dajour

Robust decision-making in complex business markets: Emerging models and applications

Robust decision-making algorithms use artificial intelligence (AI) and sophisticated data analytics for informed decision-making. For example, machine learning algorithms can more accurately forecast future market circumstances by analyzing past trends and patterns, assisting firms in making timely and informed decisions. Sensitivity analysis and scenario planning are essential in complex environments. Sensitivity analysis assesses the effects of changing important factors on decision outcomes, whereas scenario planning entails creating several conceivable future scenarios based on various assumptions. Robust decision-making models increasingly consider ethical and sustainable variables besides economic ones. Stakeholders are putting increasing pressure on businesses to behave ethically and make beneficial contributions to the environment and society. Companies can improve their long-term viability and reputation by aligning their strategic choices with larger societal goals using decision frameworks that incorporate sustainability criteria and ethical norms. Technological organizations that experience quick innovation cycles could prioritize data-driven decision-making and agile techniques to remain competitive.

On the other hand, conventional sectors like manufacturing and energy could prioritize risk mitigation and scenario planning to handle unpredictability in regulations and volatile markets effectively. Accepting uncertainty and complexity as opportunities rather than barriers is critical to making sound decisions in complicated commercial marketplaces. Businesses may improve their resilience and competitiveness in an increasingly volatile global market by implementing adaptive strategies, utilizing sophisticated analytics, encouraging agility, successfully managing risks, and incorporating ethical concerns. The development of these models will continue to influence strategic decision-making in the future, helping businesses prosper in the face of uncertainty and promoting sustainable growth. In this special Issue, we have successfully published eight articles.

In the first article (Saputra et al. 2024), the authors have compiled the available research to categorize and determine whether deep learning techniques are best for a particular job. A systematic literature review was carried out using the literature from 2012 to 2024 as a thorough investigation technique. The results showed that deep learning is essential for eight primary tasks: learning models, prediction, design, evaluation and assessment, decision-making, user instructions, categorization, and identification. The results give researchers a thorough grasp of choosing suitable and efficient deep-learning techniques for particular jobs.

In the second article (Shah et al. 2023), the authors proposed a strategic model to comprehend an apparel mill's intricacies. This model aims to empirically evaluate the relationship between resources, capabilities, generic strategy, and performance under the current uncertainties in the clothing supply chain. The study's findings confirm that lean strategy, cost leadership, customer focus, supply chain management, and integration all favor the operation of clothing mills.

In the third article (Raghavendar et al. 2023), the authors have provided a robust resource allocation model for improving data skew and consumption rate in cloud-based IoT systems. This study enhances the minimization, data skew, and approximate amount rates. This research also highlights the challenges and complexities of hybrid optimization for efficient cloud-based capital allocation in the Internet of Things. A visual that shows how much several measures have improved is included in the report.

The fourth article (Wahab et al. 2023) employs the Theory of Planned Behavior (TPB), cyber-fraud perception, confidence in e-commerce vendors, and trust in the internet medium to ascertain the elements that impact customers' intention to make an online purchase. The analysis's validity and reliability were confirmed using correlation and Cronbach's alpha. Both simple linear and multiple linear regression were used in the data analysis. This study also demonstrates that customers' attitudes regarding behavior and their perceptions of behavioral restrictions are excellent indicators of their intentions to make e-commerce purchases. This study provided further evidence of subjective norms, online vendor trust, and perceptions of cybercrime.

The fifth article (Agrawal et al. 2023) focuses on multi-attribute group decision-making problems in a hesitant, fuzzy environment—where biases are introduced into practical decision-making due to unpredictability and uncertainty. The probability-based double uncertain fuzzy (PDHF) method addressed these issues. The system creates a double hesitant fuzzy information matrix based on the likelihood for every choice expert. Emergency action plans are assessed using the suggested algorithm in the event of an aircraft incident.

In the sixth article (Byeon et al. 2023), the authors have proposed a logical Petri net model that takes advantage of the modeling advantages of Petri nets in handling batch processing and uncertainty in value passing to model multi-agent decision problems and solving optimization problems in dynamic multi-agent game decision-making. The research also integrates pertinent game elements from multi-agent game processes. Attainable graphs were created based on attainable marks to examine the dynamic game process. The study addresses how the logic game decision model for unexpected occurrences may handle dynamic game choice issues, develop optimum emergency plans, and assess resource conflicts during emergency procedures. It also describes algorithms for the construction of accessible graphs. Validation was conducted on the model's superiority and efficacy in examining the emergency business decision-making process for abrupt incidents.

https://doi.org/10.1016/j.dajour.2024.100497

Available online 26 June 2024

In the seventh article (Riza et al. 2023), the authors proposed a work that uses linear models and spatiotemporal modeling to offer a four-step computer methodology for predicting spatiotemporal light pollution in nine Indonesian protected areas. The created approach uses spatial–temporal modeling and a linear model to predict ALAN. The research presents long-term projections for the next 20 years.

In the eighth article (Selvam et al. 2024), the authors present a bi-objective time series forecasting algorithm based on linear programming to assist in forecasting sub-annual short univariate time-series data. Rather than producing forecasts optimal for one accuracy metric, the suggested method produces forecasts optimized for two. The constraint-based multi-objective optimization approach forms the basis of the algorithm. The proposed approach has the lowest maximum errors overall prediction horizons, lowering over- and under-forecast errors. The suggested approach is very adaptable and can provide understandable linear forecasting models.

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