



Optimization and decision-making with big data

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Optimization and decision-making exist in various aspects of human activities, especially in dealing with complex production practice. There is no doubt that with the ever-increasing complexity of problems, optimization and decision-making will be made by different formal ways and technologies in dynamic environment, and it calls for innovative approaches to provide interpretable solutions and effective decisions. Big data are high volume, high velocity, high variety, high veracity, and high value (5V) information assets. In virtue of their nature, they call for innovative ways of processing to take full advantage of data and thus enable enhanced decision-making processes and support process optimization.

This special issue aims to deliver a platform. On the platform, researchers coming from academe and industry can present the advanced methodologies to cope with optimization and decision-making problems. At the same time, they can also elaborate on the state-of-the-art case studies in selected areas of application through the usage of big data and report on the linkages between methodology and practice of big data analysis.

Since the call for papers was announced in March 1, 2018, this special issue has attracted tremendous attention. In total, we received 68 manuscripts. After a rigorous review process, 28 papers have been finally accepted for publication.

To gain a better insight into the essence of the special issue, we offer brief highlights of the contributing papers.

1 Theory

In order to enhance the search ability of the algorithm, the paper titled “Modified bat algorithm based on covariance adaptive evolution for global optimization problems” proposed an improved bat algorithm, which is based on

the covariance adaptive evolution process. A dynamic spatial panel with generalized autoregressive conditional heteroscedastic model is compared in “Value-at-risk forecasts by dynamic spatial panel GJR-GARCH model for international stock indices portfolio” with GARCH, spatiotemporal-AR, dynamic spatial panel GARCH models, with respect to the performances of daily volatility and VaR forecasting. J. Wang and X. Li proposed a novel modeling framework to predict the market price of commodity futures. And the neural network models with the singular spectrum analysis outperform the benchmarks in terms of distinct measures. Based on the MULTIMOORA (multi-objective optimization by ratio analysis plus the full multiplicative form), the paper titled “A novel multi-attribute group decision-making method based on the MULTIMOORA with linguistic evaluations” put forward a novel method to solve the MAGDM problems. The paper written by L. Sun et al. applied the function box counting method and the q th-order moment structure partition function method to test the multi-fractal features of USD/CNY exchange rate. C. Wang et al. discussed the possibility and necessity of fuzziness of fuzzy outputs and demonstrated the dynamic partitioning methods of fuzzy output training samples based on credibility measure. And then, based on fuzzy outputs the corresponding dynamic credibility support vector machines are established, and the feasibility and effectiveness of credibility SVMs are shown by experimental results. The paper written by M. Wen et al. proposed an optimal evaluation model to conduct an objective evaluation on these metrics and provide reasonable decision-making proposals. An evaluating index system is established on the feature analysis of these metrics. The paper titled “The coordination mechanisms of emergency inventory model under supply disruptions” developed a cooperative emergency inventory model to deal with supply disruptions. In order to achieve a cooperative state between the two sides in supply chain, the game theory is used and three coordination mechanisms are proposed. L. M. Antonio et al. proposed a novel multi-objective evolutionary algorithm (MOEA) designed for solving multi-objective optimization

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problems. Because the traditional Muirhead mean (MM) is only suitable for crisp numbers, P. Liu et al. enlarged the scope of the MM operator to the hesitant fuzzy linguistic (HFL) circumstance, and two new aggregation operators are proposed, including the HFL Muirhead mean operator and the weighted HFL Muirhead mean (WHFLMM) operator.

2 Methodologies and case studies

J. Chai et al. in the paper entitled “Impact of health-care insurance on medical expense in China: new evidence from meta-analysis” put forward an advanced conditional Dirichlet-based Bayesian semi-parametric model specific to meta-analysis and conduct random effects meta-regression finding that heterogeneity exists among the observed effect sizes. The paper written by Z. Chen et al. considered an agency problem where a firm employs a manager who has private information about his risk aversion magnitude and unobservable efforts to implement a R&D project through a menu of incentive contracts. Y. Liu et al. in the paper entitled “Supporting consumer’s purchase decision: a method for ranking products based on online multi-attribute product ratings” proposed a new method for ranking products based on online multi-attribute product ratings. Z. Liu et al. derived and compared the OEM-as-leader game and the CCM-as-leader game to explore the OEM’s and CCM’s leadership preferences. In order to provide accurate value-at-risk (VaR) forecasts for the returns of international stock indices portfolio, G. Mo et al. proposed a dynamic spatial panel with generalized autoregressive conditional heteroscedastic model (DSP-GJR-GARCH). The paper written by D. Wu et al. examined the potentials of the software effort estimation (SEE) method by integrating particle swarm optimization (PSO) with the case-based reasoning (CBR) method, where the PSO method is adopted to optimize the weights in weighted CBR. J. Li and S. Yu formulated a dynamic system which is analyzed through two cases of noncooperation and with cooperation among the enterprises and the government to study the sensitivities of different governing methods. Under the assumption that both the exchange rate and the stock price follow uncertain differential equations, the paper titled “International investing in uncertain financial market” researches the domestic prices of foreign European options, American options and Asian options by means of contour process, respectively. Q. Liu et al. employed the new intuitionistic fuzzy method to improve the score function, in order to establish an evaluation mechanism of commercial bank counterparty credit risk management. W. Ahmad et al. presented a novel intelligent hybrid decision support system based on linear discriminant analysis (LDA), k-nearest neighbor (kNN) weighed preprocessing, and adaptive neuro-

fuzzy inference system (ANFIS) for the diagnosis of thyroid disorders. X. Xu et al. put forward a bi-level programming model to solve multi-depot LRP considered the constraint of hard time window, vehicle capacity, and vehicle backhaul cost, which aims at achieving the effective interest coordination between upper-layer platform and lower-layer vehicle owners. J. Zhou et al. conducted a survey for the city of Shanghai, where three major policies and an equal number of non-policy variables have been selected to facilitate the analysis. Y. Guo et al. proposed a project portfolio selection model from the strategic perspective. Two goals are proposed for the portfolio to achieve, i.e., strategic contributions and financial returns. The paper written by J. Zhao et al. focused on a supply chain composed of one online retailer together with multiple suppliers. J. Han et al. embedded supply and demand network characteristics into a two-phase decision analysis method. Firstly, to select the matching pairs, a matching satisfaction matrix is constructed based on the supply and demand network characteristics, after which a multi-objective optimal model is built to determine the best optimization matching results and the overall improvements illustrated through comparison. The paper written by Y. Su and W. Sun proposed a new network DEA model including undesired outputs and dual-role factors. And the proposed model can calculate optimistic and pessimistic efficiency. Based on the degree of synergy in the composite system by describing the order degree of the subsystem and the synergy degree of the composite system, L. Bai et al. in the paper entitled “Project portfolio selection based on synergy degree of composite system” proposed a new project portfolio selection model which can help to quantify the synergistic relationships among these subsystems. To investigate the relationship between managerial compensation and research and development (R&D) investment under asymmetric information, G. Yang et al. established a two-period principal-agency model, in which the firm owner hires a risk-averse manager to operate the firm and to make the R&D investment decision. In order to explore intervention strategies, X. Zhu and M. Liu firstly generated a two-layered network according to the real conditions, and its diffusion threshold is calculated based on previous studies. Then, after dividing intervention conditions into before and after the outbreak, intervention strategies were explored from the aspects of network topology and public management.

We envision that the papers published in this special issue would be of interest to researchers and practitioners and help identify further research directions. We also hope that the readers can find the material of this special issue both informative and inspiring when exploring the field of optimization and decision-making.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.