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Introduction to the Minitrack "Intelligent Decision Support for Logistics and Supply Chain Management"

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Abstract

Using data and related analytics tools to provide valuable decision support can be seen under the umbrella of the digital transformation wave that is incessantly continuing its path and expected to grow in the years to come. Implications for companies are certainly to prepare their information and communication technology (ICT) infrastructure and workforce for the opportunities and new challenges regarding data-driven decision making and analytics tools. Application areas are as wide as one can imagine and the "gold nuggets" of knowledge as once upon a time named by data mining experts awaiting to be lifted.

Advances in ICT have enabled a plethora of automation efforts to take place. Based on these, the digital transformation seems accelerating its pace further pushing the digital supply chain. Business-to-business transactions are made via the Internet and enterprise resource planning systems support managing transactions within and external to companies. Automation based on software bots helps to speed up the pace of transactions and related data giving an even more clear picture of the actual situation providing a solid fundament for intelligent decision support and analytics.

Sensor networks, social network activities, retail transactions, website/online shop search histories, futuristic autonomous vehicles such as drones and robots are just a few examples of sources to provide data to support efficient decision analytics. Big data issues are well recognized to offer long-waited opportunities, but also challenging data handling and decision analytics. This year's contributions span various methodologies and aspects of logistics and supply chain management (SCM) and provide an insightful picture of where the trend is going. We present them in alphabetical order of the authors.

Lang, Reggelin, Behrendt, and Nahhas [1] provide a novel approach to solve *a two-stage hybrid flow shop scheduling problem with sequence-dependent setup times* motivated from an industrial case. Contrary to the classical approach in finding an optimal solution for an instance, their approach searches for a machine learning model that approximates the "optimal" solution strategy for a given instance. For that purpose, they use a genetic algorithm that generates arbitrary neural networks able to estimate job sequences and integrate them in a discrete-event simulation model which evaluates them. The resulting computational efficiency as well as the solution quality are significant and demonstrate well the power of analytic tools.

Viellechner and Spinler [2] apply machine learning to *predict the delay of container vessels between Europe and Asia*. They provide a rich prediction model and obtain best results for neural networks and support vector machines. The knowledge regarding vessel delays can be particularly useful on the strategic planning level. The proposed prediction model is applicable for various players in the maritime supply chain and provides strategic decision support.

The paper of Weingarten and Spinler [3] aims at *predicting customer online purchases in the fashion industry to shorten delivery times* and thus to ease the perceived disadvantage of customers of online retailers regarding waiting times for items. For that purpose, the authors propose a prediction model based on forecasting combined with clustering methods to early predict online purchases and anticipate shipping of items in the vicinity of possible future customers. They show that predictions of online purchases are achievable, but also that anticipatory shipping still incorporates difficulties to bring desired advantages.

Wendt, Moeini, and Schermer [4] focus on logistic developments investigating the *drone-assisted traveling salesman problem with robot stations* where for a single truck accommodating a

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drone a valid route should be found that minimizes the makespan of deliveries serving all customers while utilizing the drone as well as robots at one or more potential sites for unattended deliveries. The authors provide a mixed-integer linear programming formulation together with a numerical study that can be solved by standard commercial solvers in reasonable time for up to 20 customers. The authors further show that placing robot stations wisely and using drone round trips can lead to significant reductions in delivery times or operational costs which is very interesting especially in urban areas to support courier, express, and packet services for these last-mile deliveries.

References

[1] S. Lang, T. Reggelin, F. Behrendt, A. Nahhas: Evolving Neural Networks to Solve a Two-Stage Hybrid Flow Shop Scheduling Problem with Sequence-Dependent Setup Times. In: Proceedings of the 53rd Annual Hawaii International Conference on System Sciences, IEEE, Piscataway (2020).

[2] A. Viellechner, S. Spinler: Predicting Delay of Container Vessels between Europe and Asia using Machine Learning Algorithms. In: Proceedings of the 53rd Annual Hawaii International Conference on System Sciences, IEEE, Piscataway (2020).

[3] J. Weingarten, S. Spinler: Shortening Delivery Times by Predicting Customers' Online Purchases: A Case Study in the Fashion Industry. In: Proceedings of the 53rd Annual Hawaii International Conference on System Sciences, IEEE, Piscataway (2020).

[4] O. Wendt, M. Moeini, D. Schermer: The Drone-Assisted Traveling Salesman Problem with Robot Stations. In: Proceedings of the 53rd Annual Hawaii International Conference on System Sciences, IEEE, Piscataway (2020).