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EDITORIAL

Advanced systems and data analysis in public transport

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This special issue of *Public Transport*: *Planning and Operations* brings together selected papers from the 15th *International Conference on Advanced Systems in Public Transport* (CASPT2022) which was held in Tel Aviv, Israel between 6th to 10th of November 2022, in conjunction with the 8th *International Workshop and Symposium on Research and Applications on the Use of Passive Data from Public Transport* (TransitData2022). The conference initially was intended for 2021, but because of the Covid-19 pandemic it was postponed to 2022. In this issue there are six papers outlined hereunder which represent, to some extent, the wide scope of the different topics dealt with in the CASPT2022 and TransitData2022 conferences.

Decouvelaere, Trépanier and Agard present a tool for spatiotemporal clustering of smart card data that shows the importance of spatial and temporal information to get useful support for planning and operational control in public transport. Their method based on the formation of clusters with similar user behavior regarding to the parameters space and time. Practical application has been made to smart card transactions of a public transport company in Quebec City, Canada with varied types of clusters.

Jee, Sun, Schmöcker and Nakamura present an application of Wi-Fi sensors in public transport. Located at bus stops, this technique can be used to estimate the

Yuval Hadas passed away on February 16, 2024. His contributions to this special issue were completed prior to his passing.

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queue length of waiting passengers for a bus including waiting time estimation. They conducted experiments in Kyoto, Japan, and identified the most important indicators for the queue length. Beyond that, their study includes a discussion of further applications.

Alogdianakis and Dimitriou state that although public transport is an essential basis of life in urban regions, there are deficits in this respect in many cases. Therefore, they suggest a basic framework using multi-objective optimization for planning such a concept with the objective to ensure sustainability as well as strategical fairness and equity for passengers in connection with an area-based budget allocation for infrastructure and services. Their study with a multi-objective particle swarm routine to generate Pareto-optimal tradeoffs among the indicators was applied for the case of Cyprus' capital, the city of Nicosia.

Fedujwar and Agarwal review 40 studies dealing with an evaluation of crowding problems in public transport operations. The focus lies on possible measurements and modeling frameworks, among other aspects. Their conclusions based on meta-analysis show that the valuations of passenger perception towards crowding varies depending on the parameters included in the analysis of the different studies. This article is also intended to provide a basis for further investigations into the problem of capacity overload.

Ge et al. introduce a challenge that makes it possible to solve extended problems of integrated vehicle and crew scheduling in public transport based on improvements in information and communication technologies as well as in software development. Their study revisits a formulation integrating rostering and days-off patterns of the mixed scheduling problem and an inclusion of delay problems. Numerical results are provided to point out the possibilities of such applications.

Goncu and Sahin examine incidents of *Bus Rapid Transit* (BRT) systems, which are of great importance in many urban public transport systems, but especially in developing economies. To reduce the negative effects of disruptions to operating processes they developed an incident detection method based on real-time GPS data. They tested and evaluated their method on the Istanbul Metrobus system using 19 real-world incident records with good performance measures like obtaining 100% detection rate.

We hope that these papers, presented at CASPT2022 and TransitData2022, are of interest to many academics and practitioners as well as provide a useful basis for further research on the multifaceted problems in theory and practice of public transport. For interested readers: A follow-up to the series of CASPT and TransitData conferences will take place between July 01 and 04, 2025 in Japan at the Kyoto University (www.caspt.org).

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