Introduction to Intelligent Decision Support on Networks – Data-driven Optimization, Augmented and Explainable AI in Complex Supply Chains Minitrack

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1. Introduction

The minitrack "Intelligent Decision Support on Networks – Data-driven Optimization, Augmented and Explainable AI in Complex Supply Chains" invited contributions in the area of intelligent decision support under multiple-criteria and where a multitude of variables have to be considered under great uncertainty. In general, these systems are used for crisis and risk management in diverse contexts, such as health care, homeland security, aviation, transportation, energy grids, and defense to name a few. Therefore, advanced techniques from the field of Artificial Intelligence and, in particular, Machine Learning represent the best options for finding the solutions to the previous problems. However, Machine Learning algorithms sometimes lack explainability and transparency, which are fundamental for being trusted by humans in high-risk environments. Thus, the mini-track decided to showcase novel methodologies or new interactions among existing approaches. Specifically, the techniques used in the published contributions utilized iterated Q-value metrics for the state importance evaluation and route-based, hybrid route-based and origin-destination-based approaches for the estimation of the time of arrival.

2. Contributions

The paper "Detection of Important States through an Iterative Q-value Algorithm for Explainable Reinforcement Learning" by Milani et al. describes a novel methodology for the identification of important states through the consideration that highly visited situations should have a major relevance. In particular, the authors selected well-known static Q-value metrics and extended their definition in an iterative manner through the combined adoption of a recursive weight update and the exponential smoothing rule-of-thumb. Moreover, they explored the possible usage of a new measure that can be easily derived from the ones in the literature. The experiments reported how using the iterated versions of the metrics can lead to highlighting the strictly meaningful states; reducing in this way the possible risks of exploring in potentially dangerous situations. Moreover, through an accurate depiction of the relevance of each state, it is possible to implement extensive explanations helpful for increasing the trust of human users towards the Reinforcement Learning agents.

In "Machine Learning in Vehicle Travel Time Estimation: A Brief Technological Perspective and Review", Pham et al. present a concise review of techniques for the calculation of the estimated time of arrival. This value is a crucial component in the majority of transportation problems, e.g., the navigation, and intelligent transportation systems. The paper develops an analysis of the most recent studies concerning the estimated time of arrival. In detail, they structured the classification in route-based, hybrid route-based and origin-destination-based approaches. Moreover, the authors discussed the most relevant future directions in this task. Starting with the consideration of time series forecasting models, they stated that the successful capabilities of complex methodologies, such as Long Short Term Memory and Gated Recurrent Units, can help find the correct estimation. Furthermore, they proposed to take into account the uncertainty in the prediction models and to use ensemble techniques to decrease the weakness of the general approaches. Lastly, they argued the importance of having a data-sharing system that could improve the amount of information available for the development of more accurate methodologies.

URI: https://hdl.handle.net/10125/106550
978-0-9981331-7-1