

Master Thesis defense Kiran Vasudev

Date: Wednesday, 12.06.2019

Time: 09:00

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Title:

Evaluation of Machine Learning approaches to estimate travel time for freight logistics

Abstract:

Estimating travel time of freight transported by road is an important task that benefits different operators in the supply chain. Freight needs to be delivered within a defined time window to assist the selection and preparation of docking slots at warehouses, hence optimizing just-in-time and just-in-sequence delivery. Apart from optimizing processes in the supply chain, adding real time information of the current whereabouts of freight increases the transparency in the supply chain, which is the biggest problem faced in Supply Chain Management today. By estimating the time of arrival, deviations and disruptions in the supply chain can be detected well in advance and preparation measures can be carried out accordingly.

The aim of this study is to predict travel time using Machine Learning approaches using real world Track and Trace data. The business goal of the travel time estimation model is defined to have a maximum error of 2 hours. To streamline the analysis and cleaning of the raw Track and Trace data, and using this data to estimate the travel time, a system architecture is proposed based on the process of Knowledge Discovery in Databases.

Different factors that affect travel time are accessed and used as a basis for feature engineering in this study. 7 experiments are defined based on different combinations of features, that have been classified based on domain knowledge, using a correlation matrix and features that are collinear are removed using Variation Influence Factor (VIF). The performance of Neural Networks, Support Vector Machines and ensemble methods such as ExtraTrees and AdaBoost is evaluated. The model that provides the most accurate output is chosen and compared with predictions made by statistical approaches and a classical route planner. It can be seen that the most accurate Machine Learning model - SVR, outperforms the statistical approaches and that of the route planner. An MAE of 2.5 hours is obtained using the SVR approach, which has a deviation of 0.5 hours (30 minutes) from the defined business goal.