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«DEPARTMENT OF COMPUTATIONAL AND DATA MODELING» OR
«CYBERSECURITY LABORATORY»

«Super program name» «x» year «Report type»

Super paper
Super popierius

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Vilnius
2024

Contents

Abstract

Public bus transport is a key component of modern urban mobility. Society and the environment benefit from the reduced congestion, pollution, and energy consumption in cities. However, bus transport systems are complex and require careful planning and management to ensure their efficiency and sustainability. Moreover, if provided services are sub-optimal, people tend to abandon the public transport and return to more individual mobility measures. This paper presents a review of ideas on how to improve the efficiency of bus dispatching and scheduling by employing deep learning models.

1 Introduction

Transport is the key enabler of economic growth and social development of countries around the World. European Union (EU) is one of the most developed regions in the World, and it is a good example on how the development of logistics improves quality of life.

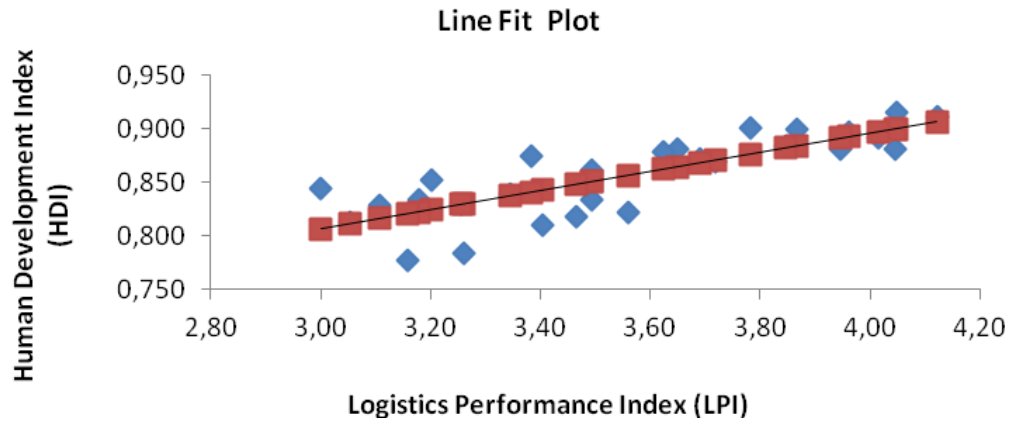


Figure 1. The correlation between the Logistics Performance Index (LPI) and the Human Development[?]

As shown in in figure ?? the relationship between European Union country logistics performance and quality of life is strong. However, transportation is also a net emitter of CO_2 in EU. According to the European Environment Agency (EEA) report domestic transport is responsible for 29.17% of total CO_2 emissions in 2022[?]. And yet the trend of domestic transport utilisation is still increasing. This is a clear indicator that transportation is sub-optimal and requires improvements in order to reduce the impact on environment.

Public transport is seen a solution on how to tackle the problem of increasing CO_2 emissions. Efficient and reliable public transport systems can reduce the number of cars used, thus reducing the load on public roads and mitigating unnecessary accident risks. However, to achieve that there are some difficult challenges that need to be addressed. Some of the most important aspects that keep people in their car are: unreliable schedules, long waiting times, inconvenient routes, high ticket prices, overloaded buses

In the scope of this research some of the most important hurdles for public transport will be addressed. The main focus of this paper will be put on increasing the efficiency of bus dispatching and scheduling. By optimising the route and schedule, the number of buses utilised in the fleet can be reduced and the size of bus sent on route can be adjusted to the number of passengers expected. By doing so, the costs of operations should decrease thus, making public transportation services more affordable and attractive to the society.

To optimise the dispatching and scheduling neural network models will be used. The models will be trained on historical data on sales of tickets in bus stops. The developed model will be used to predict the number of passengers in bus stops in the future. The decision on the size of the bus to dispatch and stations to include in the route will be made by the dispatcher, but with real time advice from the neural network model.

2 Related work overview

The research on optimisation of vehicle deployment is not a new topic, but there is a new iteration with the developments of machine learning and neural networks.

References

- [1] The Transport and Logistics Sectors Performance and the Social Development - A Comparison within the European Union - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/The-correlation-between-LPI-and-HDI-within-EU28-Source-of-data-World-Bank-United_fig1_275887205
- [2] European Environment Agency. (2024). Greenhouse gas emissions from transport in Europe. Available from: <https://www.eea.europa.eu/data-and-maps/indicators/transport-emissions-of-greenhouse-gases/transport-emissions-of-greenhouse-gases-11>