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Applied AI – Coursework – Part A

AI applications in Transportation

Introduction

In many urban areas, the home-work travel distances have become very intertwined. Many trips will frequently connect several locations in an irregular fashion. Transportation planning and operation has transformed massively over the decades because the overall capacity to recognise a typical home – school or home – work travel patterns and within the transportation system has transformed the overall approaches to the transportation sector and how they work, an example would be optimal bus routes or train routes, or how Google maps plans out an optimal route along a road from your starting point to your destination.

Urban areas occupy roughly about 3% of the Earth's land, where about 75% of the natural resources produced are consumed and roughly about 60% to 80% of the Earth's greenhouse gases are produced because of consuming these resources (Trees, land etc). The American Journal of Computing and Engineering have said that by the year 2050, the urban population is set to rise by 75% and this rapid increase in the urban area will greatly impact the environment, security and natural resources. However, many Cities & Countries have developed and adopt intelligent city programs which could help address any future problems effectively. Furthermore, within this article, they have stated that in the year of 1990, Artificial Intelligence was described as 'the science and engineering of smart machines', and the abbreviation 'AI', is often used when a computer simulation works autonomously in which humans may interpret as another mind. Furthermore, since the late 1950s, AI has evolved into a discipline which contains various other sub disciplines, including Machine Learning, processing of natural languages, image processing and data mining. Machine Learning could be used to for relevant disciplines including digital learning machines, smart cities, medical science, agriculture, archaeology, sports, business.

All of these advancements which have been described int eh previous paragraphs each have made urban mobility become less predictable, in which it follows a 'fuzzier pattern' with urban mobility which acts as an "active organism" which means that it's able to evolve (changing & adapting) to new challenges and identify any relevant patterns. This is mainly because any solutions which have been or are being offered to a consumer are being rapidly replaced, in which new options become obsolete over much shorter periods than previously and where any problems that don't matter, they become abandoned (as they are deemed inefficient). Furthermore, all of these changes in transportation planning and transport systems but also together with An inherit complexity of all the system result in several new challenges at different levels, an example would be a travel payment for a typical model of a monthly pass vs a one-travel ticket can no longer meet the demand of less stable patterns with regards to transport utilisation, as the payment system, needs to integrate different modes and mobility solutions.

AI utilisation in the Transport sector:

Autonomous Vehicles:

The modern world is already seeing an increase fully autonomous vehicles such as Tesla. Fully autonomous vehicles are vehicles in which can operated without the need for a human driver. This is accomplished by using AI algorithms which are combined with advanced sensor technologies and deep learning techniques, all of which enable a vehicle to navigate complex traffic scenarios (traffic jams), all these achievements will revolutionize transportation by optimising the traffic signal control & congestion.

Traffic Management:

Google maps use AI which will optimise traffic flow and reduce congestion by analysing real time data (the population of vehicles on the road) by using traffic sensors, cameras and analysing any historical patterns from a particular area and from this it is able to suggest any alternative routes which will improve overall transportation efficiency.

Predictive Management:

There are various AI techniques which could be used to analyse and monitor data from vehicles and any infrastructure to predict maintenance needs. All of this enables proactive maintenance and reduces the amount of any unexpected breakdowns, which in turn will reduce downtime but increases reliability.

Smart Logistic and Supply Chain Management:

AI can make the logistical process more efficient by analysing datasets, optimising routes, predicting demand and managing inventory more efficiently which in turn leads to savings on cost, faster deliveries and improved resource utilisation.

Intelligent transportation systems:

AI can be used to integrate intelligence into transportation systems, which can be used to monitor and manage transportation networks, which includes real-time incident detection, dynamic routing, adaptive traffic signal control, and providing traveller information which enhances the overall safety and efficiency.

Passenger Experience:

Over the last few years, especially over the last few, generative AI has seen a massive increase in popularity (ChatGPT, Gemini, DeepSeek), can be used to enhance the passenger experience by providing real-time information, personalized recommendations, and any assistance the person may need throughout their journey. As a result, the integration of AI into the transport sector has the ability to revolutionize the way in which we travel, making it safer, more efficient, and sustainable, however, in contrast it could raise some concerns such as any ethical considerations, cybersecurity, and the social impact on employment, all of these factors need to be carefully considered to ensure a responsible and beneficial implementation of AI within Transportation.

Conclusion

When AI is implemented in a safe and efficient way, it holds many tremendous benefits in transportation systems which hold great potentials with revolutionizing urban areas and improving various aspects of transportation. Furthermore, by leveraging AI Technologies, including Machine Learning, computer vision and natural language processing.

Reference:

Bharadiya, J.P. (2023) 'Artificial intelligence in transportation systems: A critical review', ***American Journal of Computing and Engineering*****, 6(1), pp. 35–45. Available at: https://www.ajpojournals.org (Accessed: day Month year).**