

# Artificial Intelligence in Transportation: A Review

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## ABSTRACT

The growing use of Artificial Intelligence, along with its factors is rapidly increasing in various fields now a days. It providing the opportunity to upgrade the efficiency of various industries and business, including transportation sector. AI gives more efficient service to Public Transportation to enhance the urban mobility. The goal of AI to acquire the knowledge about reasoning, planning, perception and deal with objects. The AI for transportation is assist to reduce the risk and enhance the safety. AI applications is help to solve the challenges such as travel demand, CO2 emissions, safety concerns, and fuel waste. The challenges and desideratum faces during transportation can be easily addressed by AI algorithm. This paper stretches a view about the AI technique use in worldwide Transportation of methodology, applications, future of AI in deep learning and limitations.

**Keywords** : Artificial Intelligence, Transportation, Applications, Methodology, Goal.

## I. INTRODUCTION

It is without a doubt a developing piece of computer science that will become an excellent feature of all software in the years to come. In easy words, we may state that it's a huge area of computer science that is used in machines to enable them to function similarly to human minds. It enables machines to think, behave, and comprehend like humans do. John McCarty, who discovered AI at Dartmouth in 1956, described it as a science that enables the creation of intelligent machines. Due to the availability of the vast amount of data generated by numerous devices, as well as the

accessibility of various software, networks, and hardware, this topic has gained significant attention after more than six decades [3].

Numerous studies on AI in the transportation sector have been conducted in a number of nations, with various findings. Here are a few of them: In the area of transportation, Transport Management Systems (TMS) is a potent software program. TMS are well-known in the market these days, especially for shippers that may be moving high volumes, as they assist businesses in preparing them for optimization, route planning, and much more [3].

Transportation problems become a challenge when the system and users' behaviour is too difficult to model and predict the travel patterns. Therefore, AI is deemed to be a good fit for transportation systems to overcome the challenges of an increasing travel demand, CO<sub>2</sub> emissions, safety concerns, and environmental degradation. These challenges arise from the steady growth of rural and urban traffic due to the increasing number of population, especially in the developing countries. In Australia, the cost of congestion is expected to reach 53.3 billion as the population increase to 30 million by 2031. In Melbourne, Australia alone, more than 640 km of arterial roads are congested during peak time with a CO<sub>2</sub> emission of 2.9 tons per year. It has a potential application for the road infrastructure, drivers, road users, and vehicles [2]. It has been a long time coming, but computer chess programs are finally powerful enough to beat humans. Computers are already widely used in manufacturing facilities, despite the fact that they can only do a limited number of activities. Robots have a hard time figuring out what an object is by looking at it or feeling it, and they're still terrible at moving and handling it (Elkosantini & Darmoul, 2013) [6]. The use of AI in the public transportation sector is expected to improve services in terms of quality and quantity to minimize the use of private vehicles and reduce the potential for other losses [12]. There is a growing need for an integrated system that enables the use of different modes, without the need for different physical tickets. However, dynamic information systems are also required—which facilitate the sharing of revenue between the distinct modes and operators [1].

## II. AI METHODOLOGY

The goal of incorporating AI into daily life planning is to be aware of community needs and to select the best course of action to ensure that there will be no negative effects on social, environmental, and economic aspects of transportation. Being the backbone of urban

infrastructure, the transportation sector cannot ignore data collection and consumption. Due to its emphasis on people and substantial financial gain, it plays a significant role in improvement [3].

To obtain the papers in this systematic literature review, we went through the following steps. First, we initially searched for macro-areas considering the terms and an AI e.g., "Maintenance and Inspection" & "Machine Learning". This was done on the title, abstract and keywords. Second, we additionally included relevant (e.g., with a high number of citations) papers that were published before 2010, and some papers we previously analysed in but were not covered by the first step. Third, we manually filtered and removed the non-relevant. Fourth, we further explored the literature databases using the additional specific (subdivided) [9].

According to the forecast of Price Waterhouse Coopers, the accelerated development and penetration of artificial intelligence will ensure an increase in the world gross product by 2030 by no less than 14%. Global consultant McKinsey Institute expects about 70% of companies to be actively using at least one type of artificial intelligence technology by 2030 [8].

## III. APPLICATIONS OF AI IN TRANSPORTS

### Buses

Due to the importance of bus journeys and destinations in public transportation, many research have been conducted to enhance their safety and dependability. Bus timetables are regulated by an algorithm known as an Ant Colony Hybrid (ACAH). When it comes to maximizing the scheduling of bus drivers, both are reliable and successful. Bus riders may save time by using ANNs to anticipate when the next one will arrive. In addition to automobiles, automated buses are another application of this technology [6].

## Air Transport

The application of artificial intelligence in the air transport industry has become increasingly prevalent, offering improvements in safety, efficiency, and customer service. These methods enable the industry to better predict flight demand, optimise schedules and pricing, analyse aircraft data to predict maintenance needs, optimise slot distribution for landing aircraft, facilitate air traffic management, plan fuel efficient routes, and enhance the passenger experience through AI-powered chatbots and virtual assistants. By incorporating AI into these areas, significant advancements in efficiency and quality can be achieved, leading to better outcomes for the industry as a whole [10].



Fig (a). Transportation research areas in AI4DI [7]

## Planning, Designing and Controlling Transportation Network Structures.

Genetic algorithm and fuzzy methods were used to control the traffic signal systems automatically at intersections. The first system is to control the traffic signal and the second one is to predict future traffic congestion. While demonstrated the feasibility of using NNs to control the traffic by proposing a multi-layer NNs system evaluated in three intersections networks. ANNs are also effective to use in signal traffic control [2]

### A. Autonomous Vehicles

Because of its control, processing, and maintenance capabilities, AI plays a crucial part in these driverless cars, which are an advancement in the field of transportation for the ideal future. Data transmission

and processing are essential functions in autonomous vehicles. AI provides the ability to regulate the collection, processing, and transmission of information. It also provides an ideal and attractive connection to make the operation of autonomous vehicles safer. In 2013, Toyota Prius offered automated vehicles in the United States. According to a report conducted in the USA, deploying autonomous vehicles will prevent 270 billion road accidents and over 30,000 fatalities annually [3].

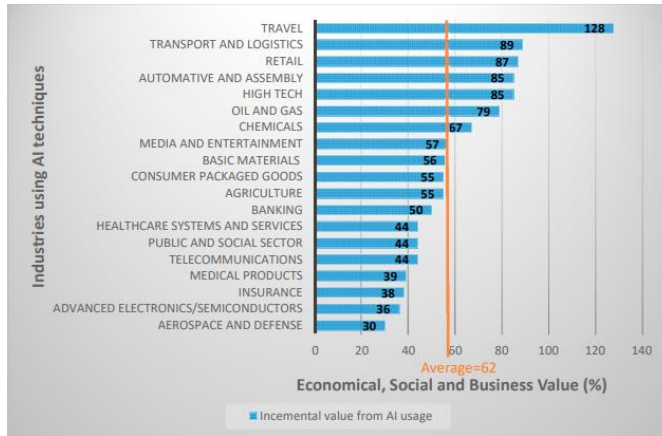
### B. Aviation

AI has been acknowledged to manage the flight journey more effectively. AI can help in Technology (Machine Learning), software/hardware and Application (Intelligent Maintenance, Flight Route Optimization). A system called (PLADS) was developed to extract information from highly dense aviation reports and modify it to support vector machine and SA algorithm systems. It showed that SVM gives good results for this type of classification. The unsupervised machine learning algorithm is reliable to use to increase safety when an airplane is landing. The safety of the plane by checking the engine on-board using the Probabilistic neural network (PNN) [2].

## IV. FUTURE OF AI IN DEEP LEARNING

Deep learning innovations continually uncover the mysteries behind the vast amounts of data generated in various industries. According to the market size of this technology was estimated at US\$272 million in 2016, and its high data storage capacity, precise computational power, and ability to handle large amounts of complexity will drive growth Expected of data. This score is based on applying Deep His Learning to healthcare image recognition tasks and Facebook's facial recognition feature. The automotive, financial and data mining sectors also continue to improve their operations by adopting deep learning AI technologies [4].

Due to the conceptual nature of the present study, it may lack generalizability of application in different scenarios. An impact study based on primary data collected from the stakeholders involved in the transport industry can be taken up in future [5].



Fig(b). The performance improvement from AI – adapted from[2].

## V. LIMITATIONS

AI methods have initiated different criticism since they were introduced to the field of transportation. One of the major limitations to AI is considering ANNs as a “black box”. This means that the relationship between the input and the output is developed without any knowledge to the internal computations of the system. Also, it was suspected of the ability of ANNs to generalize in cases where some information is missing in the data sets. However, research overcome this limitation by combining neural network with other traditional technique and other AI tools as a hybrid solution to fix this problem [9].

It would be better if AI algorithms could manage the whole process. So in order to build autonomous apps, the full potential of artificial intelligence must be exploited. Because of this, future research will need to include AI knowledge into traffic analysis, data collection and storage, decision-making, and optimization modelling. When data is obtained

through conventional methods such loop detectors, sensors, and actuators, the accuracy and timeliness of AI predictions are degraded. Because of this, it is necessary to move away from conventional data collection methodologies and toward new AI-based technologies that might provide new and simple data mining tools. Furthermore, it is not possible to tune the raster algorithms of the AI tools to their maximum performance (e.g., GA and ACO) [6].

AI in the development of these algorithms will increase the efficiency of online computations and improve the standardization of spatial and temporal data coverage requirements. Most AI approaches like NNs for time series transport applications rarely integrate testing for errors and model-specific properties. Providing the data needed to develop AI applications, the range of applications is expected to expand as cities and transportation systems become better equipped. It shows how AI can be used to solve challenges such as increasing travel demand, CO2 emissions, safety concerns, and fuel waste [4].

## VI. CONCLUSION

Paper conclude that at present Artificial Intelligence is the growing and developing technology and has a potential to increase the development of many sectors. AI can automate the data and improve efficiency and providing the productivity in various industries. At present state the Transportation is expand due to political, economical and social activities. Multiple AI transportation apply Computer vision services such as object detection or object tracking which help to control challenges faces during Transportation. So that the AI has been acknowledged to manage the system and build it more influenced. Due to AI applications the public transportation become more enhance to Avail.

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