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AI-based Management in Transportation Industry

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Abstract

We have excellent opportunities to boost the effectiveness of many businesses and industries, including the transportation sector, as a result of the rapid development of artificial intelligence. Artificial intelligence's goal is to learn about planning, knowledge acquisition, object manipulation, and thought. AI made it possible to make a number of advancements, such as sophisticated methods that demonstrated how the human mind functions. AI is creating new opportunities for improving its dependability, dependability, and effectiveness. This research paper discusses a number of difficulties that the transportation industry is currently experiencing as a result of the adoption of ITS. Concerns about safety oversight, public transportation, and traffic management are intended to be deferred by the artificial intelligence programme developed for the transportation industry. The majority of this article's attention is given to transportation-related scenarios and problems that AI can solve. Both developed and developing nations have benefited from the use of artificial intelligence (AI), which has improved technology and aided in the expansion of our economy.

Keywords: - *Transport Management Systems, Logistics, Public Transport, Traffic Management. Safety Management, Intelligent Transportation,*

INTRODUCTION

Technologies have aided businesses and others in overcoming obstacles, whether in banking, healthcare, or sports. By reducing operational costs and improving both standard and advanced performance, many

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of these technologies have transformed the way businesses run. The majority of these technologies are used in the transportation industry,which frequently faces difficulties like traffic jams, navigational problems, and delays in reaching destinations. The main providers of the advantages of global human and technological mobility are transport organisations. For business investments in transportation technology, artificial intelligence, machine learning, and the IOT are used.

Artificial Intelligence (AI)

It is undeniably a growing area of computer science that, in the coming years, will play a significant role in all software. To put it simply, it is a broad area of computer science that is used in machines to enable them to behave similarly to human minds. It makes it possible for robots to think, act, and comprehend similarly to humans. The definition of AI, as it was first coined by John McCarty at Dartmouth in 1956, is a science that enables the construction of intelligent machines. Due to the availability of enormous amounts of data produced by various devices, as well as the accessibility of a variety of software, networks, and hardware, this problem has attracted significant interest after more than 60 years [1]. In recent years, it has become clear that the development of AI-based robots and machines is widely used in many areas of our daily lives, including marketing, robotics, healthcare, and business, to name just a few. (AI)has learned how to live side by side with humans. It is now so well-known that it is impossible to say how frequently we use it in our daily lives. (AI) offers reliable and cost-effective solutions for all business decision-making processes [2]. AI has also aided in the resolution of water and climate change challenges through the use of conventional systems and industries. These attributes all assist governments in developing sustainable cities, which is a great way to preserve biodiversity and human health. It is a great plan to increase productivity and GDP around the world. According to the data, China and North America will profit the most from artificial intelligence. China's GDP will grow by 26% by 2030, whereas North America's GDP will grow by 14.5%, or $10.7 trillion. When compared to other countries, Canada donated around $125 million to AI research in 2017. When compared to other countries, Canada donated around $125 million to AI research in 2017. The French government will invest $1.8 billion in artificial intelligence by 2022, while Russia's military will spend $12.5 million every year [3].

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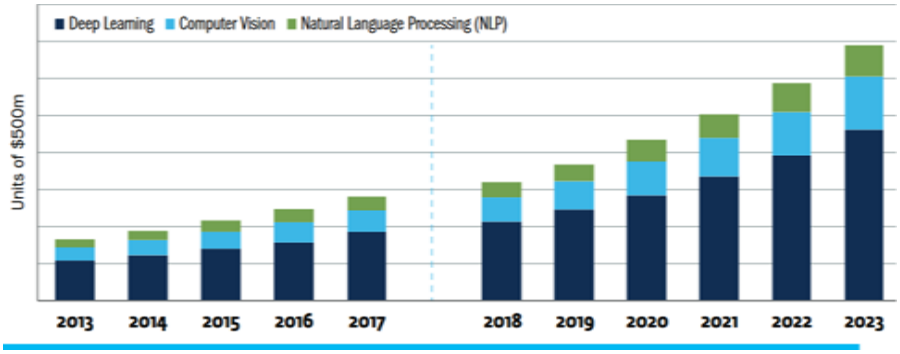


Fig. 1: AI in the Transportation Market "AI in Transportation Market Overview" is the source.2018 2018 Precious & Strategic Intelligence.

Even in India, the government has set aside $477 million towards the development of these technologies as part of the Digital India plan. The objective of the country is to acquire all essential data from the private sector and make it available to the general public for research purposes. The primary purpose of AI is to drastically simplify human lives.

Artificial Intelligence in Transport

Many cities throughout the world are facing transportation and traffic problems. This is due to both the fast rising population and the proliferation of various vehicle classifications on the road. According to research, the global value of AI transportation climbed to $4 billion in 2017 and is expected to reach 3.5 billion by 2023. Every form of transportation, large and small, is designed to operate independently in order to enhance traffic flow. Thanks to artificial intelligence, several means of transportation are becoming safer, greener, smarter, and more efficient. It speeds information exchange between ships and ports and functions in compliance with the criteria for digital freight transport records, which were created to digitize close sports and transportation operations [4]. Furthermore, the European Union has been funding initiatives that investigate the application of AI in transportation under the Horizon 2020 research and innovation initiative. The spectacular applications of self-driving vehicles, autonomous air taxis, smart trucks, and smart halls are most recognizable to the general audience. AI-powered technology will be employed in a wide range of applications, many of which will be less visible but extremely valuable. According to the UITP research, AI technology is used in 62% of public transportation projects, including those from authorities, industry providers, and public transit corporations. It has been revealed that the use of AI in public

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transportation has significantly increased over the last three to four years [5].The following are currently the most widespread uses of AI in public transportation:

- Intelligent Ticketing System
- Scheduling and Timetabling
- Customer Analytics
- Predictive Maintenance
- Real-time Operations Management
- Multi modal Journey Planner

AI METHODOLOGY

The goal of incorporating AI into daily planning is to be aware of community needs and select the best course of action to ensure that there are no negative effects on the social, environmental, and economic aspects of transportation. As the backbone of urban infrastructure, the transportation sector cannot afford to ignore data collection and consumption. Because of its emphasis on people and significant financial benefit, it significantly contributes to progress.

There are a number of contemporary uses for transportation technology that have recently emerged and will do so in the years to come. Method-oriented machine approaches with embedded offers as a means of predicting the results of transportation-related solutions are the area of expertise of the software developer. Various countries have conducted a number of studies on AI in transportation, with varying degrees of success. Here are a few illustrations: In the area of transportation, Transport Management Systems (TMS) is a potent software program. Since they aid organisations in planning for optimization, route planning, and other things, TMS are well-known in the market these days, especially for shippers that move large volumes [6]. They help them manage their data and automate various business processes, which enables them to employ fewer staff members and improve their transportation efficiency. The modes of transportation used in a city are connected to a data system for better management that could instruct us on taking pictures, sending them, and managing the statistics produced. The use of smart technology in recent years has resulted in the creation of routing, mapping, and planning. All of this has led to improved information processing abilities that have made Intelligent Transportation Systems (ITS) possible. In this area, AI has come a long way. A seamless travel experience is made possible by an intelligent transportation system that integrates people, cars, and roads as well as safety and comfort. This is done by reducing traffic congestion. The

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device is made to gather data, analyse it, and then use the findings to plan, manage, and coordinate transportation. The creation of environmentally friendly transportation systems and crisis management employ a variety of AI techniques [7]. Intelligent transportation systems are the main topic of the study. The table below lists the ITS subsystems and describes each one's operation. Our daily lives are significantly impacted by ITS, and this impact is constantly expanding.

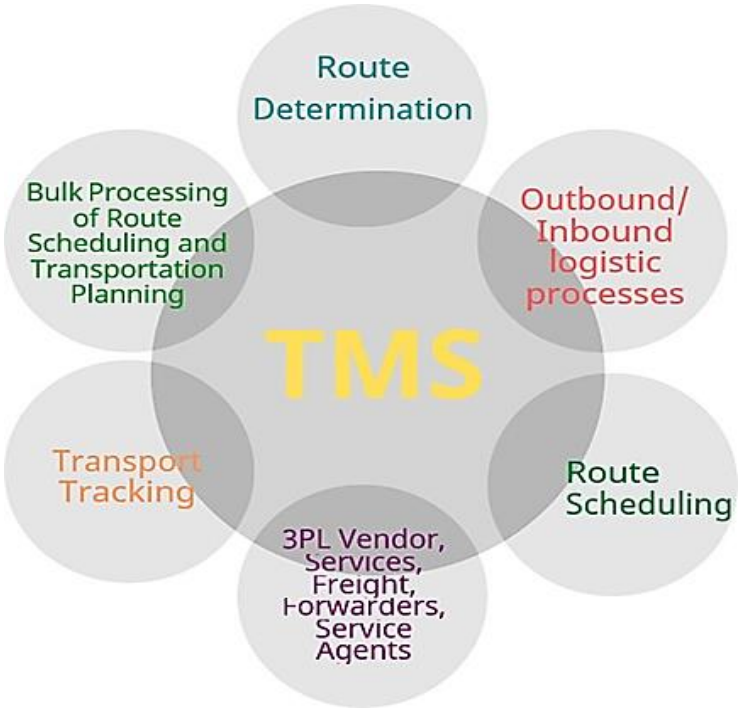


Fig. 2: TMS (Source: Value Consulting, 2013)

Table 1: Sub-Systems of ITS **Taken from (Sadek, AI Application in Transit, 2007).**

Sub-systems of ITS	Description
Intelligent Traffic Management System	Road management on a real-time basis to avoid congestion
Intelligent Public Transport System	Transportation of passengers through road along various routes
Intelligent Safety Management System	Ensuring safety of passengers, vehicles and goods on road
Intelligent Manufacturing & Logistics system	Incorporation of technologies in automobile manufacturing and transportation of goods

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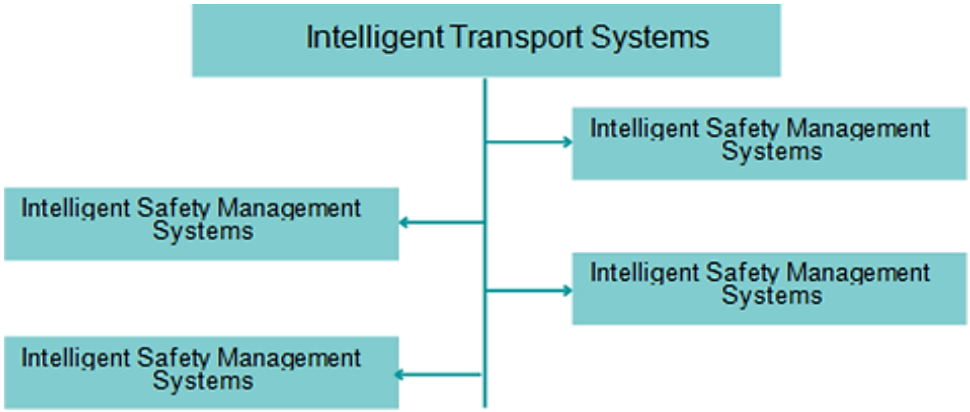


Fig. 3: Intelligent Transportation Systems

Every day's work has been simplified and enhanced as computer science has advanced. For example, statistics management is now so straightforward and accessible. Given that the data utilized in public transportation is unstructured and enormous, it must be managed properly if we are to fully profit from it. These technologies are being used to make transportation more convenient.

Aviation

To automate or speed up processes, they have opted to use artificial intelligence, or more specifically, data science and machine learning. AI is applied to route planning and revenue management in the aviation industry. The largest airlines in the world are now utilising artificial intelligence in aviation to boost customer satisfaction, increase operational effectiveness, and prevent errors. Several industries have used drones for delivery. A California start-up by the name of Nautilus is creating a delivery drone that can transport 90 tonnes of cargo. AI has also been applied to aircraft to help with maintenance and resolve cockpit issues [8]. Since 2017, a new company called Aerogility has been attempting to provide us with a cheap vendor. With the aid of tools for forecasting, engine storage, and landings, EasyJet will automate daily refurbishment planning. Customer service and passenger face recognition are additional issues that need to be given top priority [9]. Drone use in healthcare in Sub-Saharan Africa and other regions with less developed infrastructure are some additional examples.

Buses

The most commonly used algorithm for running buses is hybrid ant colonies and ANNs are also employed to notify passengers when their bus will arrive [10]. Many firms employ this strategy for bus services, and some examples are shown

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below. ITS frequently notifies commuters in Glasgow, Scotland, of public bus arrival and departure times, locations, and the number of available seats. It also offers information on the passenger density within the vehicle. The city of New Orleans has set up an emergency call Centre where ambulances are kept on standby. RATP Dev developed an AI engine that increases network planning and management effectiveness in order to better understand mobility trends [11]. SBB is developing a deep reinforcement learning technique that evaluates scenario variants on a digital twin of the Swiss railway network in order to enable optimum and autonomous dispatching and scheduling management [12].

Law Enforcement

Similar to this, AI is now being used in law enforcement to aid in the detection and selection of individuals who drive while intoxicated or texting. The speed at which cars enter and exit the field of vision presents a constant challenge for officers. However, this is no longer a problem because of artificial intelligence. AI has been found to be beneficial in a number of ways. For instance, it can identify and warn any nearby law enforcement about drivers who have consumed alcohol or are texting while operating a vehicle so that they can stop them [13]. For instance, a new AI voice assistant that can be used in real life was integrated into a new Motorola radio; when we enter the licence plate, it will quickly search for and provide the information related to it.

Traffic Management

The application of AI to traffic management systems is another example. Again, because AI can analyse and change data, it can be used to control traffic and make decisions, cutting down on travel time and improving the safety and intelligence of our roads. The predictive abilities of AI will greatly benefit traffic management systems, as they will be able to anticipate environmental and physical factors that may arise during peak traffic hours [14]. The traffic monitoring system is being developed in Bangalore, India, by Siemens Mobility. By identifying cars and alerting traffic lights, AI may use traffic cameras to calculate the volume of traffic along a route. The Land Transport Authority of Singapore is testing a system for counting cars based on images taken by drones as another example of traffic management. In order to create a smart city management system that can suggest routes and real-time traffic recommendations, Hangzhou worked with Alibaba Cloud.

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Autonomous Vehicles

Due to its control, processing, and maintenance skills, AI plays a critical role in these autonomous automobiles, which are a breakthrough in the field of transportation for the perfect future. Data transmission and processing are critical roles in self-driving cars [15]. AI allows you to control the gathering, processing, and transfer of information. It also provides an appropriate and appealing link for making autonomous car operations safer. Toyota Prius introduced autonomous vehicles in the United States in 2013. According to a study done in the United States, installing self-driving vehicles will avert 270 billion traffic accidents and over 30,000 fatalities each year [16].

DISCUSSIONS

Table 2: Showing How AI Is Used In Transportation.

Adoption of AI by transport corporations.

State Transport Corporation	AI application	Benefits
Bangalore Metropolitan Transport Corporation	AI cameras GPS trackers Facial Recognition	To monitor driver behavior related to sleep due to overwork and speeding
Karnataka State Transport Corporation	Sensors fitted at the front bumper of the bus where the driver waves at it every 3 – 4 min	Sensor cuts off accelerator if the driver does not wave at the sensor long distance luxury buses
Metropolitan Transport Corporation (Chennai)	Intelligent Traffic management system	Automatic number plate recognition cameras powered by OCR reads traffic violations. Automatic generation of challan for payment of a fine which is sent to the violator
Uttar Pradesh State Transport Corporation	Anti-collision system	Continuous monitoring of driver for objects within 180 m range by beeping
Maharashtra Transport Corporation	IVADO & Next AI Canadian companies	Set up AI clusters for various projects including transportation – Investment in R & D, Technologies for transport

Intelligent Transportation AI Solutions

The transportation sector has been greatly impacted. Traffic management, logistics, optimum routing, and autonomous

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vehicles are some ITS solutions based on AI. It is built using information produced by the AI systems installed in our vehicles. Currently, intelligent SMS, public transport systems, logistics systems, and traffic management are the four main subsystems of focus.

AI Achievement in Transportation across the World

Conversations have revealed that AI has the capacity to tackle every problem in the transportation sector on a worldwide scale. It is clear that many businesses and governments have embraced this use. The transportation industry is significantly investing in AI, but the effects will be both simple and complex.

CONCLUSION

In this effort, the advantages and potential of AI have been gathered in order to create an ITS. This study offers some solutions to the problems that have been identified because ITS is an essential tool for identifying issues in the transportation zone. It should be noted that traffic and route control are handled by machine learning techniques. This essay provides a thorough analysis of AI programmes and the development processes for those programs. As our cities and transportation networks become more reliable at supplying the data necessary for the creation of these AI applications, it appears that the scope of these applications is expanding. The focus is mainly on a variety of application areas that let you have a significant impact on the future, such as automated incident detection, self-driving cars, traffic management, and public transportation. Additionally, AI has advanced recently and can now be used for a variety of management tasks, including forecasting weather and traffic, and it may support decision-making in emergency situations.

Additionally, it can assist authorities in deciding which additional features their infrastructure needs in order to be safer and more secure. The article tries to learn about and gather information on various AI technologies to address issues in the transportation sector. In order to have a significant positive social impact, this research paper aims to shed light on how the government and other organisations might invest in new transportation technologies.

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Toronto Transit Commission	Self-driving transit shuttle	Supervised by human drivers initially. An initiative to solve last mile connectivity to public transport
French National Railway Company	Chatbots for transit passengers	Helps travellers plan their daily trip and navigate across the city in the event of inevitable delays
Telangana Transport Corporation	Chatbots for customer support	AI answers multiple questions. Difficult question is forwarded to higher authorities
West Bengal Transport corporation	Patha Disha – AI app	Availability of seats on specific buses, estimated arrival time of buses. Tracking behavior – Commuter feedback and behavior

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