ISSN No:-2456-2165

Artificial Intelligence in Transportation Industry

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Abstract:- Thanks to artificial intelligence's quick development, we have excellent opportunities to improve the efficiency of many businesses and industries, including the transportation sector. The goal of artificial intelligence is to learn about reasoning, planning, knowledge acquisition, and the capacity to move around and deal with objects. Numerous advancements were made because of AI, including sophisticated methods that revealed how the human mind functions. AI is creating opportunities to make it cleaner, more dependable, and more effective. This study paper combines a variety of issues that the transportation industry faces as a result of adopting Intelligent Transportation Systems. The AI software developed for the transportation sector aims to delay issues that could arise with safety control, public transportation, and traffic management. This article focuses mostly on transportation-related scenarios and problems that can be resolved by using AI. The use of AI in both advanced and developing economies has helped to simplify tasks, enhance technology, and improve our economy.

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

I. INTRODUCTION

Technologies, whether in banking, healthcare, or sports, have helped answer problems for businesses and beyond. Many of these technologies have altered how organisations are currently working by lowering operating costs and improving both average and advanced performance. Most of these technologies have been used in the transportation sector, which is susceptible to the following issues: traffic congestion, navigational issues, and delays in reaching your destination. The primary providers of the advantages of global human and technological mobility are the transport organisations. Artificial Intelligence, Machine Learning, and the Internet of Things are used to fully exploit the benefits of transportation technologies for business investments.

A. Artificial Intelligence (AI)

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 [1]. The development of AI-based robots and machines in recent years has been found to be widely used in our daily lives, including marketing, robotics, healthcare, business, and many other areas.

Artificial intelligence has figured out how to live among us. It has grown to be so well-known that it is difficult to discover how frequently we use it in our daily lives. AI provides dependable and affordable solutions for all commercial decision-making processes [2]. Through the use of traditional systems and sectors, AI has also contributed to the resolution of water and climate change issues. All of these abilities assist governments in creating sustainable towns, which is a great method to help us protect biodiversity and human health.

It is a fantastic way to raise the global economy's productivity and GDP. The statistics indicate that China and North America are the nations that will benefit the most from AI. By 2030, China's GDP will increase by 26%, while North America's GDP will increase by 14.5%, or $10.7 trillion. If we compare Canada to another nation, it contributed around $125 million in 2017 to AI research. If we compare Canada to another nation, it contributed around $125 million in 2017 to AI research. In the year 2022, the French government will invest $1.8 billion in artificial intelligence, and Russia's military will spend $12.5 million yearly [3].

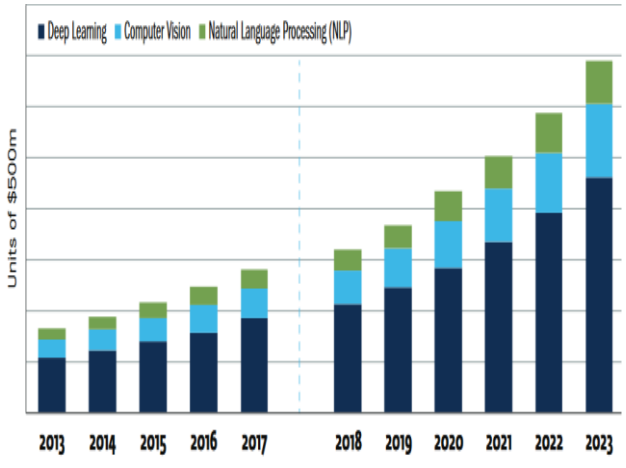

Fig. 1: AI in the Transportation Market
"AI in Transportation Market Overview" is the source.
2018 Precious & Strategic Intelligence

ISSN No:-2456-2165

Even in India, the government has allocated $477 million for the development of these technologies under an initiative dubbed Digital India. The nations' goal is to obtain all necessary data from the private sector and make it accessible to the general public for use in research. AI's main goal is to greatly simplify our lives.

B. Artificial Intelligence in Transport

Many cities throughout the world are experiencing transportation and traffic crises. That is a result of both the rapidly growing population and the expansion of a variety of vehicle categories on the road. Research indicates that the value of worldwide AI transportation increased to $4 billion in 2017 and is anticipated to reach 3.5 billion by 2023. Every mode of transportation, from large to small, is designed to run on its own to improve traffic flow. Different modes of transportation are becoming safer, greener, smarter, and more efficient thanks to artificial intelligence. It streamlines information interchange between ships and ports and operates in accordance with digital freight transport records' guidelines, which have been designed to digitize close sportss and transportation activities [4]. Additionally, the European Union has been providing financial assistance for projects that examine the use of AI in transportation through the Horizon 2020 research innovation initiative. The public is most familiar with the dramatic applications of self-driving cars, autonomous air taxis, smart trucks, and smart hallways. AI-powered technology will be used in a variety of applications, many of which are less striking but very beneficial. According to the UITP report, 62% of public transportation projects include AI technology, including those from authorities, industry providers, and public transportation companies. It has been discovered that the deployment of AI in public transportation has substantially expanded during the previous 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

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.

There are numerous contemporary uses for transportation technology that have emerged recently and will continue to do so in the years to come. The software developer's area of expertise is method-oriented machine approach with an embedded offer as a means to ascertain the consequences of the solutions related to the transportation sector. 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 [6]. They help them manage their data and automate various business processes, allowing them to use fewer workers and be more efficient in transportation. A data system for better management that might educate us on taking photos, transmitting them, and managing the statistics created is tied to the transportation methods used in a city. Things like routing, mapping, and planning have been developed during the past few years as a result of the employment of smart technology. With all of this, information processing capabilities have increased to a higher level, resulting in Intelligent Transportation Systems (ITS). It is an area where AI applications have made significant progress. An integrated system of people, roads, and vehicles, safety, and comfort that realises smooth travel by reducing traffic congestion is known as an Intelligent Transportation System. The machine is built to gather information, analyze it, and then use the conclusions to manage, coordinate, and organize transportation. Many AI techniques are employed in the creation of sustainable transportation systems and the resolution of crises [7].

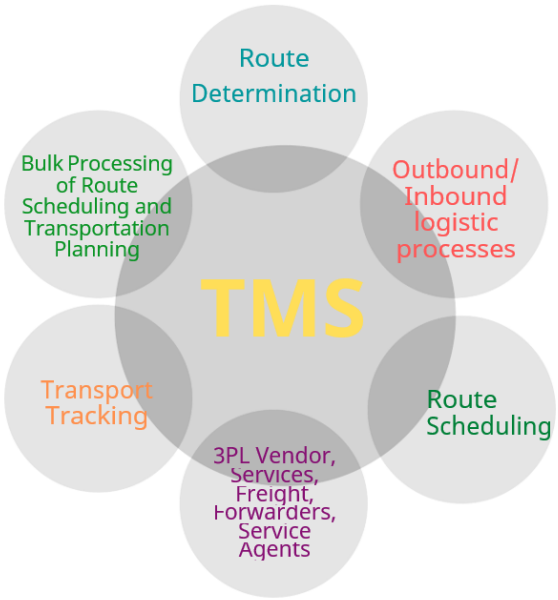

Fig. 2: TMS

(Source: Value Consulting, 2013)

The study specializes in intelligent transportation systems. The ITS subsystems are included in the following table along with an explanation of how they are used. The importance of ITS in our daily lives is enormous, and it is constantly expanding.

ISSN No:-2456-2165

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

III. APPLICATION OF AI

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

The advancement of computer science has simplified and improved every task. For instance, statistics maintenance is now so simple and accessible. Given that the data used in public transportation is unstructured and voluminous, it must be appropriately managed if we are to benefit fully from it. These technologies are being utilized to make transport easier.

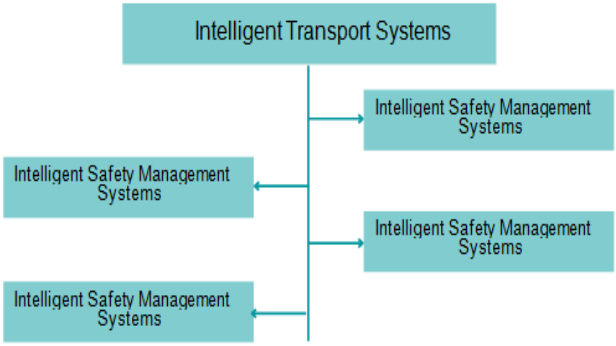

Fig. 3: Intelligent Transportation Systems

A. Aviation

They have opted to use AI, or more specifically, data science and machine learning, to automate or speed up operations. AI is being utilized in aviation for route planning and revenue management. The world's major airlines currently employ AI in aviation to improve operational efficiency, prevent errors, and increase customer happiness. Many businesses have used drones for delivery. One example of a drone for delivery is being built by a start-up in California called Nautilus, which can carry 90 tons of stuff. AI has also been applied to aircraft to help with maintenance and to address issues that pilots have in the cockpit [8]. A new company Since 2017, Aerogility has been aiming to provide us with a low-cost vendor. EasyJet will automate the daily planning for renovations, including tools for forecasts, engine storage, and landings. Passenger facial recognition and customer service are other issues that need to be prioritized [9]. Other instances that we may think of include using drones for healthcare in Sub-Saharan Africa and other regions with less developed infrastructure.

B. Buses

Hybrid ant colonies are the most commonly used algorithm for operating buses, and ANNs are also used to inform passengers when their bus will arrive [10]. Many businesses use this method for their bus services, and below are some examples. In Glasgow, Scotland, ITS regularly informs commuters about the arrival and departure times of public buses, their locations, and the number of available seats. It also provides information on the density of passengers within the vehicle. The city of New Orleans has established an emergency call base for where its ambulances are stationed on standby. In order to better comprehend mobility patterns, RATP Dev created an AI engine that improves effectiveness in network planning and management [11]. To provide optimal and autonomous dispatching and scheduling management, SBB is working on a deep reinforcement learning approach that tests scenario variations on a digital twin of the Swiss railway network [12].

C. Law Enforcement

Similarly, AI is now being employed in this enforcement capacity and is aiding in the capture and selection of those who consume alcohol or text while driving. Due to the speed at which vehicles can enter and exit the field of vision, this usually presents a challenge to officers. However, thanks to AI, this is no longer a problem. It has been discovered that AI can assist in many ways through the use of sophisticated analytical and data processing skills. It can, for example, detect and identify drivers who have consumed alcohol or are texting while driving and alert any nearby law enforcement so that they can stop them [13]. For instance, a new AI voice assistant was built into a new radio from Motorola that can be used in real life; when we enter the license plate, it will seek up the information associated with it and offer the information within a short period of time.

D. Traffic Management

The application of AI in traffic management systems is another example. Again, because AI can interpret and manipulate data, it can be used to manage traffic and make decisions, which will shave time off of travel times and make our roads safer and more intelligent. Traffic management systems will greatly benefit from AI's predictive capabilities as they will be able to predict environmental and physical variables that may arise during periods of high traffic [14]. The traffic monitoring system is being built by Siemens Mobility in Bangalore, India. By recognizing the vehicles and sending the alarm to traffic lights, AI can use traffic cameras to compute the density of traffic on the route. Other instances of traffic management include a method for counting vehicles based on drone photos being tested by the Land Transport Authority of Singapore. In order to implement a smart city management system that can suggest routes and real-time traffic recommendations, Hangzhou teamed up with Alibaba Cloud.

E. 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 [15]. 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 [16].

Table 2: Showing how AI is used in Transportation.

IV. DISCUSSIONS

A. AI solutions for Intelligent Transportation

It has had a significant impact on the 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

sector. Some AI-based ITS solutions include traffic management, logistics, optimal routing, and autonomous vehicles. It is constructed using data generated by the AI systems that are placed in our vehicles. Currently, the four key subsystems of focus are Intelligent SMS, Transport System of the Public, Logistics System, and Traffic Management.

B. AI achievement in transportation across the world

It has been discovered through conversations that AI has the potential to globally solve every issue relating to the transportation sector. It is evident that this application has been embraced by numerous organizations and nations. The transportation sector is investing heavily in AI, but the results will be both simple and complex.

C. AI applications across organizations

The use of artificial intelligence in the transportation industry has increased. Due to its climate, low population density, and superior transportation infrastructure compared to other nations, the United States is considered to be a leader in the field of AI [18]. In industrialised nations, funding for startups is simple to obtain.

D. Adoption of AI by transport corporations

According to research it's found that AI give a positive According to the study, AI has a favourable impact on urban infrastructure by producing accurate findings and understanding user preferences [17]. AI is preparing to take over the entire transportation industry in the near future. Businesses that use AI wish to consider ethical issues given the lack of ethical consensus on many technological aspects. Only a small number of organisations utilise machines to develop code; the majority write it by hand. Due to these factors, preconceptions, prejudices, and assumptions may find their way into the algorithms that are being developed.

V. CONCLUSION

The advantages and capabilities of AI have been gathered in this work to create an ITS. This study provides us with some solutions to the difficulties that have been presented because ITS is an important tool for identifying issues in the transportation zone. It should be highlighted that machine learning techniques are used for route and traffic management.

This essay provides a clear overview of the AI programmes and the methods that are utilised to create those applications. The diversity of these applications appears to be expanding as our cities and transportation networks become more reliable in supplying the data necessary for the creation of these AI applications. The focus is primarily on a number of application areas, including public transportation, autonomous cars, traffic management, and automated incident detection, that allow you to have a significant impact on the future. Additionally, AI has advanced in recent years to apply to traffic, weather forecasting, and a variety of management duties and can help with quick decision-making in an emergency.

It can also assist authorities in determining what additional features need to be included in their infrastructure in order to make it safer and more secure. The article makes an effort to learn about and gather various AI technologies to address issues in the transportation industry. The purpose of this study report is to provide insight into how the government and other organizations might invest in new transportation-related technology to have a significant positive social impact.

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

- ***Scope for further studies:*** Future consideration may be given to an effect observed based on the top facts used by the industry's involved stakeholders. It has been discovered that AI will have a significant impact on our future by creating devices like speech and language recognition technology, video game playability, computer vision and foresight, professional structures, robotics, and more. When it comes to transportation, AI has the potential to reduce traffic congestion, manage jams, give drivers time off, make parking easier, and boost ridesharing, all of which will reduce pollution and traffic congestion.

REFERENCES

[1.] How AI is Impacting our Real Life Every Day by I.Poola,(2017).(http://refhub.elsevier.com/S2666-691X(21)00039-7/sbref0047)
[2.] Advantages and Disadvantages of AI by A.W.Sadek and M.Chowdhery.Applications of AI toTransportation Areas, Transportation Research Board, Washington, United States, 2012. Retrieved October 24, 2019. (http://refhub.elsevier.com/S2666-691X(21)00039-7/sbref0010)
[3.] Gershgorn D. (2018). The AI race is just beginning, Forget the Space Race in Quartz for World Economic Forum. Retrieved in October 19, 2019.
[4.] Applications of AI in transportR. Abduljabbar, S.A. Bagloee, H. Dia and S. Liyanagean overview, Sustainability 11 (189) (2019). (https://doi.org/10.3390/su11010189)
[5.] Transportation,U.D(2019, September 23). https://www.transportation.gov. Retrieved on October 20, 2019.
[6.] Quadrant for Management Systems of Transportaion by B.D. Muynck,O.S. Duran andB. Johns. Retrieved on 7 June2021, https://www.gartner.com/doc/reprints?id=1-FPGZY0&tnqh_x0026;ct=190327&tnqh_x0026;st=sb.
[7.] Information systems applied to ITM by M.A. Serna, R.A. Gomez and J.A. Cortes,Dyna 180 Retrieved on7 June2021. http://refhub.elsevier.com/S2666-691X(21)00039-7/sbref0013)
[8.] Information systems applied to ITM by M.A. Serna, R.A. Gomez and J.A. Cortes,Dyna 180 Retrieved on7 June2021. http://refhub.elsevier.com/S2666-691X(21)00039-7/sbref0013)
[9.] Bellamy, Woodrow. 2019. "Airlines are Increasingly Connecting Artificial Intelligence to Their MRO Strategies, Avonics International, June 2019.
[10.] ChinaDaily New Paper FirstWorld's first Self-Driving Bus Goes on First Trial Run on Public Road.
[11.] Bridj. 2018. Available online: https://www.bridj.com/journey
[12.] https://www.researchgate.net/publication/326347492TheFutureofSwissRailwayDispatchingDeepLearningonaDigitalTwin .
[13.] Inside the Algorithm That Tries to Predict Gun Violence in Chicago by Jeff Asher and Rob Arthur in New York Times Upshot on 13 June 2017.
[14.] "The Technology That Could End Traffic Jams." By BBC and Future Story on 12 December 2018.
[15.] Fagnant, D.JKockelman, K.M. The travel and environmental implications of shared autonomous vehicles, using agent-based model scenarios.http://dx.doi.org/10.1016/j.trc.2013.12.001
[16.] Waymo. Available online: https://waymo.com/tech (accessed on 24 May 2018).
[17.] Design and construction of transportation infrastructure. AI Applications to Critical Transportation IssuesM. Karlaftis, S.M. Easa, M.K. Jha and E.I. VlahoGianni in Transportation Research Board, Washington, United States, 2012. Retrieved October 21, 2019. http://refhub.elsevier.com/S2666-691X(21)00039-7/sbref0028
[18.] Briggs, B., Henry, N., & Main, A. AI fueled organizations by Henry Nm. Deloitte Consulting LLP. Retrieved October 31, 2019.