

# Artificial Intelligence in Transportation

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December 2022

## 1 Introduction

Artificial intelligence is changing the transport sector. From helping cars, trains, ships and, aeroplanes to function autonomously, to making traffic flows smoother, it is already applied in numerous transport fields. Beyond making our lives easier, it can help to make all transport modes safer, cleaner, smarter and more efficient. Artificial intelligence-led autonomous transport could for instance help to reduce the human errors that are involved in many traffic accidents. However, with these opportunities come real challenges, including unintended consequences and misuse such as cyber-attacks and biased decisions about transport. There are also ramifications for employment, and ethical questions regarding liability for the decisions taken by artificial intelligence in the place of humans.

## 2 How AI is being used in transportation

### 2.1 Traffic Management

AI innovations in traffic management, such as China's City Brain project, can use AI techniques like big data analysis and predictive analytics to monitor road networks in real-time and alleviate congestion. These systems can also be used to enforce traffic laws and improve road discipline.

### 2.2 Heavy-good Transportation

Truck platooning involves connecting heavy goods vehicles in a network, allowing them to move in formation. The lead vehicle is driven by a human driver, while the drivers in the other trucks operate their vehicles passively. Truck platooning can be useful for vehicle transport companies or for transporting other heavy goods.

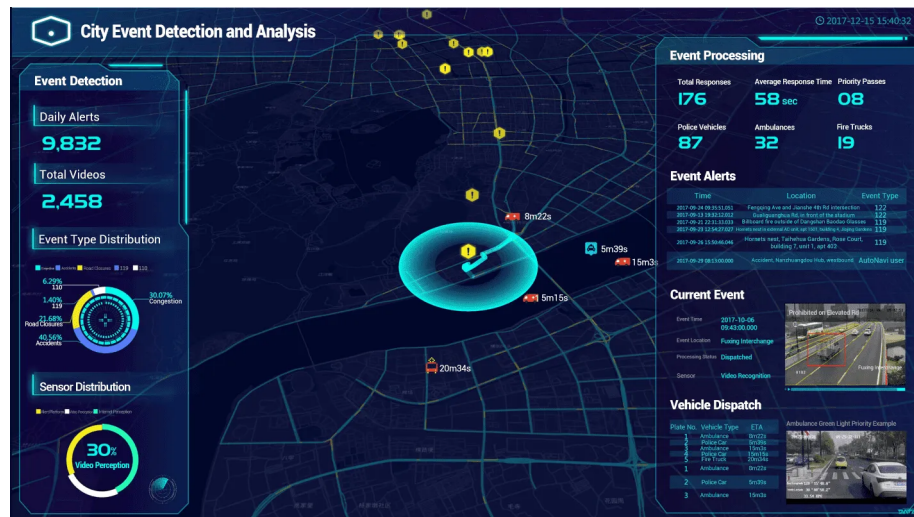


Figure 1: China's City Brain Project - Alibaba Project *Source: Google*

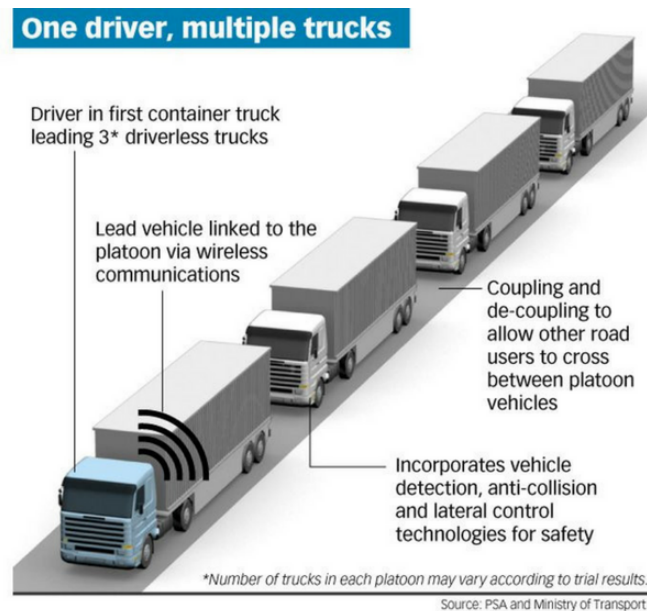


Figure 2: Truck Platooning *Source: Google*

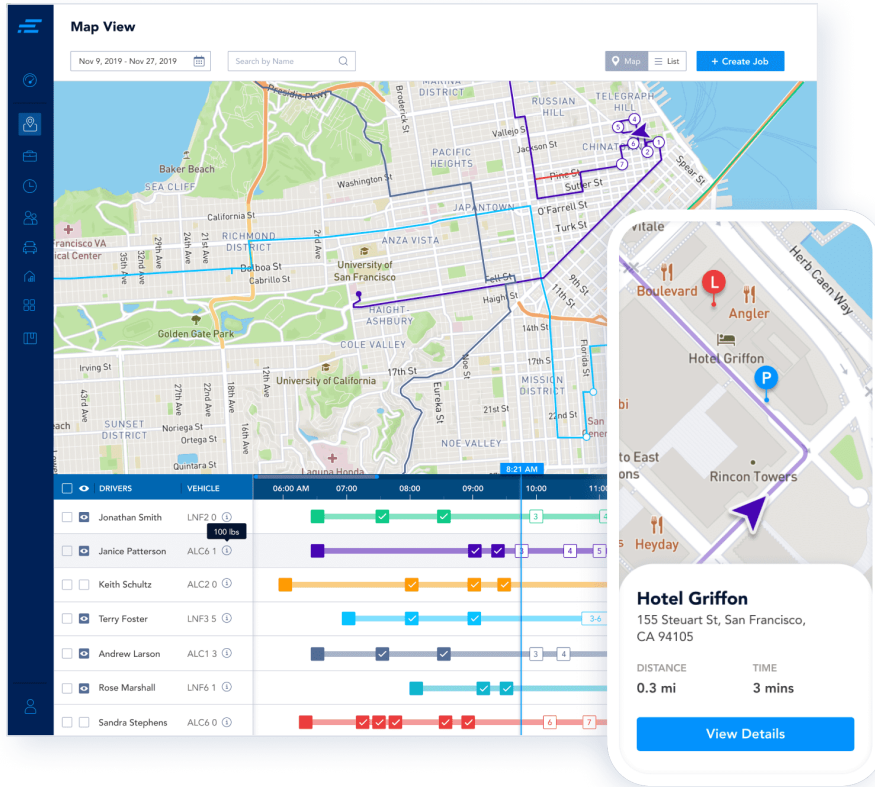


Figure 3: Route Generating *Source: Google*

## 2.3 Ride Sharing

Platforms like Uber and Lyft use AI to improve the user experience by matching riders and drivers, improving communication and messaging, and optimizing decision-making. Newer companies like Waymo are also developing driverless ride-hailing services.

## 2.4 Route Planning

Both businesses and individuals can benefit from AI-powered route planning that uses predictive analytics. Ride-sharing platforms already use AI to optimize route planning by analyzing various real-world factors. For enterprises, especially logistics and shipping companies, AI-enabled route planning can be an effective way to create a more efficient supply chain.



Figure 4: AI in Aviation *Source: Google*

## 2.5 Alternative Sources of Mobility

AI is also being used in sectors such as aviation, shipping, and rail. In aviation, AI innovations include intelligent air traffic management and trajectory prediction. In rail transport, intelligent train automation is being implemented, such as driver assistance systems. These AI solutions are helping to drive innovation and improve efficiency in these various transportation sectors.

## 3 The benefits of using AI transportation

AI has the potential to greatly improve transportation systems in various ways. Some of the benefits of using AI in transportation include:

- Improved traffic management: AI can be used to monitor road networks in real-time and alleviate congestion through techniques such as big data analysis and predictive analytics. These systems can also be used to enforce traffic laws and improve road discipline.
- Enhanced safety: Autonomous vehicles (AVs) use AI to learn how to drive safely, maintaining safe distances and lane discipline. This can potentially reduce the number of accidents on the road.
- Increased efficiency: AI can be used to optimize routes and schedules for delivery vehicles, reducing the number of miles driven and fuel consumption, and minimizing the risk of delays due to traffic congestion or other factors.

- Enhanced personal transportation services: AI can be used to match riders with available drivers, optimize routes, and predict demand for ride-sharing services, improving the efficiency of these services and reducing wait times for riders.
- Increased economic benefits: AI can be used to create new business models for solutions to current barriers like limited accessibility and reliability in the ride-sharing industry, potentially leading to economic growth.

Overall, the use of AI in transportation has the potential to significantly improve efficiency, safety, and economic benefits in various transportation sectors.

## 4 The challenges of implementing AI in transportation

The implementation of artificial intelligence (AI) in the transportation industry has the potential to revolutionize the way we move and transport goods. However, there are several challenges that need to be addressed in order for AI to reach its full potential in this sector.

One major challenge is the cost of implementing AI systems. These systems often require significant amounts of hardware and software, which can be expensive for companies to purchase and maintain. In addition, the complex import procedures for computing equipment and restrictions on foreign exchange can pose additional barriers.

Another challenge is the issue of privacy. In order for machine learning algorithms to work effectively, users may be asked to opt in and provide more personal data. This requires robust privacy laws to protect user data, while also balancing the benefits of having more data available for machine learning.

There is also the potential for AI to disrupt the transportation industry by leading to job loss. A report by the Center for Global Policy Solutions predicts that more than four million jobs could be lost in the United States alone in a quick transition to autonomous vehicles. These jobs would include delivery and heavy truck drivers, bus drivers, taxi drivers, and chauffeurs.

Finally, there are concerns about the reliability and safety of AI systems in the transportation industry. While AI has the potential to improve safety, there is still a risk of accidents or malfunctions. Ensuring that AI systems are reliable and safe is crucial for the successful adoption of AI in transportation.

Overall, while AI has the potential to transform the transportation industry, it is important for companies and policymakers to carefully consider these challenges in order to ensure a smooth and successful implementation of AI in this sector.

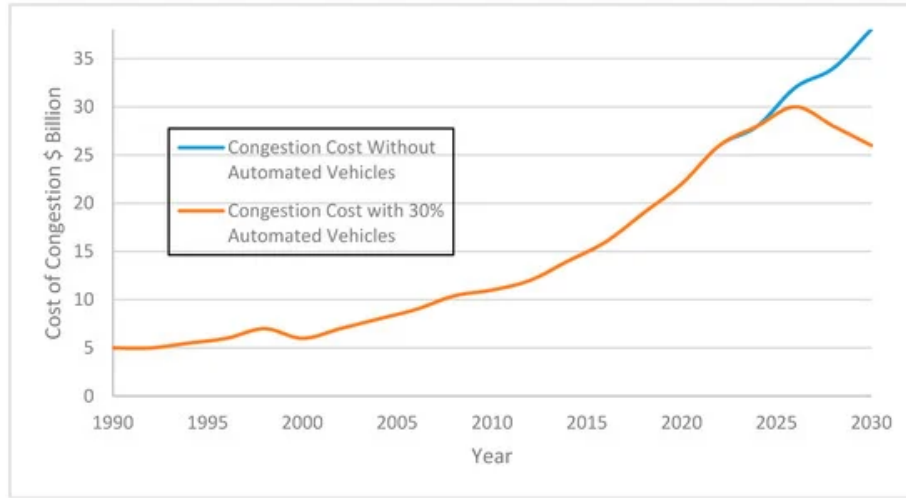


Figure 5: The effect of using 30% autonomous vehicles on road on congestion cost in Australia *Source: Google*

## 5 The future of AI transportation

The future of AI in transportation looks bright, with deep learning techniques expected to continue to revolutionize the way we move and transport goods. The market for deep learning is already valued at 272 million USD, and is expected to grow significantly as more industries adopt this powerful tool to improve their operations and efficiency. The travel and transport sectors are expected to see particularly significant benefits from the use of AI, with the potential to reduce fuel costs, minimize delivery times, optimize routes and schedules, and improve safety and air quality. Autonomous vehicles are also expected to play a major role in the future of transportation, with the potential to reduce congestion costs and improve the overall efficiency of the transportation system.[Fig:5] Overall, the adoption of AI in transportation is expected to bring significant benefits to businesses, the economy, and society, and will likely continue to drive innovation and growth in the industry.[fig:6]

## 6 Ethical consideration

As AI continues to advance and become more prevalent in various industries, including transportation, it is important to consider the ethical implications of its use. One major ethical concern is the potential for AI to perpetuate and amplify existing biases and inequalities. For example, if a transportation company's AI system is trained on data that is biased against certain demographics, it may make unfair or discriminatory decisions. Additionally, the use of AI in transportation raises questions about accountability and liability in the event of

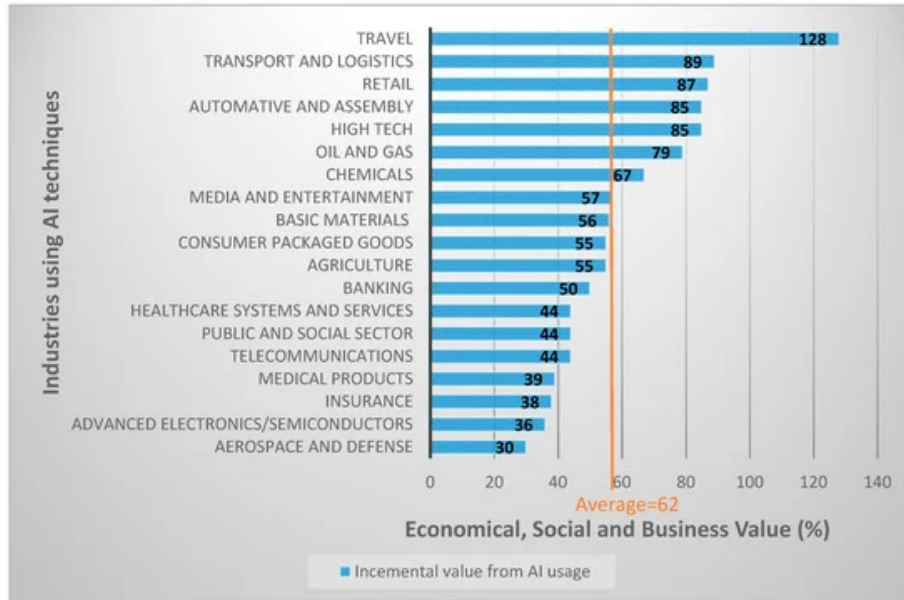


Figure 6: The performance improvement from AI *Source: Google*

accidents or other incidents. Another ethical consideration is the potential for AI to displace human jobs. As AI systems become more advanced and capable of performing tasks that were previously done by humans, there is a risk that certain jobs may become obsolete. It is important to consider the impact on workers and to address any potential negative consequences. Finally, there is the issue of privacy and data protection. As AI systems collect and analyze large amounts of data, there is a risk that personal information may be mishandled or misused. It is important to have robust privacy laws in place to protect individuals' data and to ensure that it is used ethically and responsibly.

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## 8 Conclusion

In conclusion, artificial intelligence (AI) has the potential to revolutionize the transportation industry by improving efficiency, safety, and convenience for both businesses and individuals. From traffic management systems that alleviate congestion to autonomous vehicles that improve safety and reduce the need for human drivers, the applications of AI in transportation are numerous. However, the adoption of AI in transportation also raises ethical concerns, such as job loss and privacy, which must be carefully considered as the technology is developed and implemented. Despite these challenges, the benefits of AI in transportation are likely to outweigh the costs, as the technology continues to advance and become more widespread in the coming years.