



Evolving AI Solutions

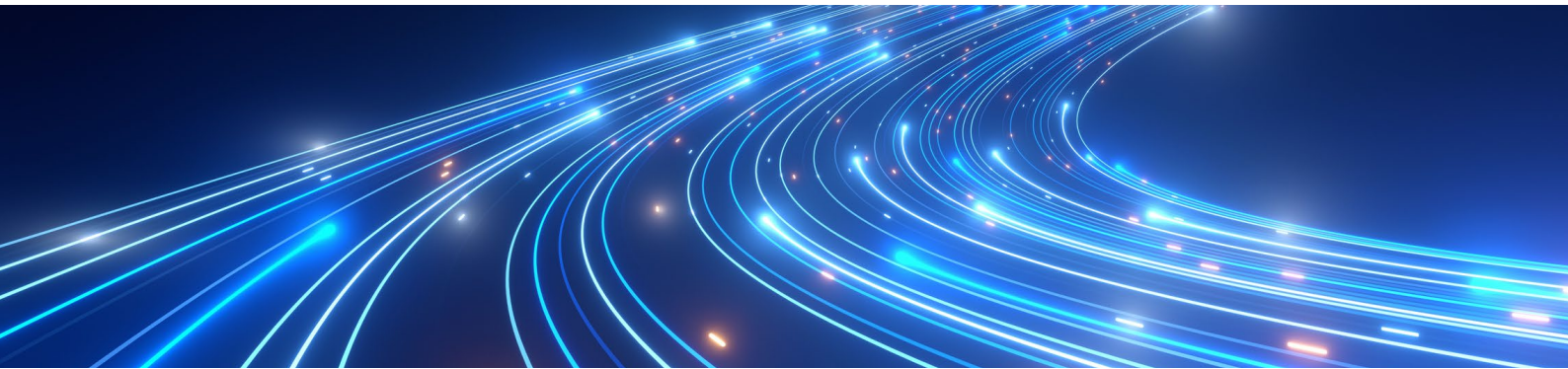
in Transportation & Infrastructure Management

NEC Australia leads the way in the use of AI to address current challenges facing the public transport industry.

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Introduction

The transportation sector is undergoing a significant transformation fuelled by rapid technological advancements. AI solutions are at the forefront of this evolution, offering promising avenues for enhancing operational efficiency, safety, and sustainability. NEC Australia is poised to lead this transformation, leveraging AI technologies and spatial analytics to address pressing challenges in public transportation and infrastructure management in Australia and New Zealand.



Driver Shortages & Safety Concerns

The bus driver shortage has been a persistent issue, with significant vacancies leading to operational inefficiencies. For example, at its peak in 2023, New South Wales faced 800 unfulfilled bus driver positions despite attractive salaries. This shortage has impacted service reliability and passenger satisfaction, underscoring the need for innovative solutions to attract and retain drivers.^[1]

Safety remains a paramount concern for both drivers and passengers. Incidents of road violations, inadequate safety measures, and the potential for accidents pose significant risks. A 2023 survey by the Transport Workers Union found that 87% of drivers had been concerned for their safety while on duty, highlighting the urgent need for enhanced safety measures.

Concerns for personal safety is a key barrier to filling bus driver positions, and addressing these barriers will work towards solving driver shortages and minimising on-road accidents.

Enhanced Safety Measures

AI technologies can improve and evolve safety measures in transportation through predictive maintenance, incident detection, collision avoidance and bus lane infringement detection.

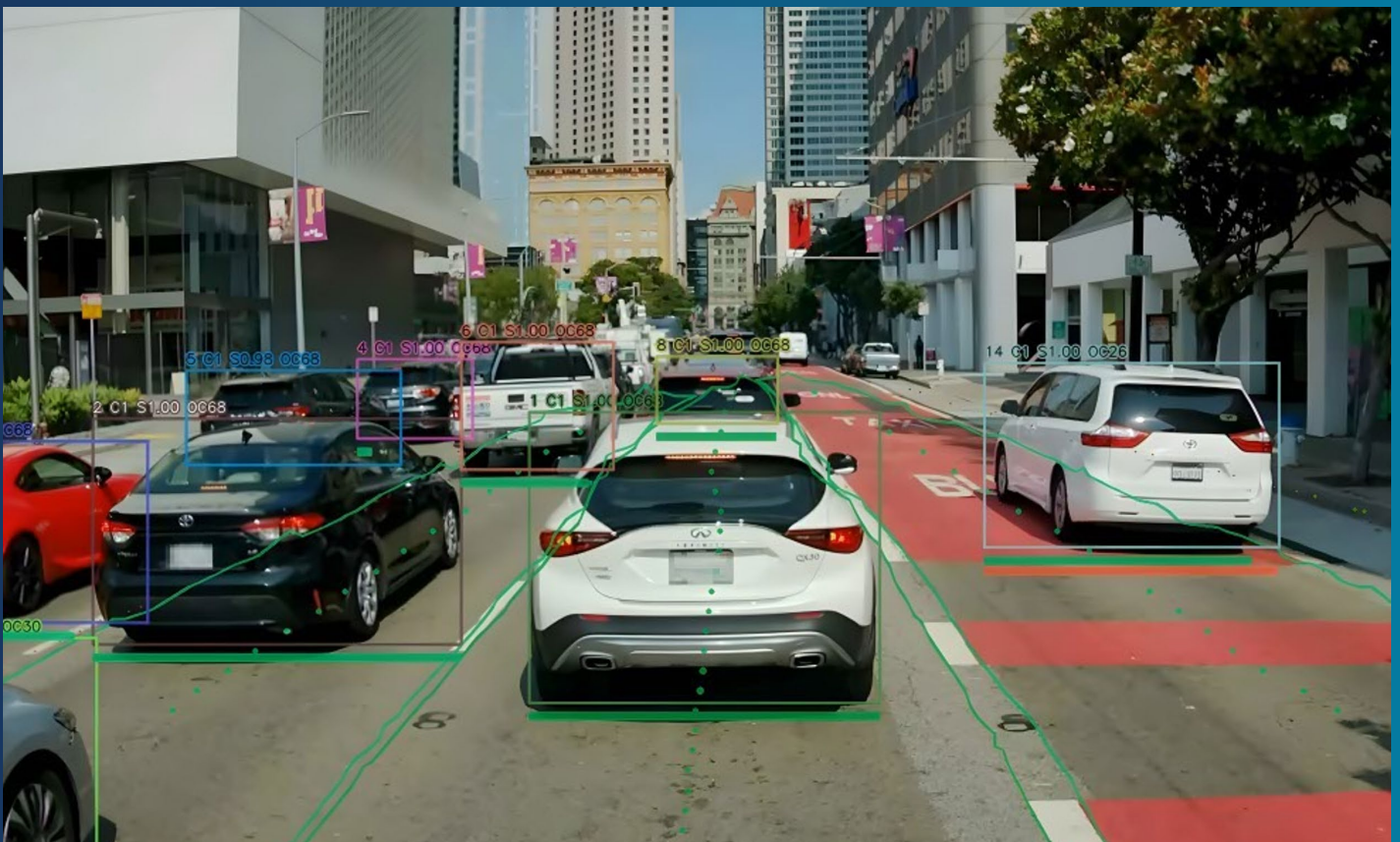
Predictive maintenance leverages sensor data to foresee vehicle failures, enabling proactive repairs that will not only improve safety but also extend vehicle life and reduce costs. Incident detection utilises AI-powered video surveillance to identify unusual activities and incidents in real time and can facilitate fast responses to potential security threats. Collision avoidance systems benefit from advanced algorithms that process sensor data to prevent accidents and ensure passenger and pedestrian safety.

Additionally, AI-powered video processing systems, such as those developed by Hayden AI, detect illegally parked cars in bus lanes, reducing safety risks and improving accessibility and bus performance through real-time enforcement.

Case Study: NEC and Hayden AI Partnership

Currently in use in New York, the solution provided leverages AI powered video processing solutions to identify parking violations that present a safety risk to buses and their passengers as they try to navigate complicated lane changes in congested traffic, and removing these obstructions helps improve safety, accessibility for people with disabilities, and on-time bus performance. This technology has resulted in a 5% increase in bus lane speeds, a 20% reduction in collisions, and an estimated 5% to 10% decrease in emissions on average.^[2]

The partnership between NEC Australia and Hayden AI exemplifies the potential of AI in transforming transportation.



Chris Carson, CEO of Hayden AI, emphasises the importance of leveraging AI to solve once-unsolvable problems, making bus lanes and cycle lanes safer and more accessible. The integration of AI-powered enforcement solutions has proven effective in cities across the United States, demonstrating the potential for similar success in Australia and New Zealand.

Orchestrating a brighter world

NEC

HaydenAI

Road Condition Management

A 2023 report by the Grattan Institute noted local councils are underspending on road maintenance by at least \$1 billion annually.^[3] Additionally, the problem is expected to grow and the report cites heavy rainfall and extreme heats occurring more frequently as significant causes of damage.

With increasingly constrained budgets and the increasing numbers of significant weather events, councils don't have the budgets to do continuous inspection of their roads and infrastructure to support preventative maintenance, so often are only able to respond to issues such as potholes when reported by the public, when ideally these issues would be detected before significant road damage had occurred. There are now AI driven systems that provide the ability for councils to easily detect road defects using simple on vehicle camera systems, effectively allowing any council vehicle including buses, garbage trucks and the like.

These technologies allow for pre-emptive measures to ensure service reliability, provide enhanced safety and ride quality, and ensure service reliability during weather events. NEC has developed a SaaS based solution – Kurumie for Cities, which is deployed across Japan, monitoring over 100,000KM of roadways.

Additionally, based on data now being collected from navigation systems on buses and cars, cloud hosted AI solutions, can analyse traffic patterns and based on this real time data along with historic data, make accurate predictions around bus arrival times, improving predictability of bus services and also optimise signal timings to improve travel times for buses as well as general traffic, again improving predictability of bus services as well reducing congestion, benefiting both public transport operations and general road users' experience for a more efficient transport network.

Infrastructure Maintenance and Operational Efficiency

AI can analyse passenger flow data to optimise bus and train schedules, reducing wait times and overcrowding. Predictive scheduling ensures that services align with peak demand periods, enhancing passenger satisfaction. Additionally, AI-powered systems provide real-time updates on delays, cancellations, and alternative routes, significantly improving the passenger experience.

For instance, AI can monitor traffic conditions and adjust schedules dynamically, ensuring minimal disruptions and efficient service delivery. This capability is particularly beneficial in urban areas where traffic congestion can cause significant delays.

Timely and effective maintenance of transportation infrastructure is crucial for ensuring service reliability and safety. However, resource constraints and manual processes often hinder efficient maintenance, leading to deteriorating infrastructure and increased risks of accidents.

Managing schedules, routes, and maintenance activities efficiently is a complex task that requires advanced technological support. Traditional methods are often inadequate for handling the dynamic nature of public transportation, resulting in delays, overcrowding, and suboptimal resource utilization.

Predictive Scheduling, Real-Time Updates, and Automated Inspections and Maintenance

In Canberra, NEC Australia is supplying cutting edge technology integrating several public transport services into one, offering personalised travel options and an efficient way for users to pay and always have their ticket available.^[4]



MyWay+ provides users with simple payment options, the ability to manage their travel, concession and payment details in the one secure account as well as real-time passenger information on services and alerts for delays, and journey planning across all modes.

MyWay+ provides advanced predictive passenger information and journey planning while also providing additional user-centric information such as the capacity of oncoming services, availability of facilities such as bike racks, and accessibility options at stops and stations as well as paths and walkways.

Automated Inspections and Maintenance

AI-driven drones and robots perform automated inspections of infrastructure, identifying defects and maintenance needs efficiently. These technologies can inspect hard-to-reach areas, such as bridges and tunnels, without disrupting operations, ensuring continuous service delivery.

Inventory Management: AI optimises spare parts inventory management by predicting usage patterns and ensuring the availability of critical components. This approach minimizes downtime and ensures that maintenance activities are performed without delays, enhancing overall operational efficiency.

Resource Allocation: AI helps allocate maintenance resources more efficiently by prioritizing tasks based on urgency and impact on service. This capability ensures that critical issues are addressed promptly, reducing the risk of service disruptions.

Future Directions



Quantum Technology Integration

Quantum computing holds significant potential for enhancing AI capabilities in transport. By handling complex data sets and optimising operations, quantum technology can further improve predictive analytics, scheduling, and maintenance activities. Integrating quantum technology with AI solutions can lead to unprecedented levels of efficiency and accuracy in transportation management.



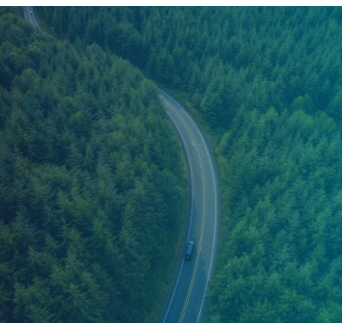
Inclusive and Adaptive Technologies

Ensuring that AI solutions cater to a diverse workforce and passenger base is crucial for maximising their impact. Providing multilingual support and accessible training methodologies ensures that all users can effectively engage with AI technologies. This inclusivity enhances the overall user experience and promotes broader adoption of AI solutions.



Continuous Innovation and Collaboration

Ongoing collaboration with technology providers, government bodies, and industry stakeholders is essential for keeping pace with evolving technological trends and meeting the dynamic needs of the transportation sector. By fostering a culture of continuous innovation, NEC and its partners can develop cutting-edge solutions that address emerging challenges and drive sustainable growth in the transportation industry.



Promoting Environmental Sustainability

AI technologies play a crucial role in promoting environmental sustainability in transportation. By optimising routes, reducing congestion, and enhancing vehicle efficiency, AI can significantly reduce greenhouse gas emissions. Additionally, AI-powered enforcement solutions help maintain clear transit zones, reducing idle times and improving fuel efficiency.



Enhancing Passenger Experience

AI solutions can transform the passenger experience by providing personalised travel assistance, dynamic pricing, and enhanced accessibility features. AI chatbots and virtual assistants offer tailored travel advice and support, ensuring a smooth and convenient journey for passengers. Dynamic pricing algorithms help balance loads and optimise revenue management, enhancing the overall efficiency of public transport systems.

Conclusion

Integrating modern AI technologies into transportation and infrastructure management is essential for addressing current challenges and future-proofing the industry. Through enhancing safety, operational efficiency, and infrastructure maintenance, AI solutions like the NEC/Hayden AI bus lane and stop enforcement technology as well as the NEC Passenger information services that provide adaptive journey planning and accurate arrival time predictions are set to revolutionise public transport in Australia and New Zealand. Embracing these advancements will not only improve service delivery but also create a more sustainable and reliable transport system for all.

NEC's strategy is to leverage AI in developing solutions that provide safer, more efficient, and reliable services, and is positioned well by extensive experience in smart transport technology positions to drive this transformation, delivering tangible benefits to Australasian transport operators and passengers alike.

Find out more about NEC's mobility platform and expertise within smart transportation at www.nec.com.au/sts

Source [1]: <https://www.theage.com.au/national/victoria/bus-drivers-demand-workplace-reform-as-violence-increases-20230829-p5e07l.html>

Source [2]: <https://www.busnews.com.au/nec-and-hayden-ai-team-up-to-improve-road-safety-for-buses/>

Source [3]: <https://grattan.edu.au/wp-content/uploads/2023/11/Potholes-and-Pitfalls-How-to-fix-local-roads-Grattan-Report.pdf>

Source [4]: <https://www.nec.com.au/insights/media/myway-simple-way-plan-and-pay>

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