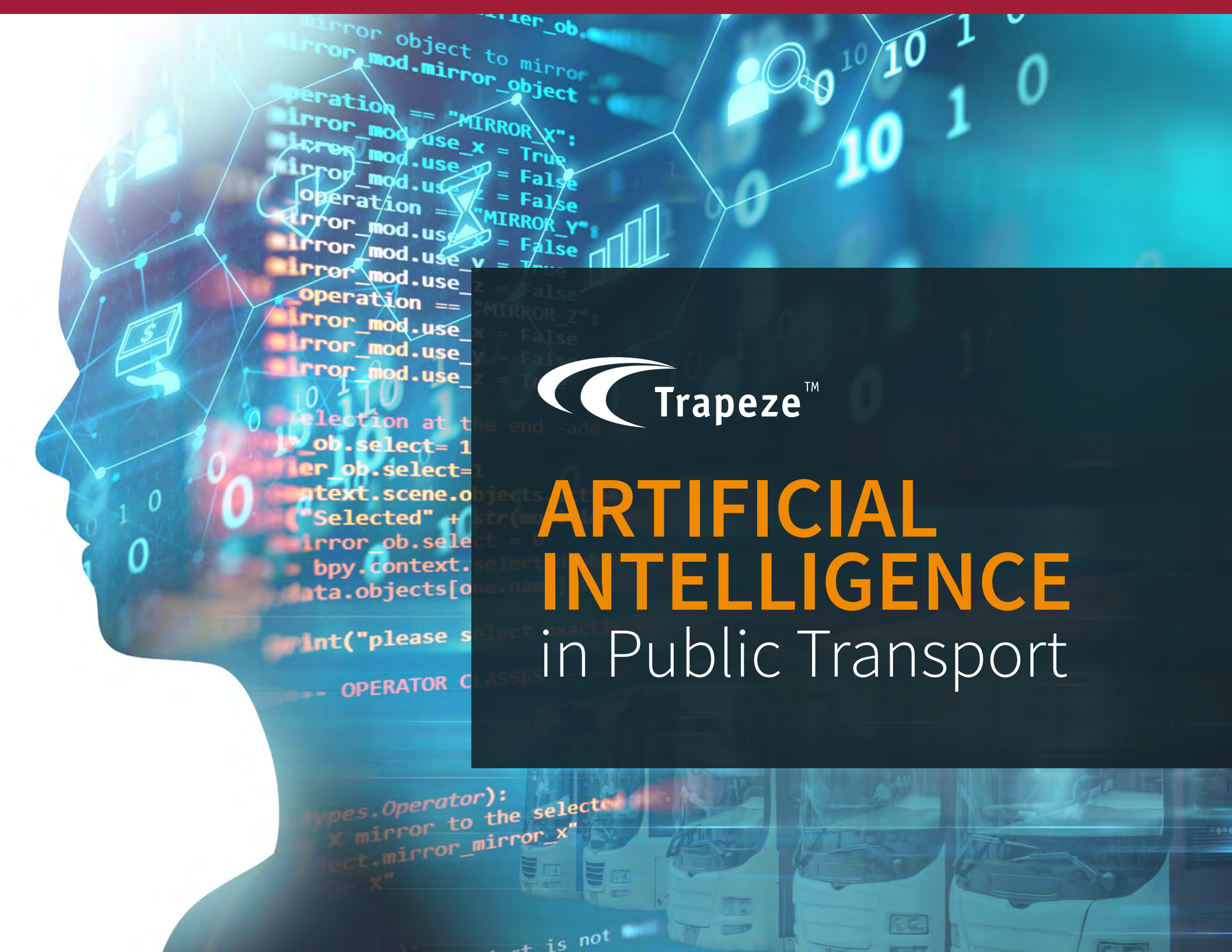

Trapeze™

ARTIFICIAL INTELLIGENCE

in Public Transport

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INTRODUCTION

Artificial intelligence (AI) is a term that seems to be everywhere you look these days in passenger transport publications, events and roundtables.

It's being touted as the answer to numerous complex challenges in public transport: ***making sense of the tons of data*** collected daily in any transport operation; bridging the gap between theory and reality for ***true MaaS***; and ***optimising more or less everything*** in Smart Cities to save time, money, lives and the environment.

As with any revolutionary technology, there are ***many schools of thought*** on the tremendous potential of AI, its myriad uses and what it all means for the future and humankind. But whether you're Team ***JARVIS*** or Team ***Skynet***, it's clear that AI applications are going to become increasingly common and every transit professional needs to familiarise themselves with the possibilities this technology opens up.

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What is **ARTIFICIAL INTELLIGENCE?**

This seemingly simple question could take several academic journals to answer adequately. The scope of what is considered 'intelligent' and what is deemed regular machine capability is constantly evolving, causing some to say "***AI is whatever hasn't been done yet***".

We looked at the USA Transportation Research Board's circular ***Artificial Intelligence in Transportation***, which looks at AI and its applications in public transport, for answers. In summary:

AI is defined as **"methods and approaches that mimic biologically intelligent behaviour in order to solve problems"** and divided into:

Symbolic AI, such as **knowledge-based systems**

Computational intelligence, such as **neural networks, fuzzy systems and evolutionary computing**

For a more in-depth look at artificial intelligence technology, check out this interactive, graphical ***Executive's Guide to AI*** or this layman-friendly ***Forbes article***.

THE CASE FOR AI IN PUBLIC TRANSPORT

It is often said that public transport is a complex business. A transport network is usually made up of multiple modes of transport such as bus, train, light rail and ferry, operated by numerous entities who may have common or conflicting goals. It is also highly stochastic, with demand changing on a daily basis, and subject to sudden perturbations as unexpected events occur.

Such networks have the ability to generate large volumes of data from vehicle telemetry, real-time tracking, ticketing systems, CCTV, sniffer beacons, in-vehicle information systems, Twitter feeds…and the list goes on. Outside of public transport, there are other information sources such as road traffic management systems and weather data collection systems. In other words, Large Data and the Internet of Things is likely to impact public transport as much as any other area.

At the same time, public transit is expected to deliver more with less. A network may have to function within specific parameters, such as enterprise bargaining agreements (EBAs) or set delivery standards ('services every 5 minutes at peak hour'). In order to do this reliably and consistently, the sheer amount of data that must be processed, conditions that must be met and factors to consider are almost impossible for the human brain to compute.

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This is where **AI** comes in.

By implementing AI in the public transport domain, transport technology will be capable of predicting future demands on transportation and learning to provide better, more efficient solutions. These predictions could also quickly adapt to disturbances such as traffic incidents and public emergencies, increasing the safety of cities and infrastructure.

Asset performance data such as fuel consumption and brake condition could be analysed and used to carry out maintenance in a much more targeted way. This would improve network performance by avoiding unnecessary breakdowns, while simultaneously saving costs from only undertaking maintenance when it is required.

A good example of how AI can be applied is in the area of improving scheduling of operations. Using historical data such as time between stops and dwell times at stops, an AI algorithm can determine much more realistic timetables. Furthermore, it can learn the disruptive impact of incidents and using self-learning make recommendations on how to better recover adherence to the schedule. Other applications include:

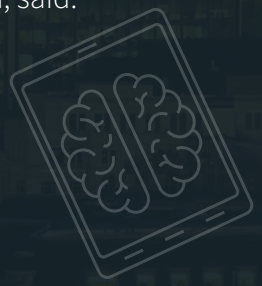
- Better scheduling solutions in real time based on passenger demand
- More accurate information in the hands of the passengers, increasing public transport reliability and utilisation
- Decreased congestion through better management of city traffic
- Increased efficiency and productivity through the automation of public transport provision

IN REAL LIFE: AI IN TRANSIT TODAY

Transport for London (TFL)

In mid-2017, TfL launched an **AI-powered social media tool** called '***Travelbot***'. Travelbot can chat with customers through Facebook's Messenger app and help them get information on bus arrival times, service updates and maps quickly. Its AI capability allows it to learn as more passengers use the service, becoming ever more precise and relevant with its responses.

The idea of Travelbot (a ***chatbot***) was to allow people to go effortlessly from chatting with their friends on Messenger to searching for travel information without needing to close the app and open a browser. TfL's Director of Customer Experience, Shashi Verma, said:



"Millions of people already use our Journey Planner and social media channels to help them get around London, and we are constantly seeking new ways to make the process even easier.

"This Travelbot will make it simpler for people using Messenger to get the information they need as they move around the city."

TfL says they are already thinking about potential new functions, such as status alerts and journey planning information.

Across the world, Australia's Transport for New South Wales launched its own intelligent Facebook Messenger bot ***RITA (Real-time Intelligent Transport Assistant)*** in September 2017 to provide real-time information and service updates.

Considering ***the benefits***, we think more transport authorities follow suit.

Travelbot is not TfL's only foray into AI. They are already working with Trapeze to implement AI concepts in support of moving from a timetable-based system to using advanced prediction algorithms to optimise schedules based on the unique variables of that day, such as weather, traffic conditions and passenger demand.

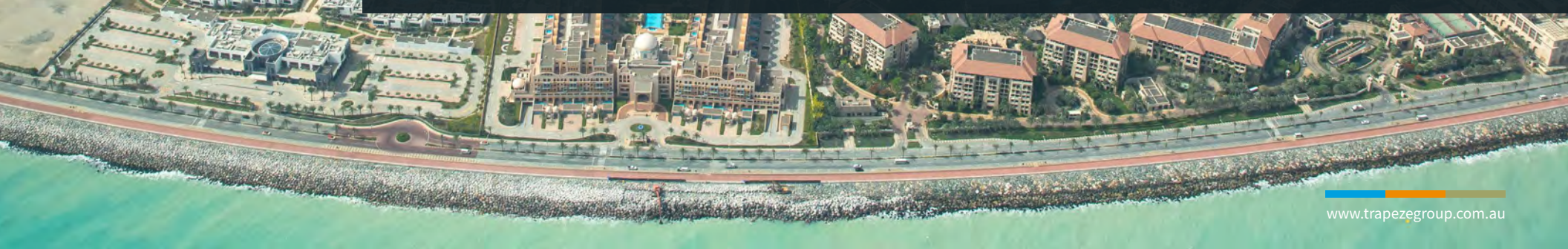
By using feeds already being pulled into ***Trapeze's Intelligent Transportation Control System (ITCS)***, TfL will provide automated real-time solutions for traffic congestion, detours, ad-hoc operations and times of heightened security. This will lead to better decision-making by dispatchers, faster incident detection, increased traveller satisfaction, automated dispatching and more efficient transfer protection.

Dubai Roads and Transport Authority (RTA)

Dubai's RTA is famous for its readiness to adopt the latest and greatest technology and its thirst for innovative ways to achieve its strategic objectives. It will come as no surprise that they have already embraced the possibilities of AI. Using machine learning capabilities, historical and live operational data is analysed to produce heat maps that show where the demand for taxi rides is highest.

Every vehicle in the RTA's taxi fleet (the largest in the world at over 10,000 vehicles) is directly connected to the control centre through smart meters. Demand from passengers is analysed and compared to the number of taxis in the vicinity to forecast the fleet's ability to meet demand; this is then broadcast as a heat map to drivers via the smart meters.

Adel Shakeri, the RTA's Transportation Director, told ***Al Bayan News*** he anticipates that the heat maps will cut down arrival times, reduce fuel consumption and save time for taxi drivers, thereby increasing customer satisfaction, reducing emissions and improving fleet efficiency.



Hong Kong's Mass Transit Railway (MTR)

The MTR is considered a regional role model in the Asian rail industry, and for good reason: it carries 5.6 million passengers every weekday and runs services every 1.9 minutes during rush hour on its busiest line, and does this all with an on-time performance record of 99.9%.

The secret? An AI that encodes all of MTR's safety rules and regulations and Hong Kong's statutory requirements plus experienced, knowledgeable human engineers. The result? MTR has since saved HK$800,000 a year since the AI Engine was introduced.

"***The AI Engine*** uses a scheduling algorithm that maximises the amount of engineering works that can be done using available MTR resources, such as personnel, equipment, space, and time. This allows MTR to do more with less," said Andy Chun, the AI Engine's designer and a City University of Hong Kong associate professor.

Verkehrsbetriebe Schaffhausen (VBSH)

The transport authority of Swiss canton Schaffhausen, VBSH, has collaborated with Trapeze, its sister company ***AMoTech*** and the Canton of Schaffhausen's Regional Development Agency to form the mobility laboratory, the ***Swiss Transit Lab***. Here, VBSH and Trapeze have been ***running tests*** on an autonomous vehicle with the aim of integrating it into VBSH's public transport operations control system.

This autonomous vehicle, an 11-seater nicknamed Trapizio, ***made its debut*** as a public transport vehicle in the town centre of Neuhausen am Rheinfall in March 2018. Trapizio travels in mixed traffic with regular vehicles and members of the public can use it for transit. A trained VBSH attendant will be on board during services initially, but the aim is to eventually reach Stage 5 of autonomous mobility, where no human supervision is required.

VBSH is certainly proof that being ***a small organisation*** does not mean you cannot dream big when it comes to technological advancements and innovating. Christoph Schärrer, a Schaffhausen government delegate, said the future is looking bright for them: "Schaffhausen is set to develop into a centre of competence for mobility solutions of the future."

Interested in autonomous vehicles?
You might like this whitepaper:

Bus Operations in the Autonomous World

PREPARING FOR THE AI FUTURE

Injecting AI into your operations will soon no longer be the domain of large multinationals or big budget authorities alone. While AI and its associated technologies currently come at a premium price, it will only be a matter of time before these innovations become more accessible: think of how creating a website with eCommerce capability was costly and difficult for most companies 20 years ago, but is now commonplace.

Forward-looking transit organisations will already be thinking about how AI will affect their people, processes and systems and what they can do to maximise its benefits. They would be doing this regardless of whether the actual implementations take place next year or next decade.

One place any public transport agency can start is by ***increasing their business intelligence*** quotient: AI needs vast amounts of good quality data to thrive, so to make the most of it in the future you need to be capturing this data now. Start by putting sustainable data management processes in place and implementing suitable systems to ensure this data is retrievable, analysable and well organised.

Regardless of whether you are as large as Transport for London or as small as Verkehrsbetriebe Schaffhausen, it pays to be prepared for the looming AI revolution.

Want to know more about this? Read

AI and the Public Transport Workforce

Trapeze Group works with public transport agencies and their communities to develop and deliver smarter, more effective public transport solutions. For more than 25 years, Trapeze has been here for the journey, evolving with our customers around the world to help them move people from point A to Z, and everywhere in between.

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