Practical Uses of AI to Increase Transport Patronage

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simplerchange

A Brief Intro to AI

AI is not new

The idea of creating intelligent machines predates the modern era…

But it will revolutionise our world

Just like the steam engine was the division line before and the after on industrialisation, Chat GPT will be the division between before and after AI…

AI is not magical

Although for those of you actively using Chat GPT it may look like it…

Let me introduce Lucy, a human…

In simple terms, and if you ignore religion, a human is a collection of senses, a brain to process it all, and a bunch of muscles, bones and tendons for movement.

Hearing

Sight

Smell

Taste

Touch

Cognitive Intelligence

Body Awareness

Muscles, bones and tendons for movement

So, let me now introduce e-Lucy, an AI…

In simple terms, AI is a collection of electronic senses, a computer brain to process it all, and a bunch of metal and plastic for movement.

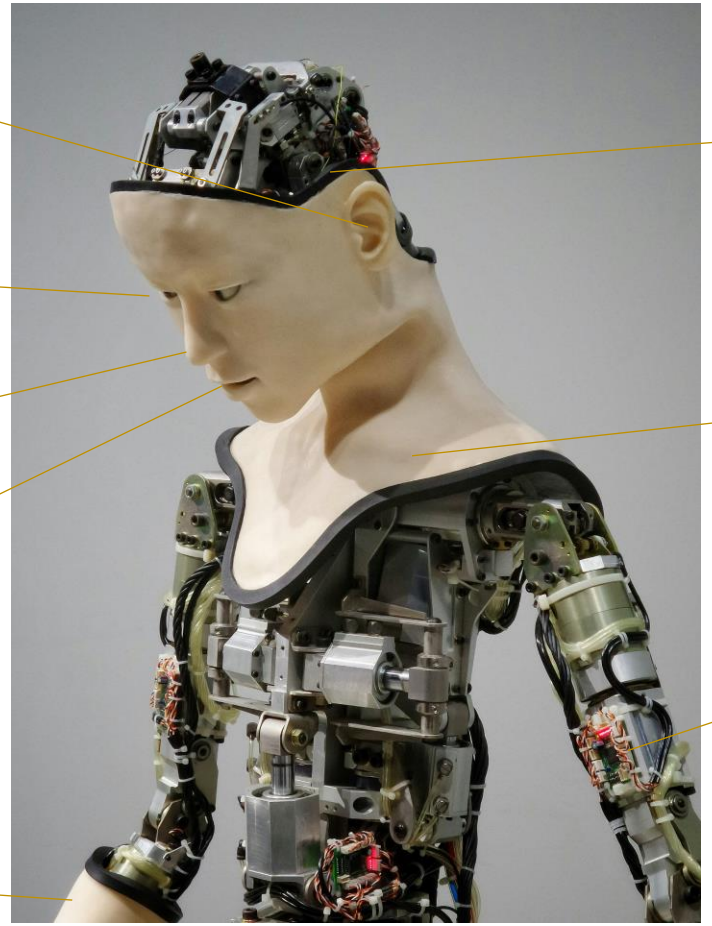
Computer Audio

Computer Vision

E-Nose

E-Tongue

Tactile Sensors



Cognitive Intelligence (Higher Processing)

Gyroscopes and Accelerometers

Robotics

Synthetic biology is round the corner…

Synthetic biology is an interdisciplinary field of science that involves the design and construction of new biological parts, devices, and systems, as well as the re-design of existing natural biological systems for useful purposes. Essentially, synthetic biology seeks to merge biology with engineering.

https://scientificorigin.com/what-is-synthetic-biology-and-how-does-it-work

And just like humans, they suffer from illnesses…

Data Poisoning

Prompt Injection

Membership Inference Attacks (MIA)

Perturbation Attacks

Model Theft (Exfiltration)

Adversarial Reprogramming

Model Inversion

AI-Powered Malware & Evasion

Data Drift

Automated Social Engineering & Deepfakes

AI Hallucinations

So, in essence…

The best way to understand **Artificial Intelligence** and its uses in real life, is not as a vague concept, but as an **Artificial Super-Human** (soon to be a physical robot), with superpowers, but the mentality of a toddler.

Let’s see a few uses…

Computer Vision…

AI Computer Vision can prove very useful. A few case studies…

Passenger Counting and Monitoring

Passenger Counting and Monitoring starts from a wish: “I wish I could count the number of passengers boarding and alighting in real-time, as I could improve my service design, leading to service efficiency, money savings and increase customer satisfaction through more adequate frequency of service”.

Crowd Management

Worried about monitoring crowd density at stations, platforms, or inside vehicles?

Cameras and AI models can detect crowded areas, estimate people density and send alerts to operators, managers or authorities that can then manage foot traffic or deploy additional vehicles, enhancing passenger safety and comfort.

Suicide Prevention

Unfortunately, suicides happen. And they tend to follow a pattern that can be recognised by AI using footage and algorithms. A suspicious passenger at the end of a platform? With computer vision in place, AI can ‘understand’ the situation, decide that an incident may be about to happen, and trigger an alarm to station staff that can rush to help.

LIDAR

LIDAR (Light Detection and Ranging) is a technology that uses laser light to measure distances and create detailed 3D maps of an area.

- Traffic Flow Analysis and Signal Prioritisation
- Design of Routes
- Infrastructure Monitoring
- Pollution Control

Computer Audio…

AI Computer Audio can prove very useful. A few case studies…

Voice Controlled Systems

Let's face it. Ticketing kiosks are not always particularly user friendly. But this could easily be changed by allowing passengers to interact with ticketing kiosks using voice commands. A passenger can say, "One ticket to downtown," and the system will process the request and issue the ticket instead of navigating menus. This would also enhance accessibility for visually impaired users.

Multilingual Support

One of my favourites: systems can translate and deliver announcements in multiple languages using speech recognition and synthesis. A traveller can ask for directions in Spanish, with the system providing audio guidance in their language.

Visual or Hearing Impaired

AI-powered kiosks or mobile apps can provide real-time travel information via voice interaction, improving user experience and assisting non-tech-savvy or elderly passengers. AI can use speech synthesis to guide passengers to platforms or exits, providing audio cues to visually impaired passengers, helping them navigate stations or vehicles.

Language Processing for Customer Support

AI chatbots can provide real-time answers to schedule questions or ticketing issues in multiple languages, improving accessibility and customer satisfaction.

Electronic Nose (e-nose)…

AI E-Nose can prove very useful. A few case studies…

Air Quality Monitoring

Sensors installed in buses, trains, train stations, or even the street, can detect pollutants, CO2 levels, and other harmful gases and decide if there is a need for activating ventilation, air purification, or to trigger an alarm.

Identify Hazardous Materials

Ever wondered why sometimes we are stopped in airports and swept with a small cloth that then goes into a machine? Airports use a form of e-nose combined with AI to detect hazardous chemicals, explosives, or flammable substances in luggage or passengers

Waste and Odour Management

Worried about unpleasant odour in public transport carriages, toilets or garbage disposal areas? E-noses can monitor restroom these facilities and notify staff when odours exceed acceptable levels. AI could even design a solution to design the right scent to create a pleasant environment in passenger areas

Alcohol and Drugs

Worried about alcohol or drugs? Need to monitor food or alcohol-free areas? E-noses can also monitor environment looking for food odours, alcohol or drug odours in areas where these are prohibited, or on passengers or drivers

Electronic Taste (e-tongue)…

AI E-Tongue can prove very useful. A few case studies…

Spill and Contamination Detection

Similarly, it can help analyse chemical spills or unusual substances in public areas or public transport vehicles, looking for acidic, basic, or contaminated liquids spilled in buses, trains, or stations.

Food and Beverage Quality Monitoring

Serving food and beverages on public transport like long distance trains and worried about how to test the quality of onboard food and beverages? E-tongues can detect spoilage or contamination in food items, preventing foodborne illnesses and maintaining high standards of service.

Innovative Food Services

E-tongue can play a valuable role in creating new food dishes by providing precise, data-driven insights into flavour profiles, ingredient interactions, and overall taste balance. E-tongue can break down the flavours of existing dishes into measurable components, such as sweetness, bitterness, umami, saltiness, and sourness. Through customer feedback, it can propose new flavours.

Public Health Monitoring

E-tongue can detect harmful substances in passenger environments, by analysing substances spilled or present in restrooms or seating areas for potential health risks and trigger an alert to maintenance or security.

Similarly, E-tongue can monitor the quality of drinking water provided in public transport systems by analysing water for pH levels, contaminants, or unusual taste profiles

Tactile Sensors…

AI Tactile Sensors can prove very useful. A few case studies…

Accessible Interface for Visually Impaired

Braille touch panels and tactile feedback systems can enable visually impaired passengers to interact with transport interfaces. For example, ticket vending machines or navigation kiosks can include Braille and haptic1 feedback for input confirmation.

Haptic Feedback

Haptic cues can be included on a wristband or a mobile phone to help passengers find their platform or bus location by vibrating at key points.

Enhanced Driver Assistance Systems

Already used on cars, tactile feedback mechanisms can alert drivers, by vibrating haptics on the steering wheel vibrates when the driver drifts out of a lane or fails to notice an obstacle.

Touch-Responsive Ticketing Machines

Ticketing kiosks and machines equipped with tactile sensors can respond to touch input for ticket purchases or information, detecting pressure and adjust sensitivity for accurate inputs.

Body Awareness…

AI Body Awareness can prove very useful. A few case studies…

Collision Avoidance Systems

Already used in high end cars, ultrasonic or radar sensors on buses or trams can detect the relative position of the vehicle in relation to other nearby vehicles or obstacles, such as pedestrians, or cyclists. Collision avoidance systems can determine whether they are in too close proximity and trigger automatic breaking if necessary, reporting the situation for future learning.

Platform Alignment Assistance

Sensors in trains can measure their position relative to the platform and adjust as needed for safe boarding.

Suspension and Comfort Monitoring

Motion sensors in buses detect uneven surfaces and dynamically adjust suspension to minimize jostling.

The ‘red button’

For those out there scared of the ‘red button’ on buses (will I alight at the wrong stop?), a ‘virtual stop request’ can be used to provide haptic feedback to passengers, signal that the next stop is their stop.

Cognitive Intelligence…

Cognitive Intelligence can prove very useful. A few case studies…

Route Optimisation and Scheduling

AI models can analyse traffic patterns, passenger demand, and operational constraints and through predictive algorithms, dynamically adjust bus or train schedules during rush hours or delays, minimising waiting times and improving efficiency.

Dynamic Pricing Systems

Machine learning algorithms can adjust fares in real time based on demand, time of day, or route popularity, helping balances demand and encouraging off-peak travel.

Disaster and Emergency Planning

AI can support simulations of various disaster scenarios to plan evacuation and recovery strategies, like modelling the impact of floods or storms on the railways, enhancing resilience and preparedness for emergencies.

Personalised Recommendations

In 2025 we are used to have personalised experiences (e.g., Netflix). Humans are driven by different criteria: some want speed, some comfort, some cost, even health or the environment. AI can deliver tailored travel recommendations to passengers, learning about their behaviours and patters and offering alternate routes or less crowded buses based on passenger preferences and habits.

Motor Controls…

Motor Controls (Robotics) can prove very useful. A few case studies…

Automated Cleaning Robots

Own a Roomba? Robotic systems clean stations, buses, and train compartments autonomously.

Baggage Handling and Delivery

Motorised baggage robots can follow passengers to their destinations within airports or large stations, reducing strain on passengers and speeding up movement through transit hubs.

Dynamic Signage and Wayfinding

Mobile robots can guide passengers to platforms, exits, or other areas, moving dynamically within stations, pointing passengers toward their destinations using screens and motorised gestures

Crowd Control Robots

Robots with motorised systems manage crowd flow during peak hours or events, Mobile robots could use gestures, lights, and voice commands to direct passengers or form temporary barriers, preventing overcrowding and enhancing passenger safety.

The AI Recipe…

Great Curious Hunger (The Need)

- Clearly Define Objectives

Great Ingredients (The Data)

- Evaluate your data
- Cleanse your data

A Great Cook (Change Management)

- Start Small with Pilot Projects
- Leverage Existing AI Tools
- Focus on Change Management
- Appoint a professional team
- Invest on infrastructure
- Prioritise Ethics and Transparency
- Use **Machine Learning** to improve the models

For more detail, or a copy of our white paper please contact us

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