

# Exploiting Artificial Intelligence (AI) In Singapore Land Transport Authority

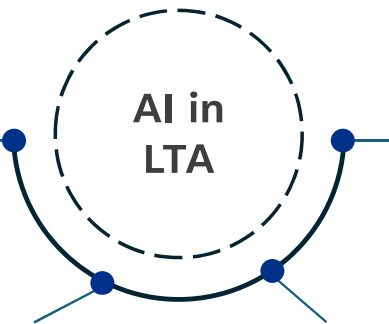
# Potential and Opportunities for AI in LTA

Recent advancement in AI/Gen AI provides tremendous opportunity for LTA to improve operations, decision making, service delivery, and productivity, while mindful of the potential pitfalls and risks

## Potential



**Roads & Traffic**  
sensors to improve traffic ops, traffic prediction models



**Engineering and Construction**  
Computer Vision to improve inspection and construction safety



**Rail Operations**  
Common data platform for condition monitoring and pre-emptive maintenance



**Bus**  
AIML to predict bus arrival times with enhanced accuracy

## Pitfall

### AI Safety and Risks



**Biases and Hallucinations**  
AI models could exhibit biased behaviour or absurd results



**Security vulnerabilities**  
Without safeguards, cybersecurity risk such as prompt injection



**Data Leak / IP**  
Personal / confidential information may be divulged to AI and Infringement of IP



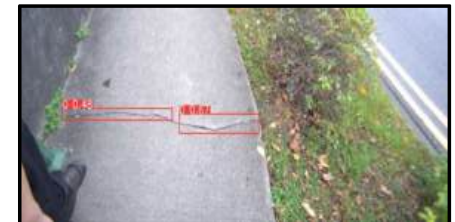
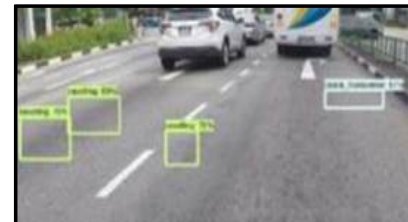
# Automating road defect detection through AI

**TARGET VALUE** : Reduce **30%** labour required for road and commuter infrastructure inspection; **reduce costs**

**APPROACH** : Replace human inspection with drive-thru camera detection (video analytics) of road and commuter infrastructure defects

- **Streamlined workflow** where defects and GPS locations are automatically collated to report
- **Human-in-the-loop to review report** before authorizing rectification works
- **Mitigates post-COVID 19 labour crunch**

**STATUS / LEARNING POINTS** : **Project in progress.** Some defects not picked up (~85% accuracy); Continue to improve model accuracy and reduce reliance on **human judgement**



# Easier viaduct bearing inspection through AI

**TARGET VALUE** : Reduce **50%** manpower and **75%** inspection time, while improving safety

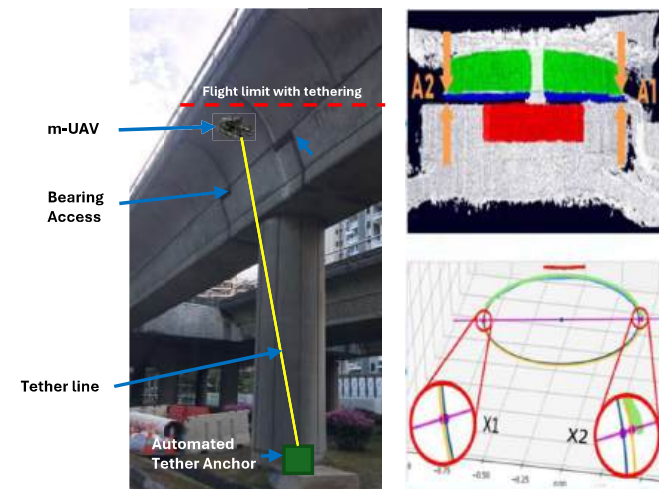
**APPROACH** : Use **drones** to capture viaduct bearing images and convert to 3D models where **video analytics** extracts **measurement features** for deformation measurement

- **No need** to set up cherry picker and for workers to **work-from-height**
- 3D models provide more **consistent measurement** relative to human judgement

**STATUS / LEARNING POINTS** : **Project Completed.** Adoption by **Public Transport Operators (PTOs)** in progress.



Before



After



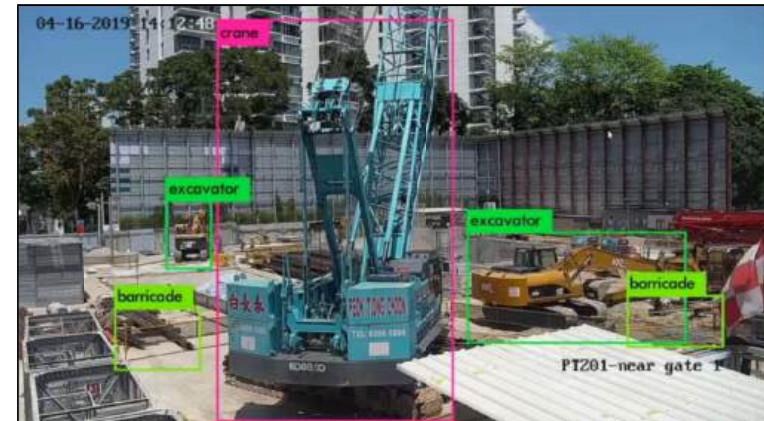
## Safer construction sites through AI

**TARGET VALUE** : Greater oversight of construction site safety with fewer manpower resources

**APPROACH** : Combination of cameras and **video analytics** to detect **high-risk activities** at work sites.

- Examples include pedestrian intrusion into vehicular access, safe working at height, safe working near machinery and facial recognition for authorised and competent workforce
- **Triggers real-time alerts** to persons-in-charge

**STATUS / LEARNING POINTS** : **Project in progress.** Services currently provided by **different contractors, with varying performance.** Potential to develop internal capabilities and models for consistent performance.



## More efficient traffic monitoring through AI

**TARGET VALUE** : More efficient way of detecting adverse traffic conditions for prompt mitigation.

**APPROACH** : Using video analytics on the North-South Corridor project's centralised monitoring platform (where all the site CCTVs are centralised) to not only detect safety non compliances, but also traffic anomalies.

- Examples includes **traffic congestion** and **illegal parking**.
- System sends out **timely alerts** to telegram group.
- **Prompt interventions** can be carried out by individual teams.

**STATUS / LEARNING POINTS** : Project in progress. **Accurate detection** requires the setting of **right parameters** based on **site conditions**. Users to **maintain** the **preset vantage** for the CCTVs. **Any changes** to the CCTV view requires **resetting** of the **region of interest (ROI)**.



# Ensuring lane closure compliance through AI

**TARGET VALUE** : To reduce occurrence of traffic congestion caused by late opening of lane closure

**APPROACH** : Using video analytics on the North-South Corridor project's centralised monitoring platform to detect late lane closure opening.

- **System sends out alerts** to the telegram group when the lane is not opened beyond the stipulated time.
- The **threshold time** set can be adjusted according to the type of work.
- **Early interventions** can then be carried out by the individual teams.

**STATUS / LEARNING POINTS** : Trial in progress. Accurate detection requires the preset vantage for the CCTVs to be maintained. More model training is required to improve detection accuracy.



## Effective way to detect jaywalking through AI

**TARGET VALUE** : To detect and reduce the occurrence of jaywalking.

**APPROACH** : Using video analytics on the North-South Corridor project's centralised monitoring platform to detect jaywalking on site.

- System sends out alerts to telegram group when jaywalking is detected.
- Based on the alerts, personnel that jaywalked can be **identified** and penalised. This will serve as a deterrence to others as well.

**STATUS / LEARNING POINTS** : Trial in progress. More model training is required to improve detection accuracy as motorcyclists are sometimes wrongly identified as jaywalkers.





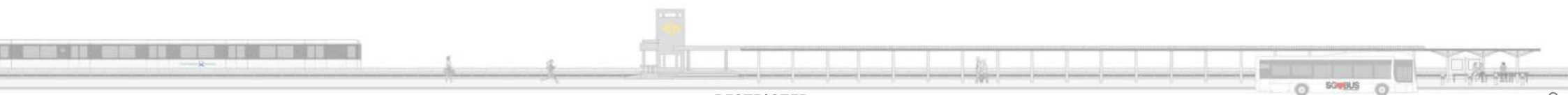
# Enhanced measures for traffic diversion through AI

**TARGET VALUE** : To provide real-time travel information for motorists to make informed decision on the travel routes in advance.

**APPROACH** : Smart VMS (solar powered) will display travel time to the pre-determined destination via the major arterials such as Thomson Road and Marymount Road, as well as alternative routes.

- Using third party data (travel time) to determine estimated travel time through different travel routes.
- Currently 7 nos of Smart VMS are deployed on site.

**STATUS / LEARNING POINTS** : Project in progress. Correct geo-referencing of the routes is essential to ensure that the travel data is accurate.



# Active Mobility Enforcement through AI

**TARGET VALUE** : Improve violation detection by up to **300%**, able to carry out constant enforcement across larger geographical area with fewer manpower resources

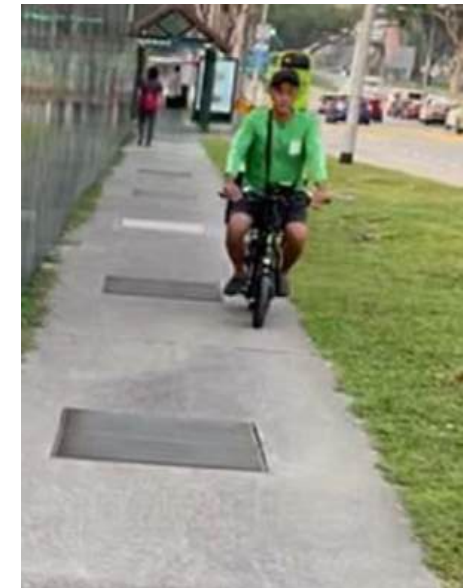
**APPROACH** : Mobile CCTVs with **video analytics** to identify active mobility (AM) violations at potential hotspots

- Automatically triggers violation to persons-in-charge for further investigation
- Expands LTA's ability to cover large numbers of potential hotspots

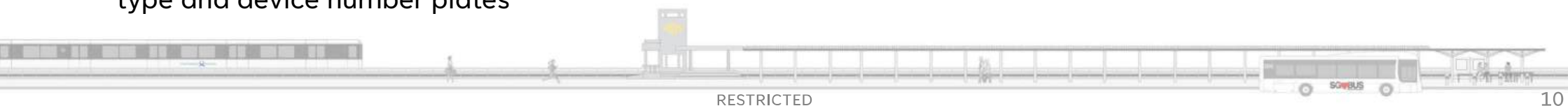
**STATUS / LEARNING POINTS** : **Project in progress**, More data / training is required to detect AM device type and device number plates



Mobile CCTVs



Example:  
Violation of using Power-Assisted Bike on footpath



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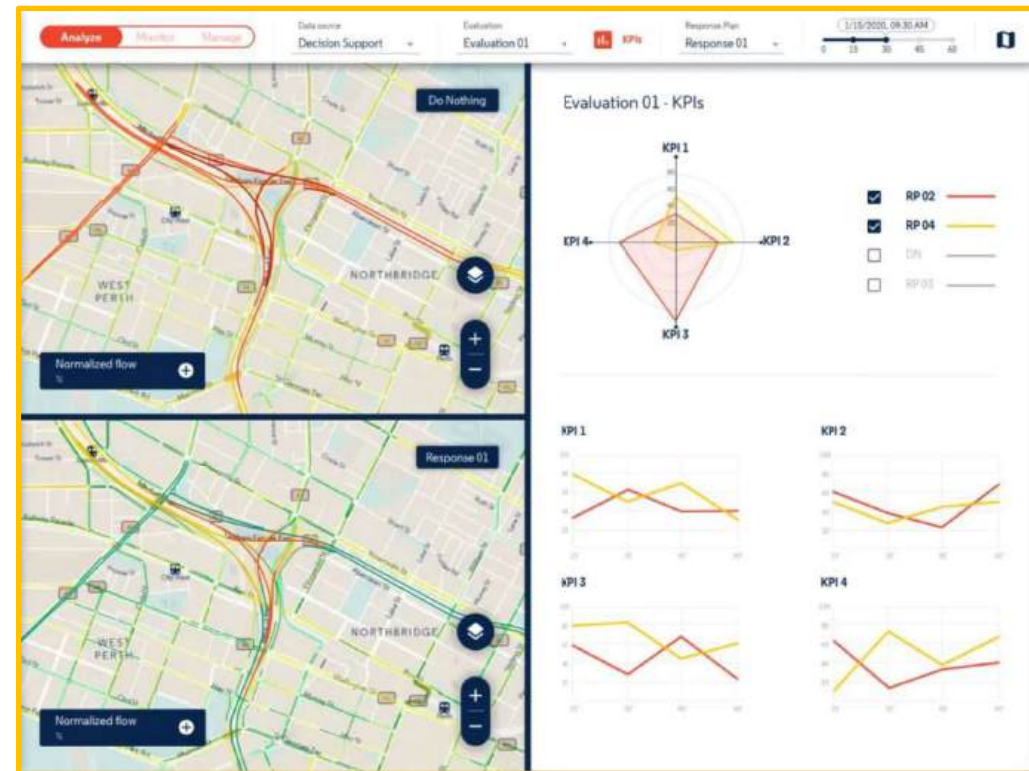
# Traffic Prediction & Simulation through AI

**TARGET VALUE :** Better Traffic and Incident Management

**APPROACH:** Harness the potential of Digital Twin with traffic prediction and simulation capabilities to:

- Use machine learning to **predict traffic congestion**
- Run concurrent traffic simulations on multiple what-if scenarios for **optimal traffic response plan**
- **Improve** OCC workflows with data-driven decision support

**STATUS / LEARNING POINTS:** Project scoping in progress. Leveraging on road pricing and other **Intelligent Transport System (ITS) data**, the traffic model can be continually refined to maintain its relevance and enhance its prediction quality.



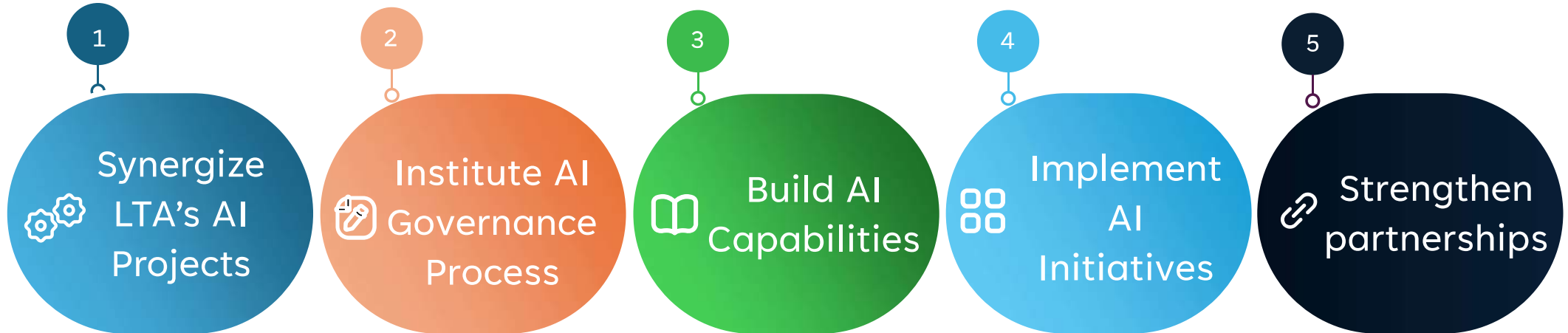
# Desired Outcomes

Improved  
Productivity

Operational  
Efficiency

Better Service  
Delivery

Driven by newly setup LTA's AI Office  
through 5 key focus areas



# Thank You

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