CAPAX TECHNOLOGY LIMITED

Deep Technology Enabler

Mar 2025

Agenda

01 Who We Are

02 What We Do

03 Business Cases (Government-Focused)

- E-Inspection Solution
  - EMSD (Lift & Escalator)
  - Airport (Airfield Ground Lighting System)
  - FEHD (Food and Non-Food License)
- Smart Traffic Solution
  - TD (Annual Traffic Census)
  - Hospital (Ambulance)
  - EPD (Car Plate)
- Smart Building Solution
  - EMSD (AI Platform for E&M Diagram)
  - EMSD (Chiller Plant Optimization)
- Site Safety Solution
  - EPD (Drone and Landfill Monitoring)

01 Who We Are

Our History

Our journey began in 2011 when Master Dynamic Ltd. (MD), a R&D focused company, was formed. MD and its group company have developed various deep technology and solutions that are commercialized and implemented in the Smart City, Healthcare, Luxury goods, and Retail industry. Our development process is different than others as it involves integration of industry domain knowledge (from customers and industry experts) into our solutions. This allows our engineers to learn relevant industry knowledge. Capax was established as a spin-off from MD in 2021 to provide technology and solutions to both public and private sectors

R&D focused, developing various deep technology including

- ✓ A.I. & Automation
- ✓ Biotechnology
- ✓ Nanotechnology
- ✓ Quantum Technology
- ✓ Material Analysis
- ✓ Precision Engineering

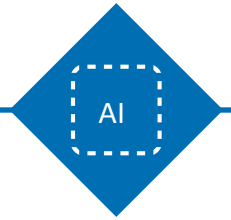
- Over 100 granted invention patents
- Our technology/solutions help customers generated over USD 1 Billion sales revenue since 2017
- Developed technology has won 46th Geneva International Exhibition of Inventions gold medal award

Further the technology development and create technical solutions for Smart Building/City, Process Automation and Traceability applications

- ✓ A.I & Automation
- ✓ Blockchain & Traceability
- ✓ Computer Vision
- ✓ Data Analytics
- ✓ IoT Device
- ✓ SaaS Solutions

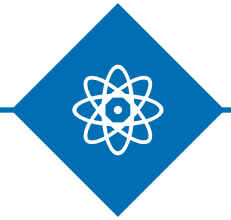
- 3 invention patents (pending)
- Developed technology has won Nvidia's A.I. Image Recognition Competition and HK Smart Transportation Challenge champion

Our Technology Pillars



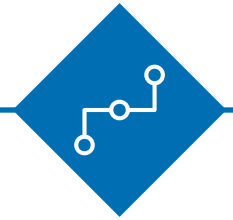
Hybrid AI

- Integrate industry domain knowledge & engineering knowhow into AI training with more meaningful outcome
- Analyze customer data and provide insightful analysis and predictions for different industries
- Successfully created world leading AI analytics engine for Diamond industry and Smart City



Automation

- Utilize AI, process improvement and software to automate business and operation process
- Real time monitoring and alert
- Enhance accuracy, efficiency and productivity, and reduce human error
- Automate data recording, analysis and reporting process for government and Smart City industry



Blockchain Traceability

- Our Blockchain based traceability platform can digitize, track, and trace business process or lifecycle of an asset for automation, process improvement and traceability applications
- Platform is Blockchain Smart Contract enabled

IoT Technology

- Develop sensors, RFID, NFC empowered IoT devices for data collection and integration throughout the value chain
- Analyze collected data for consumer preference, behaviour analysis and predictions, staff performance tracking and product allotment strategy

Our Management Team

Extensive Experience in Product Commercialization and Technology Development

Mr. Patrick Zee

Managing Director

- 20+ years experience in private equity investments/developments
- 7+ years in business advisory, including strategic planning, management consulting, and process implementation, etc.
- CFA and CMA

Ms. Rosanna Man

Chief Technology Officer

- 20+ years experience in software development, and expert in big data analytics and scalable web applications
- 10 years of hands-on experience in Silicon Valley involving 2 startups being acquired by listed companies
- MS of Computer Science from Stanford University, MBA from Carnegie Mellon University

Mr. Andy Tsang

Director, AI Technology

- 7+ years experience in AI analytics, Web portal, backend system and mobile apps development
- 7+ years startup development experience
- Assistant Dean, School of A.I.
- 2+ patents and publication owner on AI & Robotics related aspects

Ms. Ashley Cheung

Director, BD & PM

- 7+ years experience in managing SaaS platform, web and mobile apps development, corporate and retail banks' digital transformation projects
- IT consultancy at banking projects such as Payme, Faster Payment
- PMI-ACP (Agile Certified Practitioner)

Our Key Clients & Business Partners

Government Departments · Reputable Industry Experts

周大福 CHOW TAI FOOK
機電工程署 EMSD
環境保護署 Environmental Protection Department
香港特別行政區政府 食物環境衞生署
運輸署 Transport Department
周生生 Chow Sang Sang
ARUP
基督教聯合醫院 UNITED CHRISTIAN HOSPITAL
香港國際機場 HONG KONG INTERNATIONAL AIRPORT
香港科技園 HKSTP
AXA
WSP
弘海策略 OCEANUS STRATEGIC
VTC
CONSTRUCTION INDUSTRY COUNCIL 建造業議會
中国平安 PING AN
Schindler
新世界發展有限公司 New World Development Company Limited
循道衛理楊震社會服務處 YANG MEMORIAL METHODIST SOCIAL SERVICE

Why Capax?

Proven capabilities in industry and public recognition

1

Champion – AI in Image Recognition Challenge 2020

- Organizer: Nvidia & HKSTP
- Challenge Highlight:
  - Best engine accuracy and fastest response time among 15+ contestants
  - Best AI recognition algorithm

2

Champion – AI in Smart Transportation 2021

- Organizer: TD, LD, Esri, MTR, KMB, HKU etc.
- Challenge Highlight:
  - Best innovative technical solutions among 30+worldwide contestants
  - Best AI Analysis performance of HKSTP's traffic

3

Official Endorsements 2022

- Successful Application of Hong Kong Short Term Patent (July 2022)
- Successful Publication of Paper IEEE Blockchain 2022 Conference in Finland (August 2022)
- **Highlighted as key KPI in Chief Executive's 2022 Policy Address Initiatives**

4

Silver Award in OGCIO's Smart Government Innovation Lab's AI Competition 2024

- Organizer: OGCIO
- Challenge Highlight:
  - Best innovative AI solutions among all government I&T solutions
  - Best AI Analysis performance

02 What We Do

Our Smart Solution

Smart Being

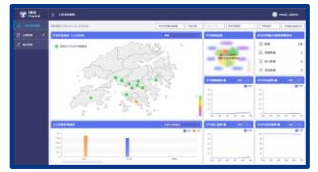
Physiotherapy Analytics

Food & Nutrition Analytics

Smart Building

Trolley Detection

Face Recognition And Demographic Analysis



Digital Logbooks

Smart Governance

Vehicle Analytics

License Plate Number Recognition

Smart Traffic

Our AI Capabilities

Comprehensive AI Computer Vision capabilities in various domains

Smart Living

Physiotherapy Analytics

AI Robotic Dog Analytics

Shopper Analytics

Food & Nutrition Analytics

Face Recognition And Demographic Analysis

Footbridge Pedestrian Analytics

Smart Traffic/Construction

Tipping Hall Cleanliness Detection

Wheel Cleanliness Detection

Ambulance Detection

Refuse Transfer Station (RTS) Safety Detection

Vehicle Analytics

License Plate Number Recognition

Safety and Security

Trolley Detection

Helmet Detection

Abnormal Behaviour Detection

Fall Detection

Wheelchair Detection

Fire Detection

AI Demo Cases

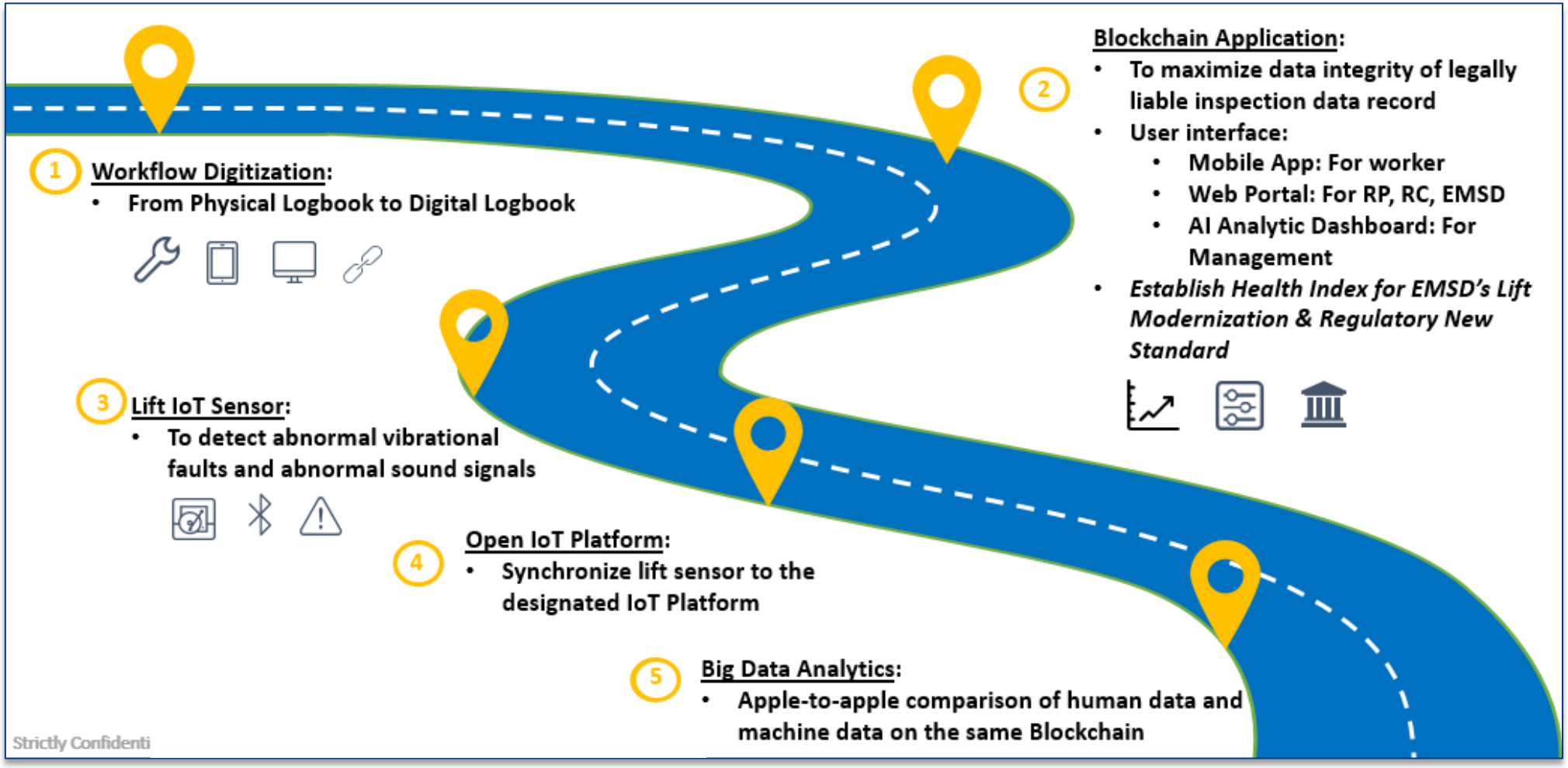
No.	Type	Case	Link
1	AI in Object Detection	Tipping Hall Cleanliness Analytics	https://www.youtube.com/shorts/sRp8MsZmpds
2	AI in Object Detection	Wheel Cleanliness Analytics	https://www.youtube.com/watch?v=ChRMBq4Rx00&ab_channel=CAPAX
3	AI in Object Detection	Shopper Analytics_3D Floor	https://www.youtube.com/shorts/-GuYJtejTeE
4	AI in Object Detection	Vehicle Analytics (Hospital Nearby)	https://www.youtube.com/watch?v=FRihJ-Icjkw&ab_channel=CAPAX
5	AI in Object Detection	Vehicle Analytics (Road)	https://www.youtube.com/watch?v=HC1ebl2QGQA&ab_channel=CAPAX
6	AI in Object Detection	Pedestrian Analytics	https://www.youtube.com/watch?v=T0x4M7-5Wvc&ab_channel=CAPAX
7	AI in Anomaly Detection	Abnormal Behavior in Escalator	https://www.youtube.com/watch?v=jlgb9WtgEjc&ab_channel=CAPAX
8	AI in Posture/Skeleton Analytics	Fall Detection	https://www.youtube.com/watch?v=EtB18N-eWW8&ab_channel=CAPAX
9	AI in Object Detection	Shopper Analytics (Behavior in Shop)	https://www.youtube.com/watch?v=E6U0SEbNO_Y&ab_channel=CAPAX
10	AI in Object Detection	Helmet Analytics	https://www.youtube.com/watch?v=k12nIIUDdng&ab_channel=CAPAX
11	AI in Posture/Skeleton Analytics	Physiotherapy Analytics	https://www.youtube.com/watch?v=zsCHcHWNWQA&ab_channel=CAPAX
12	AI in Facial Recognition	Door Access Analytics	https://www.youtube.com/watch?v=M0adxMtTeF0&ab_channel=CAPAX

03 Business Cases

03.1 E-Inspection Solutions for Lifts & Escalators (Blockchain System & IoT Sensor)

Development Blueprint – *EMSD Digital Logbook Solution*

From ***Zero to Market*** development roadmap: It has been **successfully rollout on 30 Nov 2022**



Note:
- RP: Responsible Person
- RC: Registered Contractor
- RW: Registered Worker
- RE: Registered Engineer

Promotional Video – The Rationale of *EMSD Digital Logbook Solution*

1) E-Inspection System for EMSD – Blockchain Core Solution

ABC (AI, Blockchain, Cloud) in Lift & Escalator Regulatory Implementation

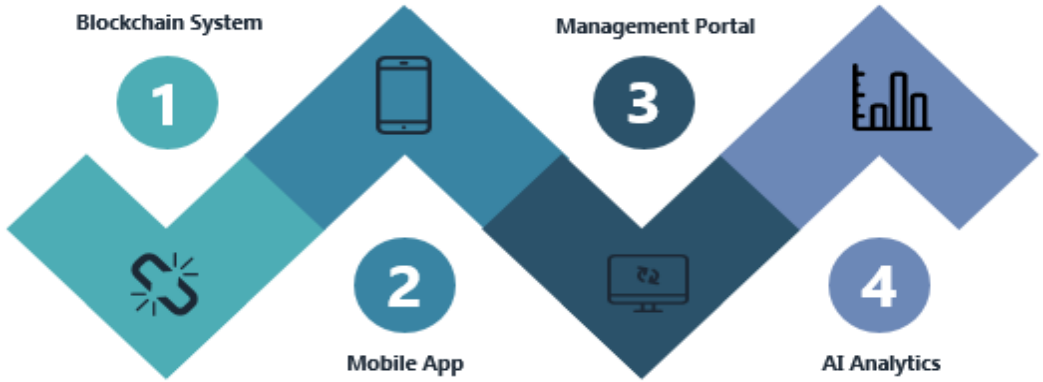
Background

- **Customer** 機電工程署 EMSD
- **Goal:**
  - Revamp existing maintenance logbook of Lift & Escalator from paper-bound to digital version
- **Pain points of Physical Logbook:**
  1) Accuracy: Missing information/uncontrolled amendment/deletion
  2) Availability: Lost / Damage
  3) Legibility: Poor handwritings
  4) Accessibility: Scattered over job sites

Our Solution for EMSD

[Blockchain-Based Digital Logbook System for Lifts & Escalators in HK]

Components



Benefits

Accolades and Recognitions:

Chef Executive's 2022 Policy Address Initiatives:
- Scale: **70,000 Lifts & 10,000 Escalators**
- KPI: **Over 60%** Penetration Rate by End-2024

Patent & Academic Paper:
- Hong Kong Short Term Patent: 32022050656.4 (co-own with EMSD)
- Paper: #1570800130
- IEEE Blockchain 2022 Conference [in Finland]

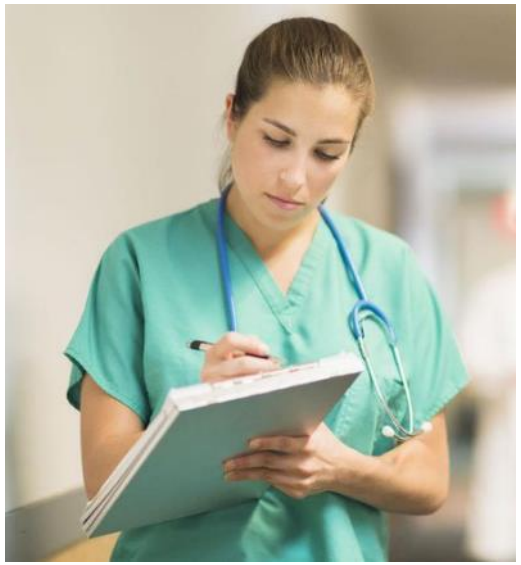
International Competition:
- Bronze Medalist in the 48th International Exhibition Inventions of Geneva (2023)

Blockchain Audit:
- By UST Professor Lei. Chen

Blockchain Technology Business Case

Convenient & User Friendly App
Just a few clicks to complete a precise report

Higher Efficiency



Systematic & Analyzable Records
Preview records anytime, anywhere
Nurture good practice

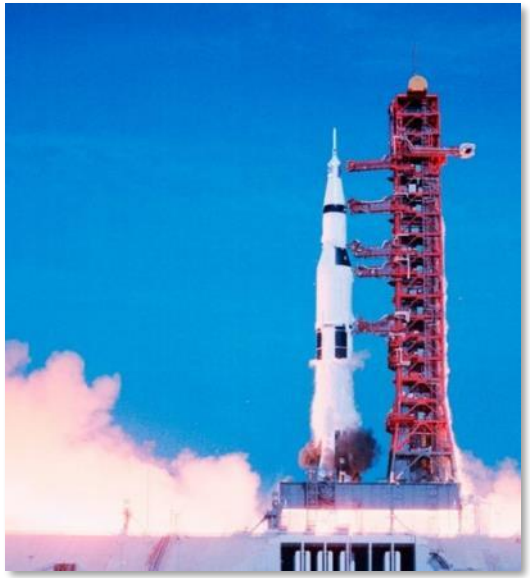
Works Quality Booster

Traceability
Impersonation in filling in log-book and disinformation will disappear

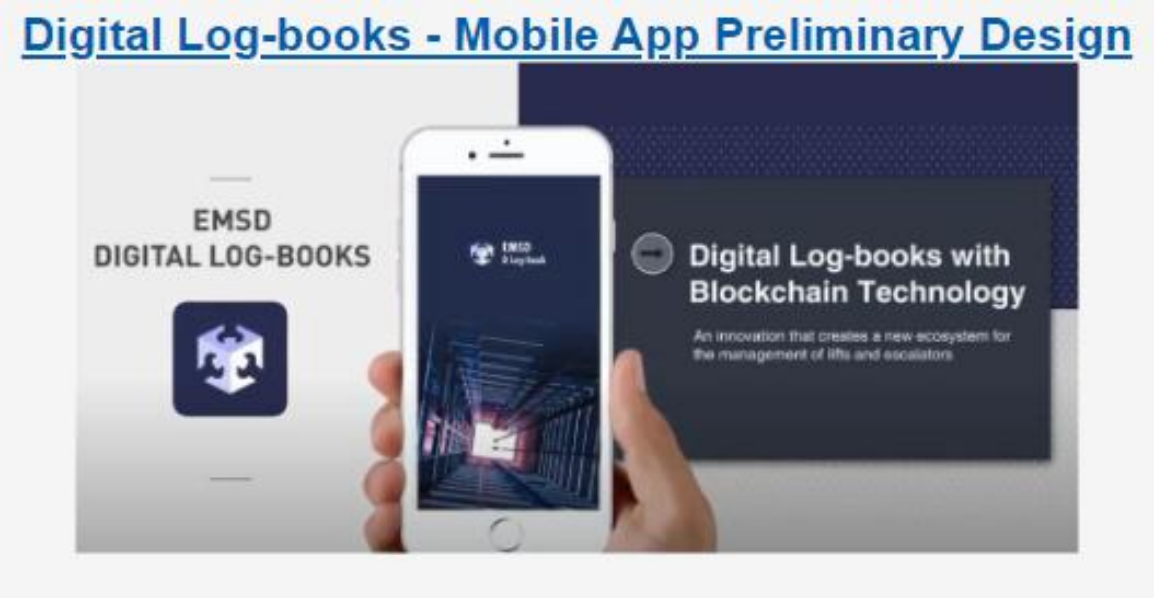
Better Compliance

Pioneer & Role Model In E&M Industry
Help to raise the status and image of lift trade

Improve Trade Image, Attract New Blood



Promotional Video – User Interfaces of *EMSD Digital Logbook Solution*



2) E-Inspection System for EMSD – AIoT Sensor Platform

A-IoT Technology in Lift & Escalator Regulatory Implementation

Background:

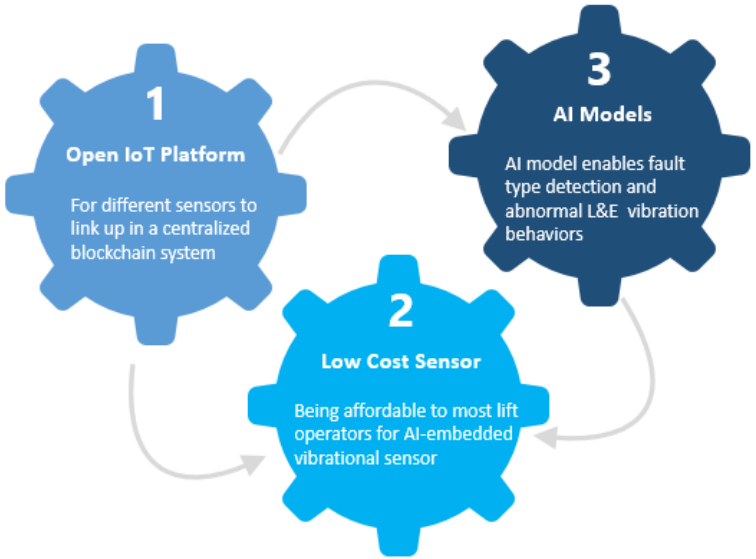
- **Customer** 機電工程署 EMSD
- **Goal:**
  - **Create an AI-enabled IoT sensor for lift fault early detection & an open-IoT-Platform for data sync**
- **Problems of Existing Lift Sensor:**
  1) **Cost: High cost which is unaffordable to the lift owners**
  2) **Installation difficulty: Hard to install as it is usually intrusive to lift's component**
  3) **Limited Parameter: Usually unable to detect abnormal sound**
  4) **Close-Loop IoT-Platform: Usually unable to integrate with multiple sensors**

Our Solution

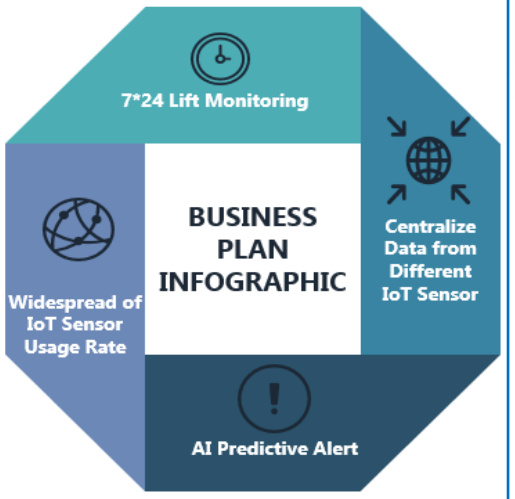
Blockchain-Based Open IoT Platform and A-IoT Sensor for Lifts

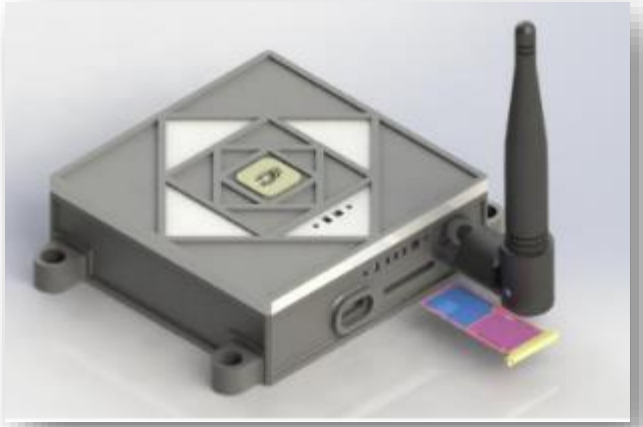
- Allow ***connection*** with all types of registered IoT sensors (from different suppliers);
- ***Synchronize sensor data*** to Digital Logbook Blockchain System
- Enable ***7*24 monitoring & analyzing of lift faults of abnormal vibration & sound***

Components



Benefits

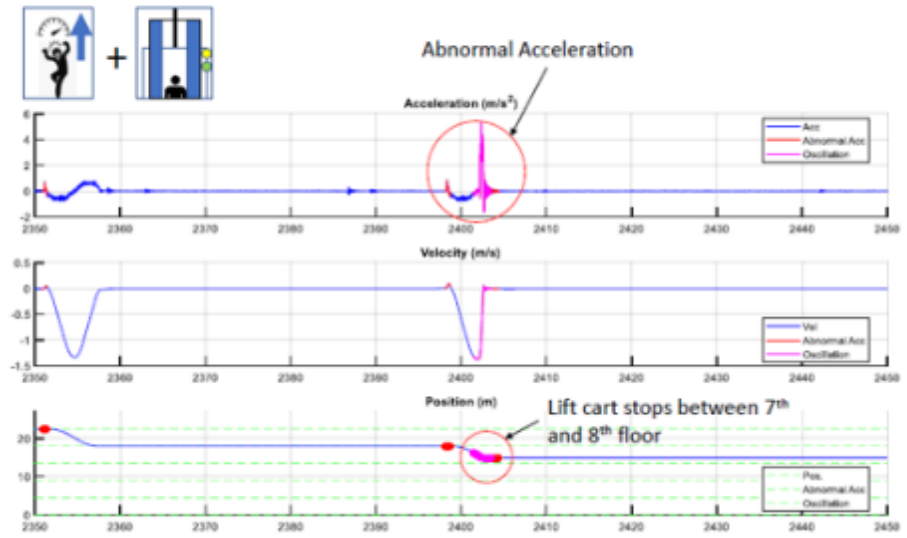




IoT Technology Business Case

Abnormal Vibration Analysis

Abnormal Acceleration + Abnormal Leveling (2/2)

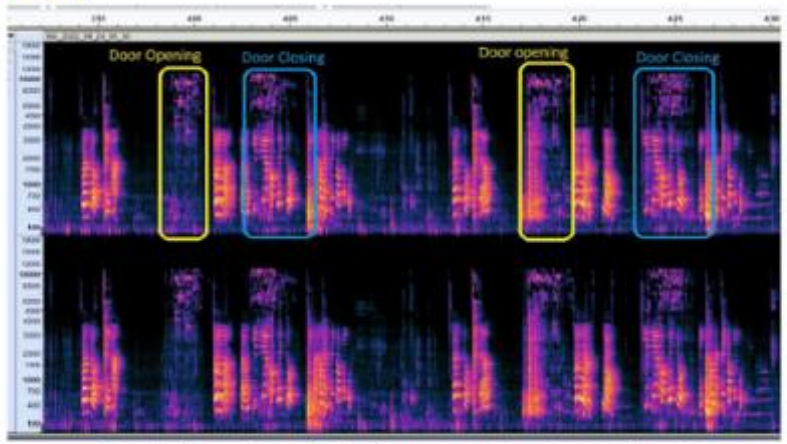


Lift: Kwan Chung VTC Lift 4
Date: 2022-07-19
Time: 11:34am – 12:15am

Abnormal acceleration is triggered in the manual operation of maintenance work, the lift cart is stopped between two floors under the operation, leading to abnormal level fault.

Abnormal Sound Analysis

Abnormal Door Open and Close (Audio Detectable 2)



Sample of sound recording by Capax sensor in spectrogram format

Lift: EMSD HQ No. 11 (0713437-011)
Date: 2022-09-24

The door opening & closing sound recording is clear.

Accuracy of AI recognition in door open/close is over 85%

03.2 | E-Inspection Solutions for Airport (Digitization of Maintenance Operation)

3) E-Inspection System for Airport – Maintenance Inspection Management

Workflow Digitization · Airport System · Inspection System

Situation:

- **Customer:** 香港機場管理局 AIRPORT AUTHORITY HONG KONG
- **Goal:**
  - **Digitize the Airfield Ground Lighting (AGL) corrective / preventive maintenance work inspection flow**
- **Problems of Existing Operation:**
  1) **Filling the existing check sheet by hand is repetitive, time and resource-consuming**
  2) **Human verification on check sheet is required to confirm compliance with specifications that results in low accuracy**
  3) **Existing operation activities (e.g. major changes, software update, equipment replacement) are only recorded in Excel, resulting in incomplete information management**

Our Solution

Intelligence Submission System for AGL System for Airport Authority

Components

Mobile Application

- Maintenance Job Assign & Scheduling Mechanism
- Digitize all Inspection Forms
- Smart Checking Mechanism for Maintenance Validation
- Generation of Maintenance Report
- Support Offline Mode
- Smart Notification Centre

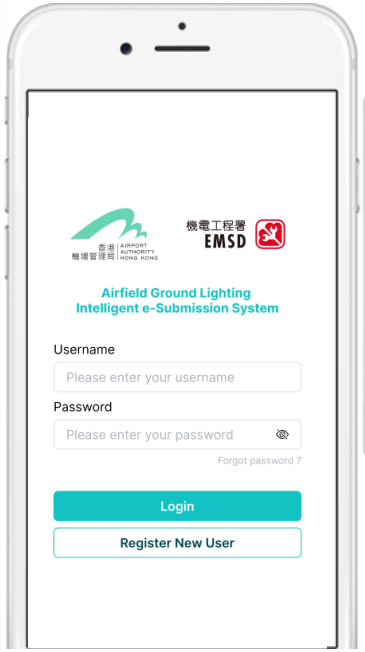
Web Portal

- Endorse and Manage Submitted Schedules/Record
- Perform Dashboard Analytics
- Update Asset Information for Equipment
- Monitor Daily Maintenance Activity
- Edit Maintenance Schedule
- Organize User Account Management

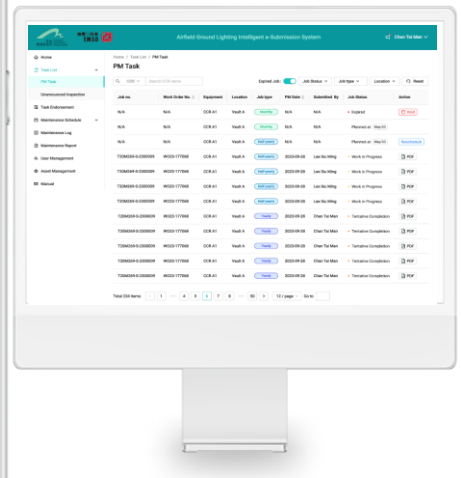
Benefits

S	M	A	R	T
Specific	**Measurable**	**Assignable**	**Replicable**	**Traceable**
The system is specifically designed for airport authority's AGL maintenance system management workflow	Maintenance performance can be quantified and measurable in form of indexing on dashboard	Each job can be assigned to appropriate maintenance contractor	This digital transformation can be replicable to other airport machine operation flow (e.g., APM)	All maintenance records / logs can be traceable in both mobile and web interfaces

Actual Interfaces

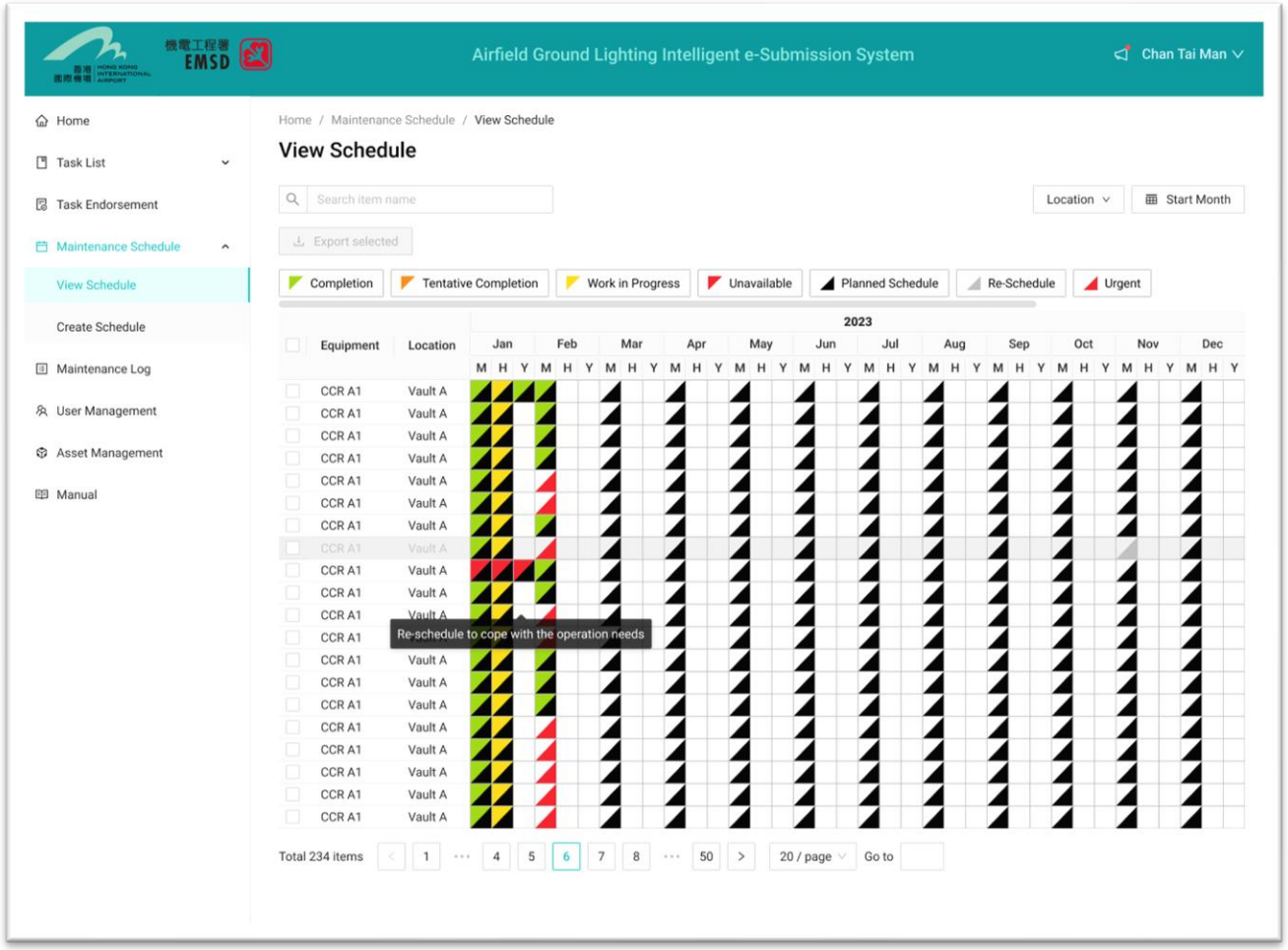


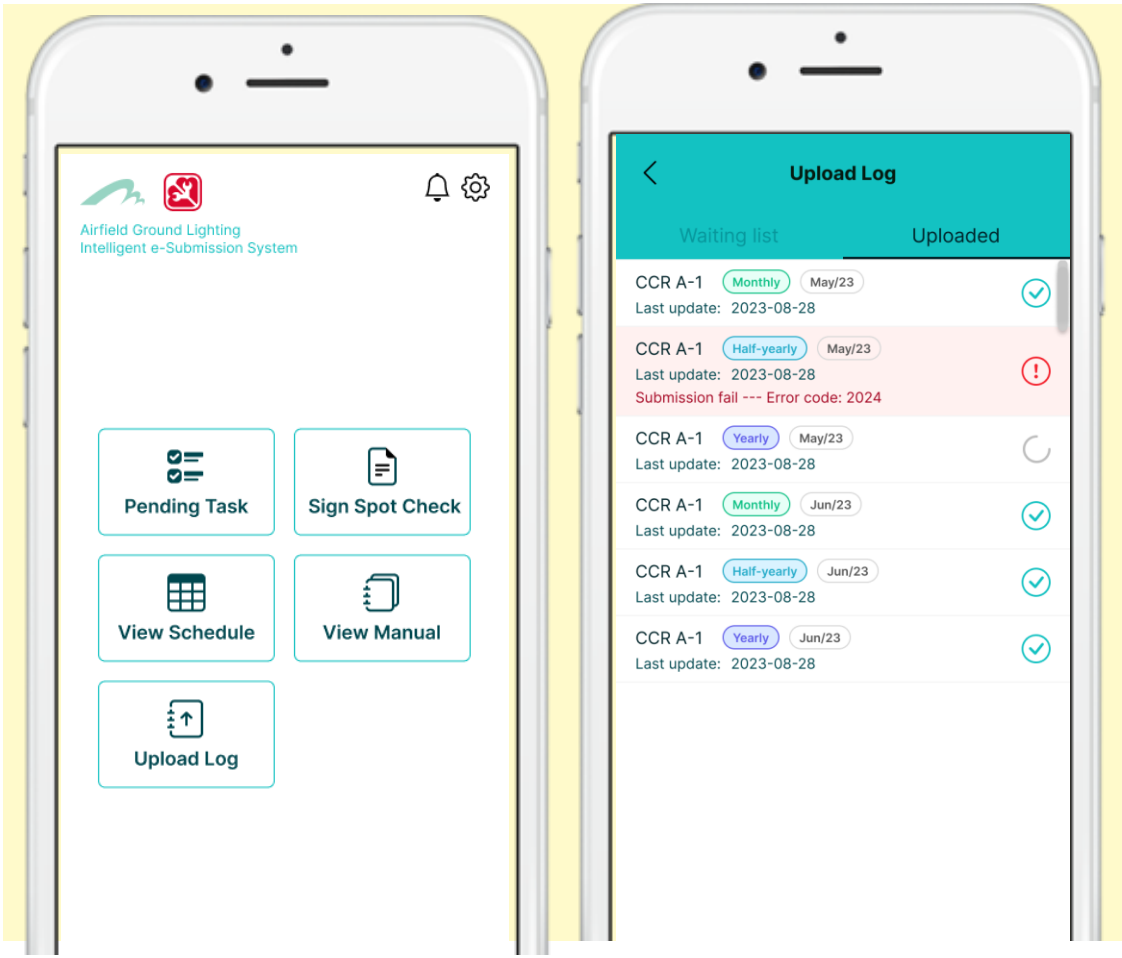
Digital Mobile App



Inspection Management Portal

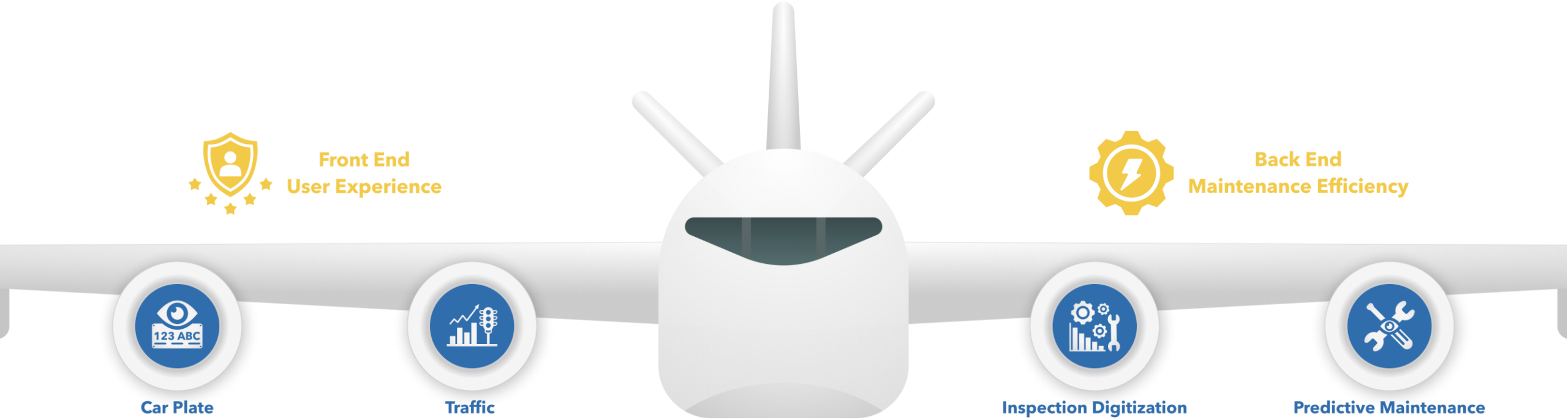
Actual Interface - Business Case





Business Extension – *All Round Airport Digital Transformation*

Enhance ***Frontend User Experience and Backend Maintenance Efficiency***



Front End
User Experience

Back End
Maintenance Efficiency

Car Plate Detection

- Parking lot space management
- Parking lot Security

Traffic Analytics

- Traffic flow management
- 7*24 designated zone monitoring

Inspection Digitization

- Streamline maintenance operation flow
- Traceability of all business processes

Predictive Maintenance

- Abnormal fault prediction
- Efficiency of asset management

03.3 E-Inspection Solutions for Food&Hygiene (Digitization of Licensing Inspection)

4) E-Inspection System for FEHD – Licensing & Inspection Management

Workflow Digitization · Licensing Management · Inspection System

Situation:

- **Customer:** 香港特別行政區政府 食物環境衞生署
- **Goal:**
  - **Digitize the Licensing Management System**
- **Problems of Existing Operation:**
  1) **Filling inspection forms by hand is unclear, time and resource-consuming**
  2) **Arranging inspection schedule by hand results in un-systematic and inaccurate management workflow**
  3) **Existing inspection investigation relies heavily on thick folder of physical papers, resulting in difficulty in traceability**

Our Solution

[Digitization of Licensing Management System for Food, Environment and Hygiene Related Area]

Development in Progress

Actual Interfaces

iPAD

03.4 Smart Traffic Solutions (AI in Vehicles & Ambulance)

5) Smart Traffic Solution for Transport Department – Annual Traffic Census 2024

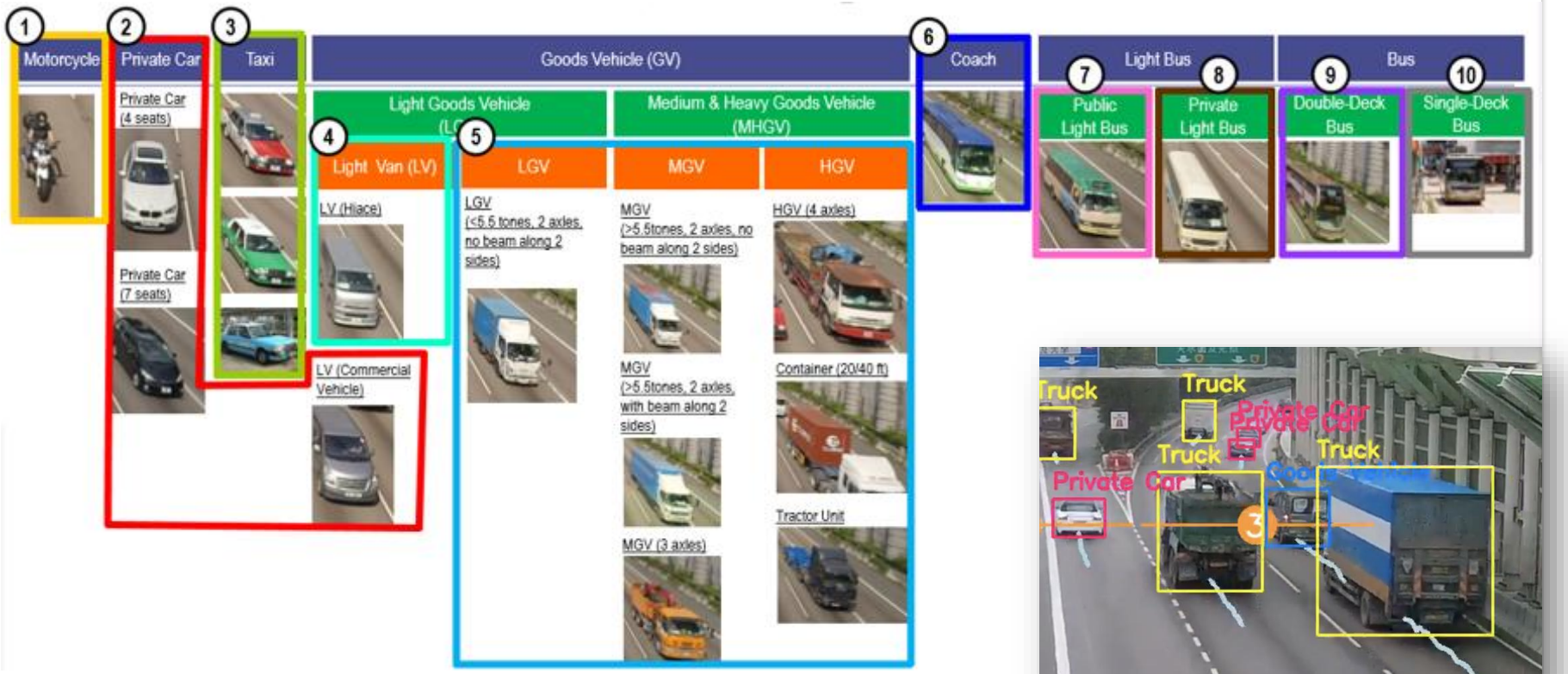
AI in Vehicle Classification · Object Detection · Smart Traffic

Situation:

- **Customer:** 運輸署 Transport Department
- **Goal:**
  - **To deliver vehicle analytics of 10 cameras monitoring for Annual Traffic Census 2024**
- **Competitive Edge:**
  - **Hybrid AI Training: Traffic engineering knowhow from ARUP combine with Capax's huge AI database of 30 million images**
  - **Vehicle classification standard compliance – FHWA (USA), EU classification (2007/46/EC), Vehicle Classification Code (Hong Kong)**
  - **Accuracy: 95%+ validated by ARUP**

Our Solution

Advanced Vehicle Classification Model



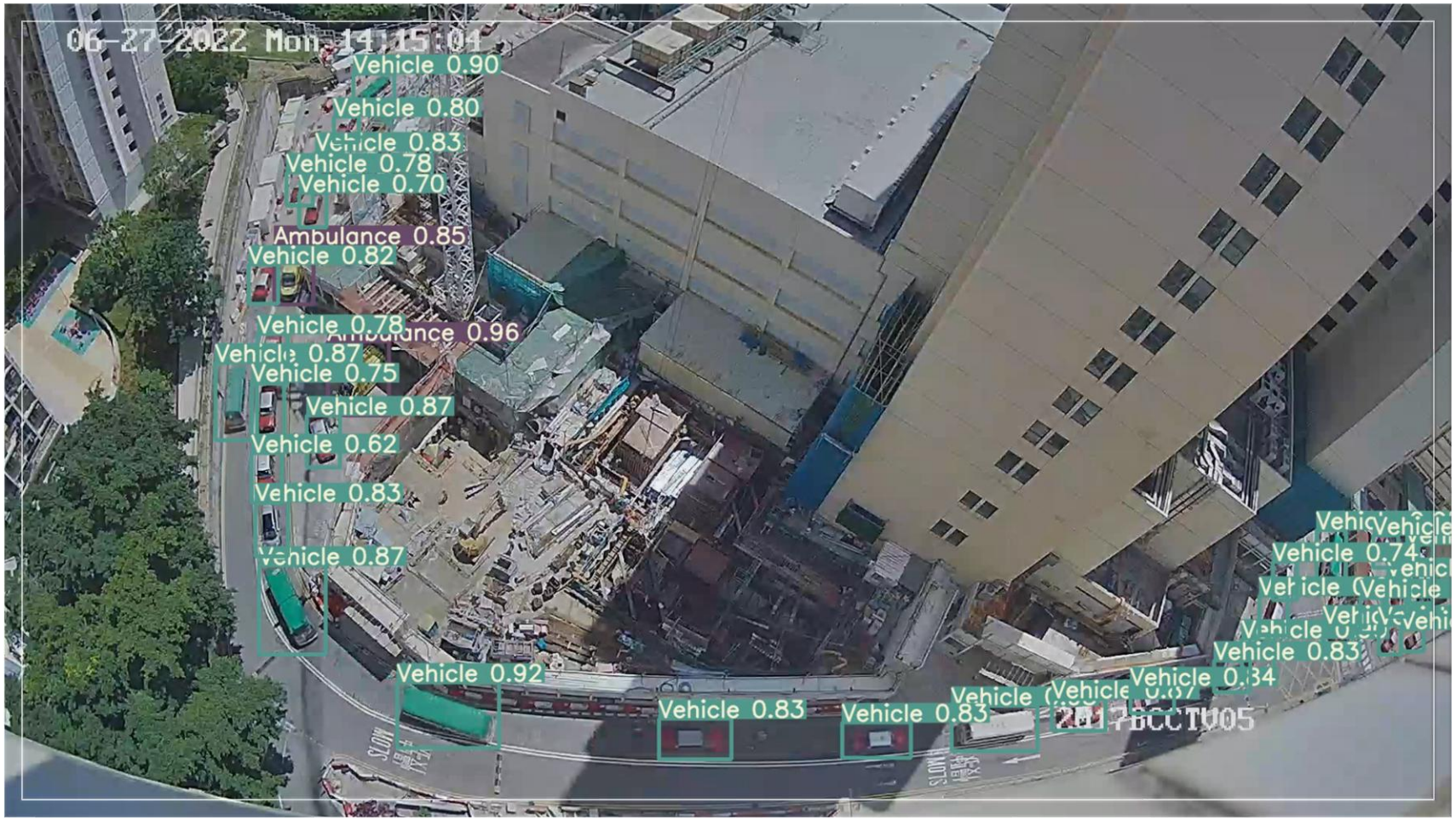
6) Smart Traffic Solution for Hospital Authority – Hospital Traffic Analysis

AI in Ambulance Classification · Hospital Vehicle Volume · Smart Traffic

Situation:

- **Customer:** 基督教聯合醫院 UNITED CHRISTIAN HOSPITAL
- **Goal:**
  - **To analyse overall traffic volume and traffic flow surrounding UC Hospital area**
  - **To monitor UC Hospital's ambulances arrival time**
  - **To analyze average traffic speed for each road segment**

- **Competitive Edge:**
  - **Accurate detection of travel direction, turn movement of each vehicle (e.g. left-turn, thru, right-turn, southbound, northbound)**



7) Smart Traffic Solution for EPD – Car Plate Detection & Analysis

AI in Car Plate Classification · Landfill Entry/Exit · Smart Traffic

Situation:

- **Customer:** 環境保護署 Environmental Protection Department
- **Goal:**
  - **Deliver car plate detection solution for EPD's cleaning cars that passing through entry location**

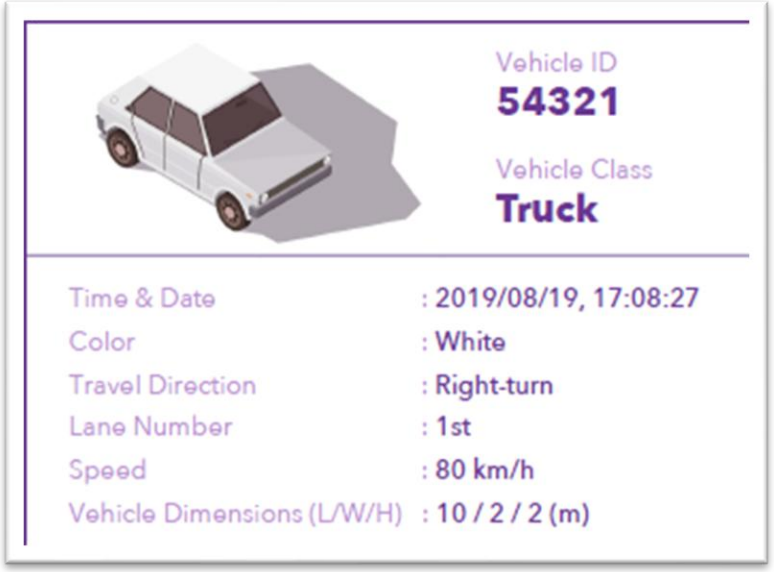
Application Scenario

Highway Traffic Counting and Analytics

Traffic Control System

Parking Control System

Extended Features – Establish Vehicle Profile Card & Dashboard Analytics

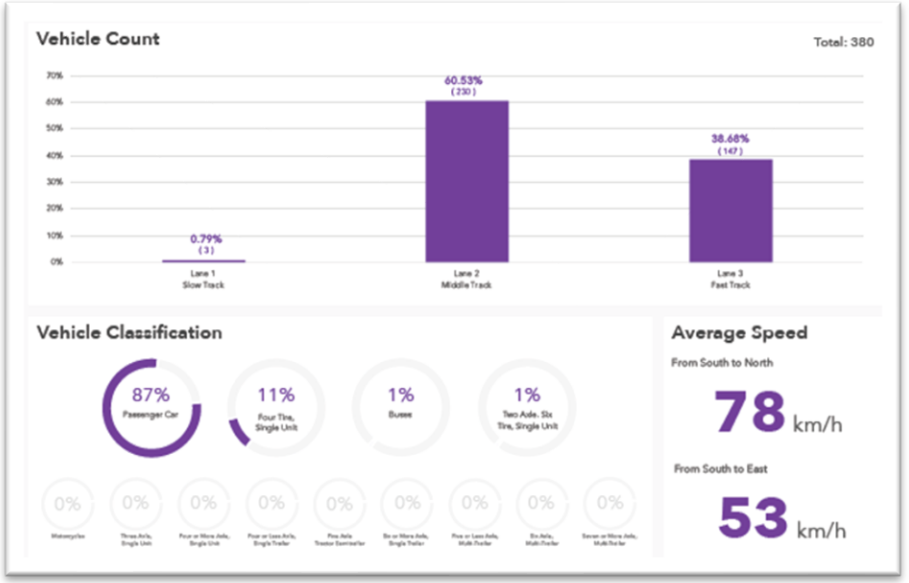


Vehicle Profile Card

Automatically generate vehicle card for each detected vehicle.

Details:

- Overview Image
- Vehicle Class
- Time & Date
- Vehicle Dimensions
- Travel Direction



03.5 Smart Building Solutions (Semantic AI Analysis of E&M Diagram)

8) AI in Smart Building for EMSD – Digitize E&M Equipment's Diagram

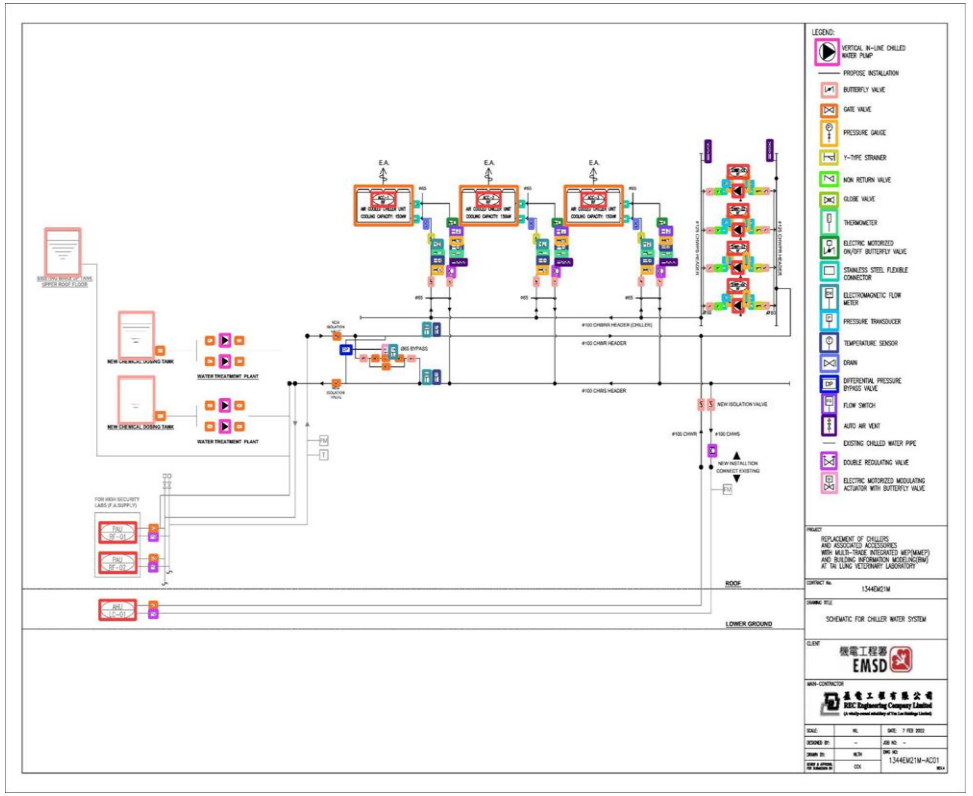
Semantic AI, Large Language Model (LLM), E&M Diagram

Background

- **Customer** 機電工程署 EMSD
- **Goal:**
  - Apply Semantic AI Technology to convert engineering diagrams into TTL formats and visualize in user-friendly web-based platform
- **Pain points of Existing Workflows:**
  1) Efficiency: Engineer takes 6 months+ to digest one complex E&M diagram and convert to knowledge graph
  2) Consistency: Engineer's manual conversion of E&M diagram may create discrepancy

Our Solution for EMSD

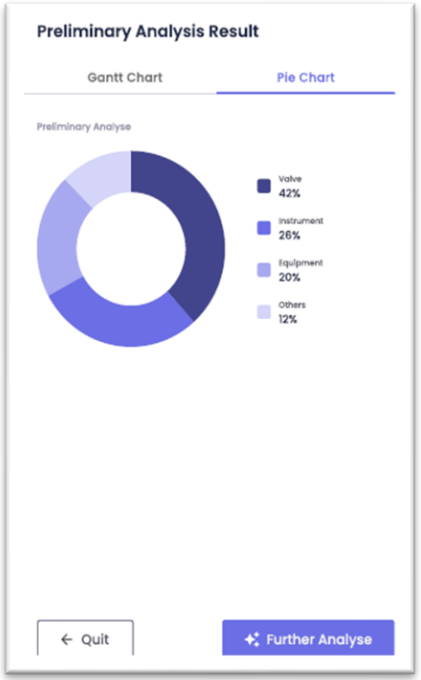
AI Conversion of E&M Equipment's Schematic Diagram into Engineer-Understandable Knowledge Graph



Accolades and Recognitions:

Silver Award in OGCIO's Smart Government Innovation Lab's AI Competition 2024

Platform Interface:



Details of AI Model – *From E&M Diagram to Logical Representation*

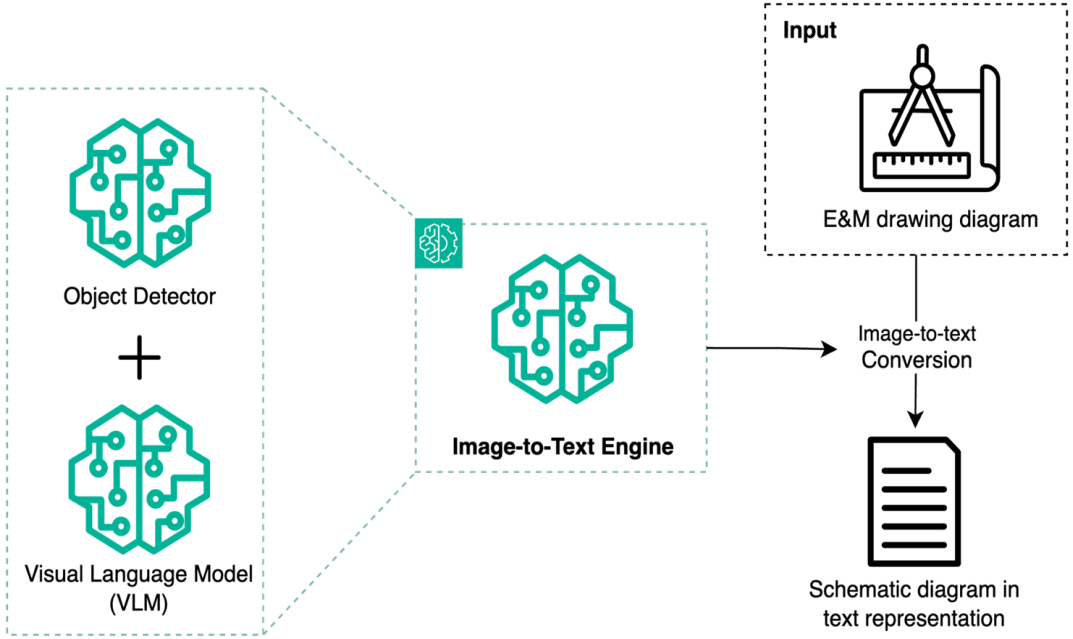
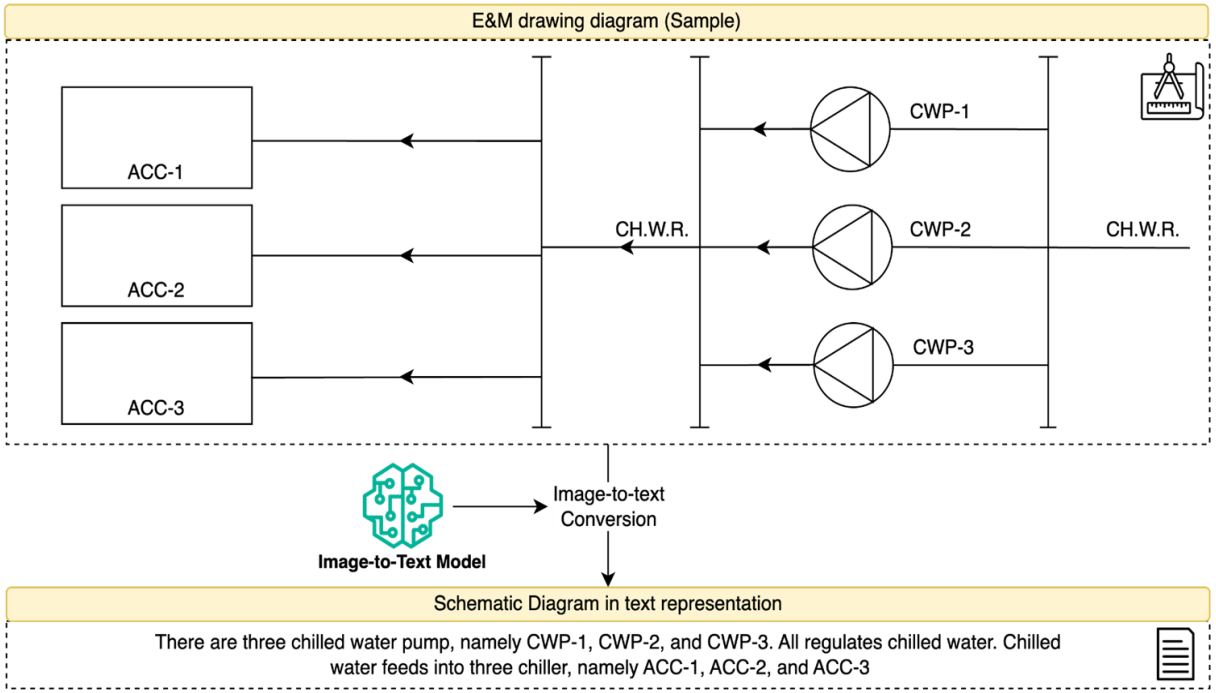


Image-to-Text Engine

- Object Detector: Detecting engineering components
- Visual Language Model: Recognizing connection & relationship between each components

Example Input & Output



9) AI in Smart Building for EMSD – AI in Chiller Plant Optimization

Chiller Plant Optimization, AI Reinforcement Learning, Energy Saving

Background

- **Customer** 機電工程署 EMSD
- **Goal:**
  - Apply Machine Learning Algorithm (zero-inflated regression technique, classification and regression model), to provide precise prediction of cooling load and energy consumption
- **Competitive Edge:**
  - Zero-inflated regression technique instead of the commonly used artificial neural networks (ANN) was employed to exclude unreliable data points and avoid overfitting
  - High accuracy embedded with domain knowhow

Our Solution for EMSD

AI in Chiller Plant Optimization

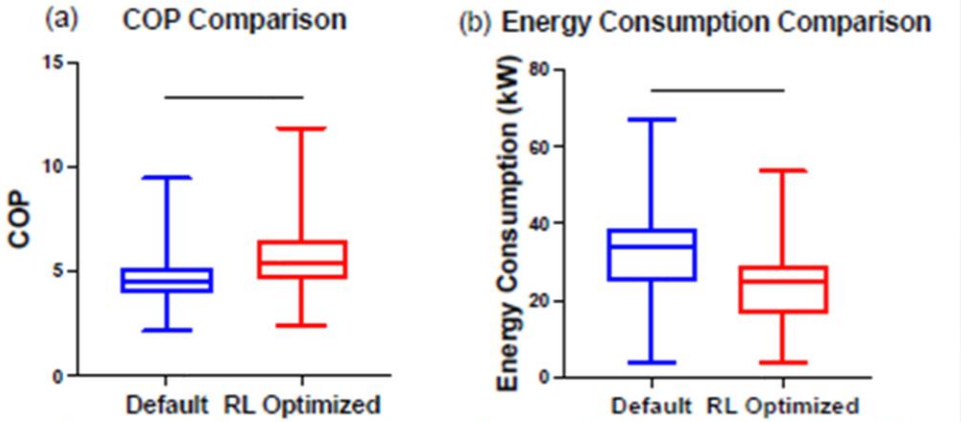


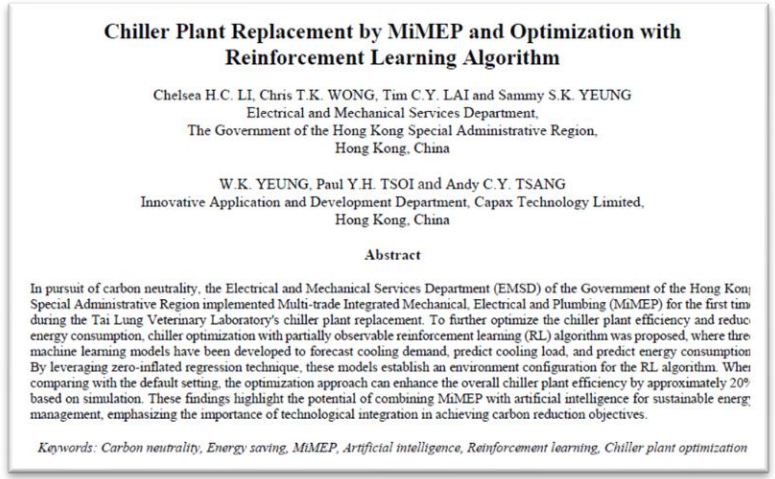
Figure 7. The comparison of magnitude of (a) COP and (b) energy consumption, before and after optimization (****P <0.0001, Wilcoxon signed-rank test)

Result:

Demonstrated a theatrical reduction in the energy consumption by 16% and an improvement in coefficient of performance by 20% respectively

Accolades and Recognitions:

ICEE 2024 Paper



Chiller Plant Replacement by MiMEP and Optimization with Reinforcement Learning Algorithm

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The Government of the Hong Kong Special Administrative Region,
Hong Kong, China

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Innovative Application and Development Department, Capax Technology Limited,
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Abstract

In pursuit of carbon neutrality, the Electrical and Mechanical Services Department (EMSD) of the Government of the Hong Kon Special Administrative Region implemented Multi-trade Integrated Mechanical, Electrical and Plumbing (MiMEP) for the first tim during the Tai Lung Veterinary Laboratory's chiller plant replacement. To further optimize the chiller plant efficiency and reduc energy consumption, chiller optimization with partially observable reinforcement learning (RL) algorithm was proposed, where thre machine learning models have been developed to forecast cooling demand, predict cooling load, and predict energy consumption By leveraging zero-inflated regression technique, these models establish an environment configuration for the RL algorithm. Whe comparing with the default setting, the optimization approach can enhance the overall chiller plant efficiency by approximately 20% based on simulation. These findings highlight the potential of combining MiMEP with artificial intelligence for sustainable energ management, emphasizing the importance of technological integration in achieving carbon reduction objectives.

Keywords: Carbon neutrality, Energy saving, MiMEP, Artificial intelligence, Reinforcement learning, Chiller plant optimization

03.5 Site Safety and Management Solutions (Drone & AI Monitoring Platform)

10) Site Safety & Monitoring System for EPD – AI Core Solution

AI in Waste Management · Construction Site · Site Safety

Situation:

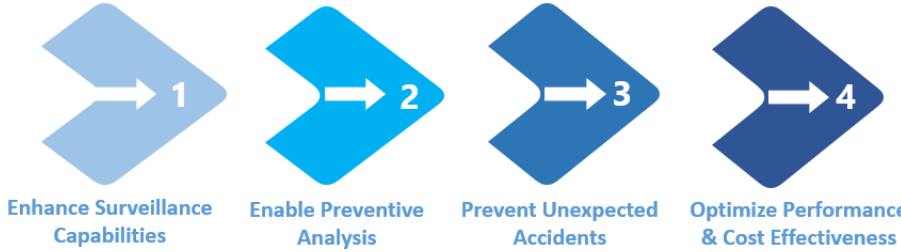
- **Customer:** 環境保護署 Environmental Protection Department
- **Goal:**
  - **Revamp existing landfill site from physical workflow to an enhanced AI level**
- **Problems of Existing Landfill:**
  1) **Landfill Surveillance: In lack of an effective way to oversee the whole landfill site's activities**
  2) **Waste Classification: In lack of an automatic way to classify inert/non-inert garbage and construction or domestic garbage**
  3) **Operation Monitoring: In lack of a system to monitor operator's abnormal behaviours to pre-alert management**

Our Solution

Comprehensive AI Revamp for the Overall Landfill Site

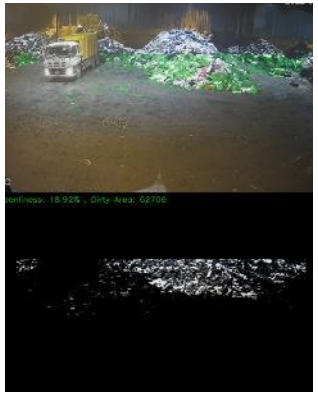
Components

Benefits

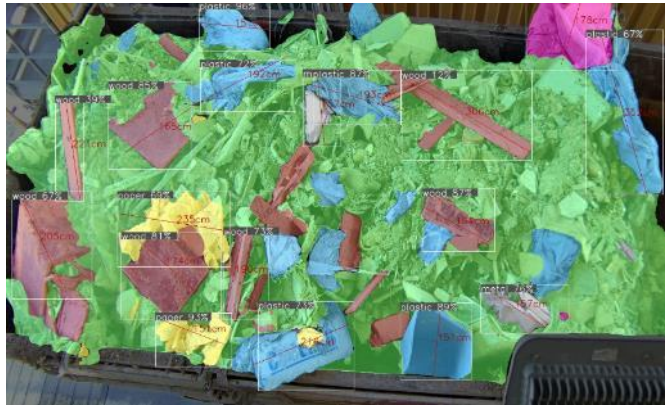


On-Site Photos

Tipping Hall - Empty



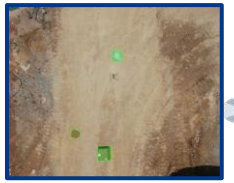
Tipping Hall - Full



Waste Classification

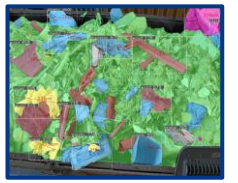
Our Sustainable Solution

Drone Surveillance



Access Road Monitoring

Waste Management



Waste Classification

Wheel Cleanliness Detection

Site Safety

Hall Condition Analysis

Fall Detection

Thank you

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