**Joe Waldy, PhD**
+65-XXXXXXX | waldyjoe@gmail.com | https://waldyjoe.github.io/

## EXECUTIVE SUMMARY

I am passionate about the applications of data-driven, quantitative methods to solve real-world optimisation problems specifically on how Artificial Intelligence (AI) and Operations Research (OR) methodologies can synergise to address increasingly dynamic real-world problems especially pertaining to routing and scheduling particularly in logistics, law enforcement and smart manufacturing domains. I have over 10 years of working experience in the domains of Data Science, Operations Research, IT project management, government procurement and public policy, and have deepened my technical and research expertise in AI by obtaining a PhD. I see myself as the bridge that connects the gap which often exist between business needs and technical solutions.

## EXPERIENCE

### Data Scientist (Optimization)

**Hyundai Motor Group Innovation Center in Singapore** January 2023 – Present

- Developed and deployed a novel algorithm to measure the factory's Overall Equipment Effectiveness (OEE) and automate the root cause analysis process of identifying sources of delays in flexible cell-based car production.
- Developed an analytical tool to analyse, visualize and simulate performance of mobile robots operations.
- Developed and deployed OEE monitoring dashboard and mobile robots monitoring dashboard to aid in-production and post-production countermeasure and root cause analysis.
- Developed and implemented multi-agent pathfinding algorithms for Autonomous Mobile Robots (AMRs) in a Digital Twin simulator environment.
- Lead and drive research initiative to formulate and solve real-world multi-robot routing problem in smart factory as a Multi-Agent Pickup and Delivery Problem (MAPD).

### Research Engineer

**Singapore Management University** August 2022 – December 2022

- Design, develop, integrate and implement RL-based order assignment and routing algorithm for dynamic same-day delivery problem for AI Singapore and uParcel. (link)
- This research work has been published at the International Conference of Computational Logistics 2023.

### PhD Candidate in Computer Science

**Singapore Management University** August 2018 – December 2022

- My research focus is on how advanced AI techniques such as Machine Learning and Multi-Agent Systems can be infused with Classical OR techniques to solve complex, dynamic real-world combinatorial optimization problems specifically those pertaining to routing and scheduling. (thesis)
- I worked on an industry research project with Fujitsu-SMU Urban Computing and Engineering (UNiCEN) Corp Lab to enhance the scalability, solution quality and efficiency of the existing routing and scheduling engine of the Collaborative Urban Delivery Optimisation (CUDO) platform for commercial adoption.
- I interned with Home Team Science and Technology Agency (HTX) to propose and develop a learning-based approach to solve dynamic patrol routing and scheduling problem.
- I published 5 first-authored publications and 2 second-authored publications in reputable venues.

### Senior Manager, Data Science

**Ministry of Home Affairs Headquarters** February 2017 – July 2018

- Championed and executed the application of data science and data-driven methodologies using tools such as Tableau, geospatial analytics, and machine learning techniques to uncover insights from repositories of untapped data in the law enforcement domain.

### Senior Manager, Operations Analysis & Improvement

**Ministry of Home Affairs Headquarters** December 2013 – January 2017

- Worked on the applications of Operations Research in solving complex problems in the law enforcement domain such as application of discrete-event simulation for strategic manpower planning and linear programming to develop a facility location optimisation model.
- Explored and kept abreast with the latest developments in mathematical optimisation solvers to have ready tools in addressing various optimisation problems.

**Staff Officer, Business Unit & Staff Development**
**Singapore Prison Service Technology Branch** June 2011 – November 2013

- Procured, managed projects and collaborated with vendors for the development of new IT systems.
- Developed training development framework, strategic IT plan and roadmap and internal ICT policies.
- Assisted Prisons Tech to achieve ISO/IEC 27001:2005 certification for management of data centre.

## EDUCATION

**Singapore Management University**

- PhD in Computer Science majoring in Intelligent Systems and Optimization under Artificial Intelligence & Data Science Research Group GPA: 3.80/4.00
- Awarded SMU Presidential Doctoral Fellowship AY2021/2022 and Dean's List for AY2021/2022.

**National University of Singapore**

- B.Eng (Industrial and Systems Engineering) with Second Class Honours (Upper) GPA: 4.47/5.00
- Dean's List, Semester 2 2009/2010, Semester 1 and 2 2010/2011.
- Worked on a System Design Project with IBM Supply Chain Singapore to design a layout for new warehouse and perform simulation and analytical study to analyze its capability. (poster)

## PUBLICATIONS

(Details can be found in my Google Scholar page)

- Zhiqin Zhang, **Waldy Joe**, Yuyang Er and Hoong Chuin Lau. "When Routing Meets Recommendation: Solving Dynamic Order Recommendations Problem in P2P Logistics Platforms". In *ICCL 2023.* (paper)
- **Waldy Joe** and Hoong Chuin Lau. "Learning to Send Reinforcements: Coordinating Multi-Agent Dynamic Police Patrol Dispatching and Rescheduling via Reinforcement Learning". In *IJCAI 2023.* (paper|code)
- Songhan Wong, **Waldy Joe** and Hoong Chuin Lau. "Dynamic Police Patrol Scheduling with Multi-Agent Reinforcement Learning". *In LION17*. (paper)
- **Waldy Joe** and Hoong Chuin Lau. "Coordinating Multi-party Vehicle Routing with Location Congestion via Iterative Best Response". *In SN Computer Science 2023.* (paper)
- **Waldy Joe**, Hoong Chuin Lau and Jonathan Pan. "Reinforcement Learning Approach to Solve Dynamic Bi-objective Police Patrol Dispatching and Rescheduling Problem". In *ICAPS 2022.* (paper|poster)
- **Waldy Joe** and Hoong Chuin Lau. "Coordinating Multi-Party Vehicle Routing with Location Congestion via Iterative Best Response". *In EUMAS 2021.* (paper)
- **Waldy Joe** and Hoong Chuin Lau. "Deep Reinforcement Learning Approach to Solve Dynamic Vehicle Routing Problem with Stochastic Customers". In *ICAPS 2020*. (paper|video)

## TECHNICAL SKILLS

| | |
|---|---|
| **Programming Language** | Python, Java, JavaScript, C++ |
| **Data Science Tools** | Completed e-learning courses from Coursera and DataCamp and codecademy<br>Proficient in libraries such as Numpy, Pandas, scikit learn and PyTorch |
| **Optimisation/Operations Research** | Optimisation Software: SCIP, CBC, CPLEX, Gurobi and Google OR-Tools<br>Simulation Software: Automod and ExtendSim |
| **Data Visualisation/BI Tools** | Tableau |
| **Geospatial** | QGIS and worked with onemap.sg API and geospatial data from data.gov.sg |
| **Collaborative Tools** | Gitlab, Bitbucket, Jira |
| **Application Deployment** | FastAPI, Docker, Harbor, Kubernetes |
| **IoT Platform** | PTC ThingWorx |

## PERSONAL

**Language Proficiency:** English Language, Malay Language, Bahasa Indonesia and Basic Chinese.
**Community Involvement:**

- Serve as Cluster Supervisor to mentor young adult groups leaders and oversee the running of several your adult groups in church
- Took part in overseas missions to perform community health education and other community service activities.

**Interest:** Enjoy recreational sports (running, football and badminton) and have deep interest in Christian literature and philosophy.