Research Statement

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Background

My research domain is the application of Operational Research (OR) to complex resource planning, scheduling and coordination problems within logistics and transportations. In 2023, I have expanded my own research interest to other domains, such as machine learning (ML) in logistics. My research vision is to use both theory and experiment to create novel algorithms, mechanisms, and frameworks that enable to support decision making processes in respective research domains and generate great impacts, to theoreticians and practitioners alike. Tackling challenging new problems, applying my work to interesting data sources, and fostering new interdisciplinary collaborations are also my interests.

My research interests are broadly classified in two broad areas which are in line with one of SMU research areas "Sustainability Living", two of SCIS core research areas "Decision Making and Optimisation" & "Machine Learning and Intelligence", and one of integrative research areas "Urban Logistics and Sustainability":

1. *Logistics and transportation: orienteering problem, vehicle routing problem, green logistics, waste and e-waste management, and other related topics;*
2. *Healthcare optimisation and analytics*

Logistics and transportation. Logistics includes the science of planning for managing and implementing procedures for the most efficient and effective storage and transportation of goods and services. Although logistics and transportation are sometimes used interchangeability, the differences are simply logistics deals with the integration of storage, transportation, cataloging, handling, and packaging of goods, while transportation deals with the function of moving products from one location to another. I have specialized in route planning problems in which the selection of customers is integrated, namely "Orienteering Problem (OP)", and have published efficient solution methods for different variants of the OP. My interests have also been expanded to other types of transportation problems, such as vehicle routing problems with cross-dock and reverse cross-dock, multi-vehicle cycle inventory routing problem, vehicle routing problems with green logistics aspects, including waste and e-waste management. I also work on one research area related to the application of machine learning technique in logistics, transportation, and healthcare domains. I am focusing on implementing machine learning approaches for solving stochastic and dynamic logistics problems.

Healthcare optimization and analytics. When I was a researcher, I have worked on some projects related to the healthcare management, especially related to the manpower scheduling [Gunawan and Lau, 2013] and the application of the application of OP in healthcare [Gunawan et al., 2017b]. In 2021, I started to focus on healthcare from the optimization and analytics perspective. All three research areas will be further elaborated below.

Research Areas

1. Logistics and transportations

Orienteering Problem. I have focused on the route planning problems in which the selection of customers is integrated, namely the Orienteering Problem (OP). This work was started in my early years as a faculty member, and it nicely follows from my previous work as a research scientist. This problem is originally from the sport game of orienteering [Vansteeenwegen et al., 2011]. The goal is to find a single route by visiting as many nodes as possible that maximizes the total collected score subject to a given time budget frame and fixed start and end nodes. I have published a comprehensive survey of the OP [Gunawan et al., 2016b], that has received 491 citations by 29 July 2022. Prior to 2020, I have also been working on three different classifications of the OP: the classical OP, extended variants of the OP and applications of the OP as summarized in Table 1.

Table 1. The Orienteering Problem Publications (prior 2020)

Classifications	Problems	Publications
Classical Variants	Team OP with Time Windows	[Gunawan et al., 2017a, 2017c, 2018a]
	Time Dependent OP	[Gunawan et al., 2014, 2016f, 2018a]
Extended Variants	Team OP with Variable Profits	[Gunawan et al., 2016b, 2018b]
	Capacitated Team OP	[Gunawan et al., 2018d, 2019e]
	Team OP with Time Windows and Partial Scores	[Yu et al., 2019]
Application	Crowdsourcing	[Chen et al., 2014]
	Tourist Trip Design Problem	[Gunawan et al., 2016g, Liang et al., 2017, 2023e]
	Healthcare Problem	[Gunawan et al., 2017b]
	Personalized Conference Recommendation	[Gunawan et al., 2016c, 2016e]

I have also published a textbook with the title of “Orienteering Problem: Models and Algorithms for Vehicle Routing Problems with Profits” [Vansteenwegen and Gunawan, 2019]. This tutorial book covers a comprehensive review of variants of the OP, mathematical models and techniques for solving these OP variants and discusses their complexity. It also reviews the latest applications of these problems in the fields of logistics, tourism, and others. The book mainly aims for graduate students in engineering, economics, applied mathematics and operations research. Practitioners and planning engineers in logistic companies will be inspired by this book. In the last three years, together with co-authors, my main contributions focus on the extended variants of the OP and applications of the OP in real-world problems, as summarized in Table 2.

In 2023, one publication [Yu et al., 2024a] investigates the Set Team Orienteering Problem with Time Windows (STOPTW), a new variant of the well-known Team Orienteering Problem with Time Windows and Set Orienteering Problem. In the STOPTW, customers are grouped into clusters. Each cluster is associated with a profit attainable when a customer in the cluster is visited within the customer’s time window. A Simulated Annealing with Reinforcement Learning algorithm is developed to solve large STOPTW benchmark instances. I am currently writing a book chapter for the application of the OP in logistics. This chapter covers the most recent variants, methods, and applications of the OP. The book will be released in 2024.

Table 2. The Orienteering Problem Recent Publications

Problems	Applications	Contributions	Publications
OP with Time Windows	Agile Earth Observation Satellite	The proposed algorithm, Adaptive-directional Dynamic Programming with Decremental State Space Relaxation, outperforms the SOTA algorithms in solving benchmark instances	[Peng et al., 2019, Peng et al., 2020]
Team OP	Unmanned Surface Vehicle problem	The proposed algorithm, the Iterative Clustering Heuristic, solves a real-world scenario effectively	[Prasetia et al., 2020]
Set OP with Time Windows	Consolidated delivery in supply chain	The proposed algorithm, Adaptive Large Neighborhood Search, is comparable to the SOTA algorithms in solving benchmark instances	[Gunawan et al., 2021d]
Capacitated Team OP	The vehicle routing problem with limited resource capacities	The proposed algorithm, Simulated Annealing and Iterated Local Search, is comparable to the SOTA algorithms in solving benchmark instances	[Zhu et al., 2021]
Time Dependent OPTW and Service Time Dependent Profits	The vehicle routing problem with variable service times and profits of nodes	The proposed algorithm, Variable Neighborhood Search, solves a real-world problem for the city of Shiraz (Iran)	[Khodadadian et al., 2022]
Team OP	Machine Learning in Algorithm Selection	The proposed algorithm selection, ALORS, outperforms the SOTA algorithms in solving benchmark instances	[Misir et al., 2022]
Set TOPTW	The vehicle routing problem with profits	The proposed algorithm, Simulated Annealing with Reinforcement Learning, outperforms the SOTA algorithms in solving benchmark instances	[Yu et al., 2024]

Vehicle Routing Problem. My research publications are mainly supported by three research grants:

- MOST Add-on Grant for International Cooperation (MAGIC) MOST106-2410-H-011-002-MY3 (Project Title: Optimization Models for City Logistics with Electric Vehicles) (Years 2020-2021)
- SMU Internal Research Grant Academic Research Fund (AcRF) Tier 1 (Project Title: Vehicle Routing Problem with a Reverse Cross-Dock) (Years 2020-2021)
- SMU Internal Research Grant Academic Research Fund (AcRF) Tier 1 (Project Title: “E-waste must never be waste”: Vehicle Route Planning Optimization) (Years 2022-2023)

MOST Add-on Grant for International Cooperation (MAGIC): For this grant, I have been appointed as the PI (Singapore based) to collaborate with Prof. Vincent F. Yu from NTUST (Taiwan). This grant focuses on developing optimization models in city logistics, which is an add-on to his grant MOST106-2410-H-011-002-MY3 (Project Title: Optimization Models for City Logistics: 2017-2021), awarded by Ministry of Science and Technology (MOST) Taiwan.

I worked on the problem of designing a two-echelon freight distribution system in a dense urban area that considers third-party logistics (TPL) and loading–unloading zones (LUZs) [Yu et al., 2018, 2020]. Collaborating with a third party logistic (TPL) is one of the business strategies to increase the competitiveness of a company. The proposed system takes advantage of outsourcing the last mile deliveries to a TPL provider and utilizing LUZs as temporary intermediate facilities instead of using permanent intermediate facilities to consolidate freight. Main contributions include a

new mathematical model and a Simulated Annealing (SA) algorithm to solve a two-echelon freight distribution system in Taipei City, Taiwan as a case study.

I also focused on a new variant of the vehicle routing problem, namely the Green Mixed Fleet Vehicle Routing Problem with Realistic Energy Consumption and Partial Recharges [Jodiawan et al., 2019a, Yu et al., 2021b]. This problem contains three important characteristics — realistic energy consumption, partial recharging policy, and carbon emissions. The main contribution includes the analysis of the potential carbon emission reduction resulting from the proposed model.

SMU Internal Research Grant Academic Research Fund (AcRF) Tier 1 (VRP-RCD): This project studies a four-level supply chain network: an integration of suppliers, cross-dock, customers, and outlets, with the objective of minimizing the vehicle operational and transportation costs. Cross-docking consists of transferring incoming deliveries directly to outgoing vehicles without storing or keeping them in between [Yan and Tang, 2009] to cut the inventory costs while increasing the flow of goods or items and shortening the shipping cycle.

This research work was first started by focusing on the VRP with cross-docking (**VRPCD**) (Figure 1a). The contribution is to develop algorithms (heuristics) that can be further applied to extended problems, namely the VRP with reverse cross-docking (VRP-RCD) and the VRP with forward-reverse cross-docking (VRP-FRCD). Reverse logistics is defined as the process of planning, implementing, and controlling the efficient, cost-effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal [Roger and Tibben-Lembke, 1999]. Returns process management, which is a part of reverse logistics, has become an interesting field of performance improvement, especially true in business with seasonal demand, such as fashion or books. Motivated by the ability of a VRPCD network to minimize the distribution cost in the forward flow, my work incorporates the reverse logistics scheme in a VRPCD network, namely the VRP with reverse cross-docking (VRP-RCD), as illustrated in Figure 1b. I also worked on the integration of both forward and reverse flows in a cross-docking network, namely the vehicle routing with forward and reverse cross-docking, VRP-FRCD, namely the VRP with forward and reverse cross-docking (VRP-FRCD).

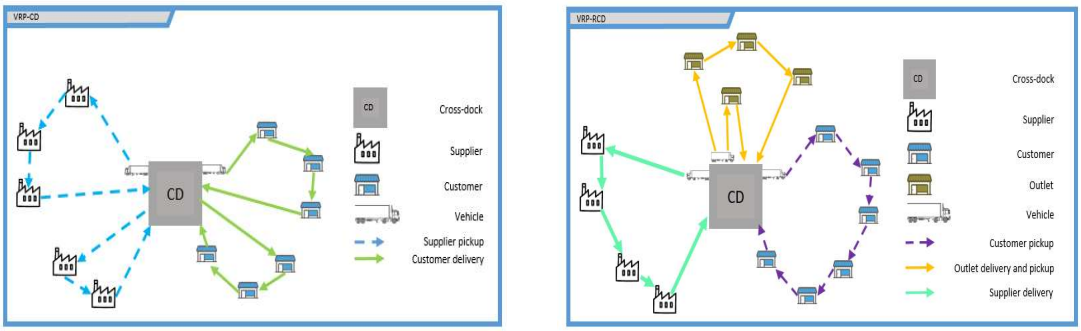

Figure 1. (a) The VRPCD model, (b) The VRP-RCD model

The AcRF Tier 1's contributions are summarized in Table 3. In total, I have published 5 conference papers (full papers) and 1 conference paper (short paper). Two journal papers have also been published in Year 2021. Our main contributions include new mathematical models, newly generated benchmark problems which are inspired by real-life problems that can be used and solved by other researchers and most of our results are considered as the best-known solutions so far.

Table 3. Research publications of AcRF Tier 1

Problems	Contributions	Publications
VRPCD	A new mathematical model for handling and delivering multiple products and two sets of benchmark instances inspired by real-world scenarios	[Gunawan et al., 2020d]
	A metaheuristic algorithm, Adaptive Local Neighborhood Seach, solves larger instances which commercial software is unable to do so	[Gunawan et al., 2020b]
	The proposed algorithm, a two-phase matheuristic, improves 80 (out of 90) best known solutions of benchmark instances; therefore, they are treated as the latest best-known solutions	[Gunawan et al., 2020c, 2021b]
VRP-RCD	A new mathematical model and newly generated benchmark instances for a four-level supply chain network that involves suppliers, cross-dock, customers, and outlets in the context of VRP-RCD	[Widjaja et al., 2020b]
	The proposed algorithm, a two-phase heuristic, provides new best-known solutions for newly generated benchmark instances	[Gunawan et al., 2020a]
	The proposed algorithm, a two-phase matheuristic, further improves my previous work; therefore, they are treated as the latest best-known solutions	[Gunawan et al., 2021a]
VRP-FRCD	A new mathematical model and newly generated benchmark instances for a four-level supply chain network that involves suppliers, cross-dock, customers, and outlets in the context of VRP-FRCD	[Gunawan et al., 2021e]
	The proposed algorithm, a two-phase matheuristic, provides the latest best-known solutions	
	A new mathematical model and newly generated benchmark instances by considering heterogeneous fleet vehicle routing problem with multiple forward-reverse cross-docks	[Anh et al., 2022]

***SMU Internal Research Grant Academic Research Fund (AcRF) Tier 1 (E-waste)*:** In this project, together with Assistant Prof Aidan Wong (SOSS-SMU) as co-PI, we study the e-waste collection problem, using a case study in the Singapore context, and formally model it as the dynamic VRP considering multi-compartment fleet. We also consider the joint optimization problem of e-waste collection problem performed by multiple PRS Operators as another extension which is not implemented yet in Singapore. The contributions include the proposed method, the deep reinforcement learning, to recommend an optimal e-waste collection schedule that deals with real-world constraints such as the dynamic nature of the e-waste amount and e-waste truck limitations. We worked on publications in 2023 and plan to apply for an external grant for extended scopes and topics in 2024. Prior to this grant, I have published a survey paper related to the waste collection routing problem (WCRP) [Liang et al., 2022]. The paper reviews the latest approaches and applications on the collection and routing of waste. The outcomes of this grant are listed in Table 4.

Other transportation and logistics publications. The Vehicle Routing Problem (VRP) was formally presented to the scientific literature since 1959 [Dantzig and Ramser, 1959]. Sixty years on, the problem is still heavily researched, with hundreds of papers having been published addressing this problem and the variants that now exist. I have published a survey of VRP datasets, categorized to enable researchers to have easy access to the problem(s) that are of interest [Gunawan et al., 2021c]. Various datasets have been proposed to enable researchers to compare their algorithms using the same problem instances where either the best-known solution is known or the optimal solution is known. I also make some suggestions as to the type of datasets that might be useful in the future to provide the scientific community with even more challenging problems, which are suited to the problems that we face today. Other transportation and logistics publications which focus on new variants or problems are listed in Table 5.

Table 4. Research publications of AcRF Tier 1

Problems	Contributions	Publications
Extended Producer Responsibility (EPR)	This work examines the role of the Extended Producer Responsibility (EPR) scheme in managing electronic waste (e-waste) logistics in Singapore.	[Gunawan et al., 2023a]
Static e-waste model	This study proposes a mixed integer linear programming (MILP) model to solve the e-waste collecting problem by formulating it as the heterogeneous vehicle routing problem with multiple time windows (HVRPMTW). The model is validated with newly developed benchmark instances that are solved by commercial software, CPLEX. The model is also adopted for solving a real case study in the context of Singapore.	[Gunawan et al., 2023c]
	This study proposes a metaheuristic based on the Greedy Randomized Adaptive Search Procedure complemented by Path Relinking (GRASPPR) to solve the e-waste problem.	[Gunawan et al., 2023b, 2023d]
Dynamic e-waste model	We introduce two methods for integrating and utilizing Q-learning to generate a trained Q-table into the search procedure to solve the Heterogeneous VRP with Multiple Time Windows and Stochastic Travel Time problem.	Under review
	In this study, we model the e-waste collection process as a stochastic Vehicle Routing Problem (VRP), specifically the Heterogeneous VRP with Multiple Time Windows and Stochastic Travel Times (HVRP-MTWSTT). This problem involves the multi-period route planning of a heterogeneous fleet with stochastic traveling times. We propose a solution method that employs Deep Reinforcement Learning to steer local search heuristics (DRL-LSH).	Under review

Table 5. Other transportation and logistics publications

Domains	Problems	Publications
VRP	VRP with simultaneous pickup and delivery with an occasional driver	[Yu et al., 2021d]
	Time-Dependent VRP with Time Windows	[Liang et al., 2019]
	The integration of assignment and routing with mixed service mode cross-dock	[Gunawan et al.,2019c]
	Multi-Vehicle Cyclic Inventory Routing Problem	[Gunawan et al., 2019a, 2019d; Yu et al., 2021c]
	VRP with simultaneous pickup and delivery and occasional drivers	[Yu et al., 2023]
	Heterogeneous Fleet VRP with multiple forward/reverse cross-docks	[Yu et al., 2024b]
	VRP with parcel locker and public transportation	[Nguyen et al., 2023a, 2023b]
Two-echelon delivery system	Crowdsourcing transportation system into the two-echelon delivery system	[Putra et al., 2020]
	Two-echelon vehicle routing problem with time windows, covering options, and occasional drivers	[Yu et al., 2021a]
Last-mile delivery	Parcel locker sharing problem	[Indrakarna et al., 2019; Rasyid et al., 2020]

I also focus on the application of Machine Learning in logistics. To be specific, I have applied some ML techniques in the e-waste collection problem. Electrical and Electronic Equipment (EEE) has evolved into a gateway for accessing technological innovations. The rapid turnover of EEE imposes substantial pressure on the environment due to the shortened life cycles. E-waste encompasses discarded EEE and its components which are no longer in use. The study focuses on the e-waste collection problem and models it as a Vehicle Routing Problem with a heterogeneous fleet and a multi-period planning problem with time windows as well as stochastic

travel times. Two different Q-learning-based methods are designed to enhance the search procedure for finding solutions of the problem. The first method involves utilizing the state-action value (Qvalue) to determine the order of multiple improvement operators within the GRASP framework. The second method involves a hyperheuristic that extracts a stochastic policy from the Q-table to select heuristic operators during the search. *This work is still under review.*

Another study models the e-waste collection process as a stochastic Vehicle Routing Problem (VRP), specifically the Heterogeneous VRP with Multiple Time Windows and Stochastic Travel Times (HVRP-MTWSTT). This problem involves the multi-period route planning of a heterogeneous fleet with stochastic traveling times. We propose a solution method that employs Deep Reinforcement Learning to steer local search heuristics (DRL-LSH). Computational experiments demonstrate that DRL-LSH performs competitively with the investigated hyperheuristic and metaheuristic methods on the small-sized instances, while the DRL-LSH widens the performance gap as the size of the problem instances increases. The integration of DRL into the search procedure enhances efficiency and robustness, and also provides a certain level of explainability. It shows that utilizing DRL to control heuristics is particularly well-suited for solving real-world VRPs that are large, complex, and subject to stochastic variations. *This work is still under review.*

3. Healthcare Optimization and Analytics

This is another research direction that I have started to focus on in 2021. Together with Assoc Prof. Tan Kar Way, we proposed a systematic approach to the construction of a simulation model to support decision-making concerning the capacity limit and staffing configurations at the paediatric eye clinic in Singapore under the COVID-19 pandemic [Tan et al., 2021]. We developed simulation models to examine the `as-is' process and proposed numerous `to-be' processes for new clinic configurations to operate under pandemic conditions.

We also looked at another topic to investigate the trends in mobility changes due to Covid-19 observed in the six different sectors in Singapore from 2020 to 2021 [Gunawan et al., 2022]. The observed patterns obtained from descriptive data analysis would shed light on the social distancing measures in Singapore as well as the level of compliance among the country's residents. The results reveal a strong sense of compliance with government policies and personal responsibility to social distance. We establish that the Transit Stations Sector, and Retail and Recreation Sector are the most two sensitive sectors to mobility changes. In future, we will extend the work to compare with other countries.

Recently, I worked on a home healthcare routing and scheduling problem, where perishable products such as medicines, vaccines, or meals must be provided for some patients' treatments. This problem is formulated as a mixed integer linear programming (MILP). A two-stage matheuristic is then developed as the solution approach. The first stage is a local search to solve the nurse routing problem, and the second stage is run as the relaxed MILP to solve the scheduling problem. The matheuristic is tested on newly generated instances and compared with the results of CPLEX. The proposed matheuristic is able to obtain CPLEX solutions within shorter computational times for small instances. For larger instances, the matheuristic achieves feasible solutions. *This work is still under review*.

Future Plans

Strengthening SMU's and SCIS's research areas: I am committed to contribute to one of the SMU's research focus areas, namely "Sustainable living" and SCIS integrative research areas "Urban Logistics and Sustainability" and "Job and Skill Intelligence" for next few years. I will still be focusing more in three different areas: logistics and transportation, including green logistics, waste and e-waste management, human capital management and talent analytics and healthcare analytics, as listed below:

- **Logistics and Transportation.** In 2022 and 2023, I already have some research publications which are under review by high-impact OR journals. Most of them have received positive comments from reviewers. I will target to submit my work to A* journals. I will be continuing working closely with external collaborators who have been working with me in the last few years. I would also like to extend my collaborations by visiting some universities that have invited me, but they have to be postponed due to Covid-19. These invitations will extend my research collaborations with other faculties from overseas universities. In the green logistics and e-waste management domain, I have been worked on the e-waste scheduling problem. I plan to extend this work in future.
- **Healthcare optimization and analytics.** In this topic, I want to link data analytics and Operations Research. Analytics can help us to derive insight from data and turn those insights into tangible results which is the focus of OR community. Some preliminary works will be further extended in 2024. I will also explore the applications of ML into this domain, especially in TCM. This is an on-going research work with an Eng-D student who just enrolled to this program in 2024.

Selected Publications and Outputs

[Anh, et al., 2022] P. Anh, V.F. Yu, **A. Gunawan**, H. Han, "Integrating Forward and Reverse Logistics in Vehicle Routing Problem with Cross-docking", proceedings of the 16th International Congress on Logistics and SCM Systems (ICLS 2022), August 28-30, 2022, Khon Kaen, Thailand - abstract

[Chen et al., 2014] C. Chen, S.-F Cheng, **A. Gunawan**, A. Misra, D. Chander and K. Dasgupta, "TRACCS: Trajectory-Aware Coordinated Urban Crowd-Sourcing", proceedings of the 2nd AAAI Conference on Human Computation and Crowdsourcing (HCOMP-2014), 2-4 November 2014, Pittsburgh, USA

[Dantzig and Ramser, 1959] Dantzig, G. and Ramser, J. (1959), "The Truck Dispatching Problem", Management Science, vol. 6, pp. 80-91

[Gunawan and Lau, 2013] **A. Gunawan** and H.C. Lau, "Master physician scheduling problem", Journal of the Operational Research Society, vol. 64, pp. 410 - 425, 2013

[Gunawan et al., 2014] **A. Gunawan**, Z. Yuan, and H.C. Lau, "A Mathematical Model and Metaheuristics for Time Dependent Orienteering Problem", proceedings of the 10th International Conference on the Practice and Theory of Automated Timetabling (PATAT 2014), 26-29 August 2014, York, United Kingdom

[Gunawan et al., 2016a] **A. Gunawan**, H.C. Lau and P. Vansteenwegen, "Orienteering problem: a survey of recent variants, solution approaches and applications", European Journal of Operational Research, vol. 255, pp. 315 - 332, 2016

[Gunawan et al., 2016b] **A. Gunawan**, K.M. Ng, G. Kendall and J. Lai, "An ILS Algorithm for the Team Orienteering Problem with Variable Profit", proceedings of the 17th Asia Pacific Industrial Engineering and Management Systems Conference (APIEMS 2016), 7 December - 10 December 2016, Taipei, Taiwan

[Gunawan et al., 2016c] **A. Gunawan**, H.C. Lau, P. Varakantham and W. Wang, "An Intelligent System for Personalized Conference Event Recommendation and Scheduling", proceedings of the 22nd European Conference on Artificial Intelligence (ECAI 2016), 29 August - 2 September 2016, The Hague, Netherlands

[Gunawan et al., 2016d] **A. Gunawan**, H.C. Lau and K. Lu, "A fast algorithm for personalized travel planning recommendation", proceedings of the 11th International Conference on the Practice and Theory of Automated Timetabling, 23 - 26 August 2016, Udine, Italy

[Gunawan et al., 2016e] **A. Gunawan**, H.C. Lau, P. Varakantham and W. Wang, "PRESS: PeRsonalized Event Scheduling recommender System", proceedings of Autonomous Agents and Multiagent Systems International Conference (AAMAS 2016 - DEMOs track), 9 - 13 May 2016, Singapore

[Gunawan et al., 2016f] **A. Gunawan**, H.C. Lau and K. Lu, "Enhancing local search with adaptive operator ordering and its application to the Time Dependent Orienteering Problem", proceedings of the 11th International Conference on the Practice and Theory of Automated Timetabling (PATAT 2016), 23-26 August 2016, Udine, Italy

[Gunawan et al., 2016g] **A. Gunawan**, H.C. Lau and K. Lu, "A fast algorithm for personalized travel planning recommendation", proceedings of the 11th International Conference on the Practice and Theory of Automated Timetabling, 23 - 26 August 2016, Udine, Italy

[Gunawan et al., 2017a] **A. Gunawan**, H.C. Lau, P. Vansteenwegen, and K. Lu, "Well-Tuned Algorithms for the Team Orienteering Problem with Time Windows", Journal of the Operational Research Society, vol. 68 (8), pp. 861 - 876, 2017

[Gunawan et al., 2017b] **A. Gunawan**, H.C. Lau and K. Lu, "Home Health Care Delivery Problem", proceedings of the 8th Multidisciplinary International Scheduling Conference (MISTA 2017), 5 - 8 December 2017, Kuala Lumpur, Malaysia

[Gunawan et al., 2017c] **A. Gunawan**, A.A.N. Perwira Redi, V.F. Yu, P. Jewpanya and H.C. Lau, "A Selective-Discrete Particle Swarm Optimization Algorithm for Solving a Class of Orienteering Problems", proceedings of the 8th Multidisciplinary International Scheduling Conference (MISTA 2017), 5 - 8 December 2017, Kuala Lumpur, Malaysia

[Gunawan et al., 2018a] **A. Gunawan**, H.C. Lau, and K. Lu, "ADOPT: Combining Parameter Tuning and Adaptive Operator Ordering for solving a Class of Orienteering Problems", Computers and Industrial Engineering, vol. 121, pp. 82 - 96, 2018

[Gunawan et al., 2018b] **A. Gunawan**, K.M. Ng, G. Kendall, and J. Lai, "An Iterated Local Search Algorithm for the Team Orienteering Problem with Variable Profits", Engineering Optimization, 2018, vol. 50 (7), pp. 1148 - 1163, 2018

[Gunawan et al., 2018d] **A. Gunawan**, K.M. Ng, V.F. Yu, G. Adiprasetyo and H.C. Lau, "Iterated Local Search Algorithm for the Capacitated Team Orienteering Problem", proceedings of the 11th International Conference on the Practice and Theory of Automated Timetabling (PATAT 2018), 28 - 31 August 2018, Vienna, Austria – short paper

[Gunawan et al., 2019a] **A. Gunawan**, V.F. Yu, A.T. Widjaja and P. Vansteenwegen, “Simulated Annealing for the Multi-Vehicle Cyclic Inventory Routing Problem”, proceedings of the 15th Annual IEEE International Conference on Automation Science and Engineering (IEEE CASE 2019), 22 - 26 August 2019, Vancouver BC, Canada (gunawan etal. 2019)

[Gunawan et al., 2019b] **A. Gunawan**, Gan, B., J.A. Tan and S.L.S. Lee Villanueva, "EzLog: Data Visualization for Logistics", proceedings of the 14th International Congress on Logistics and SCM Systems (ICLS 2019), 19 - 22 August 2019, Taipei, Taiwan (Best Paper in Smart Logistics)

[Gunawan et al., 2019c] **A. Gunawan**, V.F. Yu, E.I. Junaidi and A.T. Widjaja, "Integrated Assignment and Routing with Mixed Service Mode Cross-Dock", proceedings of the 14th International Congress on Logistics and SCM Systems (ICLS 2019), 19 - 22 August 2019, Taipei, Taiwan

[Gunawan et al., 2019d] **A. Gunawan**, V.F. Yu, A.T. Widjaja and P. Vansteenwegen, "Simulated Annealing for the Single-Vehicle Cyclic Inventory Routing Problem", proceedings of The Genetic and Evolutionary Computation Conference 2019 (GECCO 2019) - short paper, 13 - 17 July 2019, Prague,Czech Republic

[Gunawan et al., 2019e] **A. Gunawan**, K.M. Ng, V.F. Yu, G. Adiprasetyo and H.C. Lau, “The capacitated team orienteering problem”, proceedings of the 9th International Conference on Industrial Engineering and Operations Management (IEOM 2019), 5 - 7 March 2019, Bangkok, Thailand

[Gunawan et al., 2020a] **A. Gunawan**, A.T. Widjaja, P. Vansteenwegen and V.F. Yu, "Vehicle Routing Problem with Reverse Cross-Docking: an Adaptive Large Neighborhood Search Algorithm", proceedings of the International Conference on Computational Logistics 2020 (ICCL 2020), Lecture Notes in Computer Science 12433, pp. 167-182, Springer-Verlag Berlin Heidelberg, 2020

[Gunawan et al., 2020b] **A. Gunawan**, A.T. Widjaja, P. Vansteenwegen and V.F. Yu, “Adaptive Large Neighborhood Search for Vehicle Routing Problem with Cross-Docking”, proceedings of 2020 IEEE Congress on Evolutionary Computation (CEC) - IEEE World Congress on Computational Intelligence (IEEE WCCI), 19 - 24 July 2020, Glasgow, United Kingdom (fully virtual conference), pp. 1-8

[Gunawan et al., 2020c] **A. Gunawan**, A.T. Widjaja, P. Vansteenwegen and V.F. Yu, “A Matheuristic Algorithm for solving the Vehicle Routing Problem with Cross-Docking”, proceedings of the 14th Learning and Intelligent OptimizatioN Conference (LION 2020), 24 - 28 May 2020, Athens, Greece, Lecture Notes in Computer Science 12096, pp. 9-15, Springer-Verlag Berlin Heidelberg, 2020

[Gunawan et al., 2020d] **A. Gunawan**, A.T. Widjaja, B. Gan, V.F. Yu and P. Jodiawan, “Vehicle Routing Problem for Multi-Product Cross-Docking”, proceedings of the 10th International Conference on Industrial Engineering and Operations Management (IEOM 2020), 10 - 12 March 2020, Dubai, UAE (Best Paper in Logistics track)

[Gunawan et al., 2021a] **A. Gunawan**, A.T. Widjaja, P. Vansteenwegen, and V.F. Yu, "Two-Phase Matheuristic for the Vehicle Routing Problem with Reverse Cross-Docking", Annals of Mathematics and Artificial Intelligence, 2021, DOI: 10.1007/s10472-021-09753-3

[Gunawan et al., 2021b] **A. Gunawan**, A.T. Widjaja, P. Vansteenwegen, and V.F. Yu, "A Matheuristic Algorithm for the Vehicle Routing Problem with Cross-Docking", Applied Soft Computing, vol. 103, 2021, 107163

[Gunawan et al., 2021c] **A. Gunawan**, G. Kendall, B. McCollum, H.-V. Seow, and L.S. Lee, "Vehicle Routing: Review of Benchmark Datasets", Journal of the Operational Research Society, vol. 72 (8), pp. 1794 - 1807, 2021

[Gunawan et al., 2021d] **A. Gunawan**, V.F. Yu, A.N. Sutanto, and P. Jodiawan, "Set Team Orienteering Problem with Time Windows", proceedings of the 15th Learning and Intelligent OptimizatioN Conference (LION 2021), 20 - 25 June 2021, Athens, Greece (virtual) – short paper

[Gunawan et al., 2021e] **A. Gunawan**, A.T. Widjaja, P. Vansteenwegen and V.F. Yu, "Vehicle Routing Problem with Forward and Reverse Cross-Docking: Formulation and Matheuristic Approach", proceedings of the 17th Annual IEEE International Conference on Automation Science and Engineering (IEEE CASE 2021), 23 - 27 August 2021, Lyon, France

[Gunawan et al., 2021f] **A. Gunawan**, A.T. Widjaja, R.K.-W Lee and E.-P Lim, “Metaheuristic for the Personalized Course Sequence Recommendation Problem”, submitted to the 13th International Conference on the Practice and Theory of Automated Timetabling (PATAT 2021), 24 - 27 August 2021, Bruges, Belgium - short paper

[Gunawan et al., 2022] **A. Gunawan**, L.C. Tran, K.W. Tan, and I.-L. Wang, "Exploring and Evaluating the Impact of COVID-19 on Mobility Changes in Singapore”, proceedings of the 12th Annual International Conference on Industrial Engineering and Operations Management (IEOM 2022), 7-10 April 2022, Istanbul, Turkey

[Gunawan et al., 2023a] **A. Gunawan**, T. Visawameteekul, A. Wong, L.C. Tran, "The Analysis of Extended Producer Responsibility (EPR) for E-waste Management Policy Drivers and Challenges in Singapore", proceedings of the 17th International Congress on Logistics and SCM Systems (ICLS 2023), 9 - 12 August 2023, Seoul, South Korea

[Gunawan et al., 2023b] **A. Gunawan**, D.V.A. Nguyen, P.K.M. Nguyen, and P. Vansteenwegen, "GRASP based Metaheuristic to solve the Mixed Fleet E-waste Collection

Route Planning Problem", proceedings of the 17th International Congress on Logistics and SCM Systems (ICLS 2023), 9 - 12 August 2023, Seoul, South Korea - abstract

[Gunawan et al., 2023c] **A. Gunawan**, P.K.M. Nguyen, V.F. Yu, and D.V.A. Nguyen, "The Heterogeneous Vehicle Routing Problem with Multiple Time Windows for the E-Waste Collection Problem", proceedings of the 19th Annual IEEE International Conference on Automation Science and Engineering (IEEE CASE 2023), 26 - 30 August 2023, Auckland, New Zealand

[Gunawan et al., 2023d] **A. Gunawan**, D.V.A. Nguyen, P.K.M. Nguyen, and P. Vansteenwegen, "GRASP solution approach for the e-waste collection problem", proceedings of the International Conference on Computational Logistics (ICCL 2023), 6 – 8 September 2023, Berlin, Germany

[Gunawan et al., 2023e] **A. Gunawan**, S.L. Hoe, X.Y. Lim, L.C. Tran, and D.V.A. Nguyen, "ExploreLah: Personalised and Smart Trip Planner for Mobile Tourism", proceedings of the 2023 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM 2023), 18 - 21 December 2023, Singapore

[Indrakarna et al., 2019] P.A.Y. Indrakarna, V.F. Yu, **A. Gunawan**, "Simulated Annealing for the Share-a-Ride Problem with Adjustable Compartment", proceedings of the 2019 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM 2019) - poster, 15 - 18 December 2019, Macao, China

[Jodiawan et al., 2019a] P. Jodiawan, **A. Gunawan**, V.F. Yu and A.T. Widjaja, "A Mathematical Programming Model for the Green Mixed Fleet Vehicle Routing Problem with Realistic Energy Consumption and Partial Recharges", proceedings of the 2019 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM 2019), 15 - 18 December 2019, Macao, China

[Jodiawan et al., 2019b] P. Jodiawan, V.F. Yu and **A. Gunawan**, "A Green Mixed Fleet Vehicle Routing Problem with Realistic Energy Consumption and Partial Recharges", proceedings of the 14th International Congress on Logistics and SCM Systems (ICLS 2019), 19 - 22 August 2019, Taipei, Taiwan (Best Paper in Optimization of Logistics and Supply Chain Systems)

[Khodadadian et al., 2022] M. Khodadadian, A. Divsalar, C. Verbeeck, **A. Gunawan**, and P. Vansteenwegen, "Time Dependent Orienteering Problem with Time Windows and Service Time Dependent Profits", Computers and Operations Research, 2022

[Liang et al., 2017] Y.-C. Liang, **A. Gunawan**, H.-C. Chen and R.C.J. Josue, "Solving Tourist Trip Design Problems Using a Virus Optimization Algorithm", proceedings of the 8th Multidisciplinary International Scheduling Conference (MISTA 2017), 5 - 8 December 2017, Kuala Lumpur, Malaysia

[Liang et al., 2019] Y.-C. Liang, V. Minanda, **A. Gunawan** and A.H.-L. Chen, "Harmony Search Algorithm for Time-Dependent Vehicle Routing Problem with Time Windows", proceedings of the 20th Asia Pacific Industrial Engineering and Management Systems (APIEMS 2019), 2 - 5 December 2019, Kanazawa, Japan

[Liang et al., 2021] Y.-C. Liang, V. Minanda, and **A. Gunawan**, "Waste Collection Routing Problem: A Mini-Review of Recent Heuristic Approaches and Applications", Waste Management & Research: The Journal for a Sustainable Circular Economy, vol. 40 (5), pp. 59 – 537, 2021

[Liang et al., 2022] Y.-C. Liang, V. Minanda, **A. Gunawan**, and H.-S. Chen, "Metaheuristics for Time-Dependent Vehicle Routing Problem with Time Windows", International Journal of Operations Research, 2022, DOI: 10.1504/IJOR.2022.10045858

[Misir et al., 2022] M. Misir, **A. Gunawan**, and P. Vansteenwegen, "Algorithm Selectionfor the Team Orienteering Problem", proceedings of the 22nd European Conference on Evolutionary Computation in Combinatorial Optimisation (EvoStar 2022), 20-22 April 2022, Madrid, Spain

[Nguyen et al., 2023a] P.K.M. Nguyen, V.F. Yu, and **A. Gunawan**, "Vehicle Routing Problem with Parcel Locker and Public Transportation: Goods delivery using Mass-Rapid-Transit System", proceedings of the 17th International Congress on Logistics and SCM Systems (ICLS 2023), 9 - 12 August 2023, Seoul, South Korea - abstract

[Nguyen et al., 2023b] P.K.M. Nguyen, **A. Gunawan**, V.F. Yu, and M. Misir, "An Adaptive Large Neighborhood Search for Heterogeneous Vehicle Routing Problem with Time Windows", proceedings of the 19th Annual IEEE International Conference on Automation Science and Engineering (IEEE CASE 2023), 26 - 30 August 2023, Auckland, New Zealand

[Peng et al., 2019] G. Peng, R. Dewil, C. Verbeeck, **A. Gunawan**, L. Xing, and P. Vansteenwegen, "Agile Earth Observation Satellite Scheduling: an Orienteering Problem with Time-Dependent Profits and Travel Times", Computers and Operations Research, vol. 111, pp. 84 - 98, 2019

[Peng et al., 2020] G. Peng, G. Song, L. Xing, **A. Gunawan** and P. Vansteenwegen, "An Exact Algorithm for Agile Earth Observation Satellite Scheduling with Time-Dependent Profits", Computers and Operations Research, vol. 120, 2020, 104946

[Prasetia et al., 2020] A.C.G. Prasetia, I.-L. Wang and **A. Gunawan**, "Optimal Collaborative Path Planning for Unmanned Surface Vehicles Carried by a Parent Boat Along a Planned Route", International Journal of Operations Research, vol. 17 (4), pp. 101 - 116, 2020

[Putra et al., 2020] K. Putra, V.F. Yu, I.G.B.B. Dharma and **A. Gunawan**, "Two-Echelon Vehicle Routing Problem with Occasional Drivers. proceedings of the 1st International Conference on Intelligent Production and Operations (IPO 2020), 19 - 21 June 2020, Taipei, Taiwan – abstract

[Rasyid et al., 2020] M.F. Rasyid, V.F. Yu, B.M. Sopha and **A. Gunawan**, "Vehicle Routing Problem with Parcel Locker Sharing in a Collaborative Environment, proceedings of the 1st International Conference on Intelligent Production and Operations (IPO 2020), 19 - 21 June 2020, Taipei, Taiwan – abstract

[Rogers and Tibben-Lembke, 1999] D. Rogers and R. Tibben-Lembke (1999), "Going backwards: reverse logistics trends and practices", vol. 2. Pittsburgh, PA: Reverse Logistics Executive Council.

[Tan et al., 2021] K. W. Tan, B. K. Goh and **A. Gunawan**, "Redesigning Patient Flow in Paediatric Eye Clinic for Pandemic using Simulation", proceedings of the IEEE International Smart Cities Conference 2021 (ISC2 2021), 7 - 10 September 2021 (virtual)

[Vansteenwegen and Gunawan, 2019] P. Vansteenwegen, and **A. Gunawan**, "Orienteering Problems - Models and Algorithms for Vehicle Routing Problems with Profits", EURO Advanced Tutorials on Operational Research, Springer Link, 2019, DOI: 10.1007/978-3-030-29746-6

[Vansteenwegen et al., 2011] P. Vansteenwegen, W. Souffriau and D.V. Oudheusden (2011), "The Orienteering Problem: A Survey", European Journal of Operational Research, vol. 209 (1), pp. 1-10

[Widjaja et al., 2020a] A.T. Widjaja, L. Wang, N.T. Truong, **A. Gunawan** and E.-P. Lim, "Next-Term Grade Prediction: A Machine Learning Approach", proceedings of Educational Data Mining 2020 (EDM 2020), 10 - 13 June 2020, Morocco (fully virtual conference) - Poster

[Widjaja et al., 2020b] A.T. Widjaja, **A. Gunawan**, P. Jodiawan and V.F. Yu, "Incorporating a reverse logistics scheme in a vehicle routing problem with cross-docking", proceedings of 2020 IEEE 7th International Conference on Industrial Engineering and Applications (ICIEA 2020), 16 - 18 April 2020, Bangkok, Thailand (Best Presenter Award)

[Widjaja et al., 2021] A.T. Widjaja, E.-P. Lim, and **A. Gunawan**, "On Analysing Student Resilience in Higher Education programs using a Data-Driven Approach", proceedings of the IEEE International Conference on Teaching, Assessment, and Learning for Engineering (TALE 2021), 5 - 8 December 2021, Wuhan, China

[Yan and Tang, 2009] H. Yan and S.L. Tang (2009), "Pre-distribution and post-distribution cross-docking operations", Transportation Research Part E: Logistics and Transportation Review, vol. 45(6), pp. 843-859

[Yu et al., 2018] V.F. Yu, H.-I Ting, Winarno, S.-W Lin and **A. Gunawan**, "Optimizing a 2-Echelon Distribution System with Temporary Intermediate Facilities", proceedings of the 29th European Conference on Operational Research (EURO 2018), 8 July - 11 July 2018, Valencia, Spain – abstract

[Yu et al., 2019] V.F. Yu, P. Jewpanya, A.A.N.P. Redi and **A. Gunawan**, “Selective Discrete Particle Swarm Optimization for Team Orienteering Problem with Time Windows and Partial Scores”, Computers & Industrial Engineering, vol. 138, 2019, 106084

[Yu et al., 2020] V.F. Yu, Winarno, S.-W. Lin and **A. Gunawan**, “Design of a Two-Echelon Freight Distribution System in an Urban Area considering Third-Party Logistics and Loading-Unloading Zones”, Applied Soft Computing, vol. 97, part B, 2020, 106707

[Yu et al., 2021a] V.F. Yu, P. Jodiawan, and **A. Gunawan**, “Design of a Two-Echelon Freight Distribution System in Last-Mile Logistics considering Covering Locations and Occasional Drivers”, Transportation Research Part E: Logistics and Transportation Review, vol. 154, October 2021, 102461

[Yu et al., 2021b] V.F. Yu, P. Jodiawan, and **A. Gunawan**, “An Adaptive Large Neighborhood Search for the Green Mixed Fleet Vehicle Routing Problem with Realistic Energy Consumption and Partial Recharges”, Applied Soft Computing, 2021, 107251

[Yu et al., 2021c] V.F. Yu, A.T. Widjaja, **A. Gunawan**, and P. Vansteenwegen, “The Multi-Vehicle Cycle Inventory Routing Problem: Formulation and a Metaheuristic Approach”, Computers and Industrial Engineering, 2021, 107320, DOI: 10.1016/j.cie.2021.107320

[Yu et al., 2021d] V.F. Yu, G. Aloina, P. Jodiawan, **A. Gunawan**, and T.-C. Huang, “Solving the Vehicle Routing Problem with Simultaneous Pickup and Delivery and Occasional Drivers by Simulated Annealing”, proceedings of the 2021 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM 2021) - abstract, 13 - 16 December 2021, Singapore – abstract

[Yu et al., 2023] V.F. Yu, G. Aloina, P. Jodiawan, **A. Gunawan**, and T.-C. Huang, "The Vehicle Routing Problem with Simultaneous Pickup and Delivery and Occasional Drivers", Expert Systems with Applications, vol. 214, pp. 119118, 2023

[Yu et al., 2024a] V.F. Yu, N.Y. Salsabila, S.-W. Lin, and **A. Gunawan**, “Simulated Annealing with Reinforcement Learning for the Set Team Orienteering Problem with Time Windows”, Expert Systems with Applications, 2024

[Yu et al., 2024b] V.F. Yu, P.T. Anh, **A. Gunawan**, and H. Han, “Simulated Annealing with Variable Neighborhood Descent approach for the Heterogeneous Fleet Vehicle Routing Problem with Multiple Forward/Reverse Cross-Docks”, Expert Systems with Applications, vol. 237, Part C, 121631, 1 March 2024

[Zhu et al., 2021] J. Zhu, **A. Gunawan** and K.M Ng, “The Capacitated Team Orienteering Problem”, submitted to the 13th International Conference on the Practice and Theory of Automated Timetabling (PATAT 2021), 24 - 27 August 2021, Bruges, Belgium - short paper