Jonathan Edward Teo

INTRODUCTION

Hi! I'm J.E.T.

Singapore Management University

Bachelor of Science (Computer Science)

Track: Artificial Intelligence

BACKGROUND

- SCIS Achievements Scholarship Holder
- Graduated from Dunman High School in 2019
- Dean’s List for 2023, 2024

MYSELF IN THREE WORDS

Workaholic | Passionate | Self-Starter

MY INTERESTS

AI & Algorithms Research | Data Analysis Research

More About Me

Dec 2021 - Jul 2022

DATA SCIENCE INTERN — BOSCH

- Developed machine learning models for a research project on car air-conditioning filters

Feb 2023 - Jul 2023

RESEARCH ASSISTANTSHIP — SMU Singapore Management University

Text Analytics & Social Network Analysis

- Analysed relationships of weekly class reflections of students and academic performance
- Analysed relationships of student's peer helping behaviours and academic performance (Presented Proceedings Paper)
- Published at **IEEE TALE 2023** and won **Best Paper Award**

May 2023 - Aug 2023

FULLSTACK DEVELOPER INTERN — Continental

- Developed a driver trip-logging web application used in GoAhead Singapore's bus driver safety.

Aug 2023 - Apr 2024

RESEARCH ASSISTANTSHIP — SMU Singapore Management University

Text-to-Speech Development

- Create a Singlish-Speaking model through finetuning Microsoft's SpeechT5

May 2024 - Aug 2024

A-STAR RESEARCH INTERN — Agency for Science, Technology and Research, Singapore

Advancing Quantum Optimal Control with Deep Reinforcement Learning

- Environmental Noise makes quantum calculations unreliable.
- Analysed how different reward functions and control pulse shapes affect learning rate of the RL agent.

Aug 2024 - Present

RESEARCH ASSISTANTSHIP — SMU Singapore Management University

Quantum Reinforcement Learning for Combinatorial Optimization

- QRL has been shown recently to achieve good performance on small scale TSP instances (sizes <= 15) with a significant reduction in parameters.
- We aim to contribute to the literature by increasing TSP sizes possible with QRL.

Aug 2024 - Present

ACM ICPC — icpc.foundation

Team BogoSort (representing SMU)

- Achieved High Honour at Hanoi Regionals 2024
- Participated in the Asia Pacific Championship 2025

SMU Undergraduate Research Programme

Quantum Reinforcement Learning for Combinatorial Optimization | Aug 2024 - Present

RESEARCH AIM

Context:

- Investigate **Quantum Reinforcement Learning approaches** to approximating **Combinatorial Optimization problems**
- QRL has a scalability issue: Time complexity is $O\left(2^n\right)$, where n is the number of qubits.

My role:

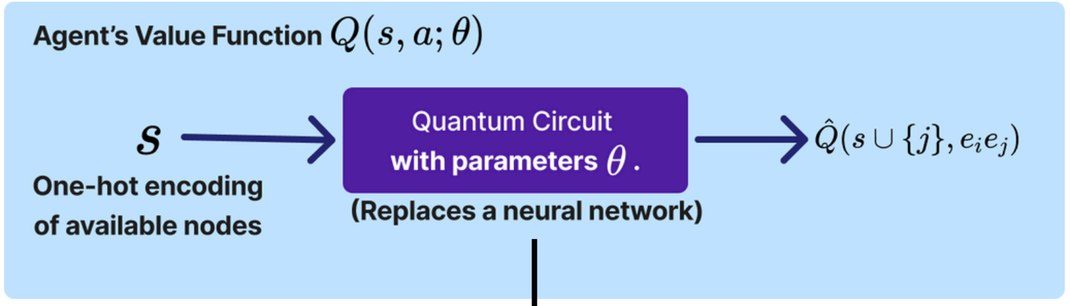
- Propose a QRL method for moderate **Travelling Salesman Problem to about 30 - 50 nodes**.
- Improve **explainability for QRL circuit structures.**

PROGRESS

- Modify the current **state of the art ansatz design** as a form of ablation experiments on the performance of the RL agent as a better understanding of what gates are crucial for good RL performance.

PROJECT ILLUSTRATION

- The classical neural network representing the agent's policy function is replaced by a **Parameterized Quantum Circuit,** which **significantly reduces number of trainable parameters.**



The **ansatz** refers to the underlying circuit design, which is a sequence of gate operations on a system of qubits.

A*STAR Research Intern

Quantum Optimal Control, Reinforcement Learning | May 2024 - Aug 2024

RESEARCH AIM

Research aim:

- To improve fidelity of quantum calculations for single qubit gates with environmental noise.

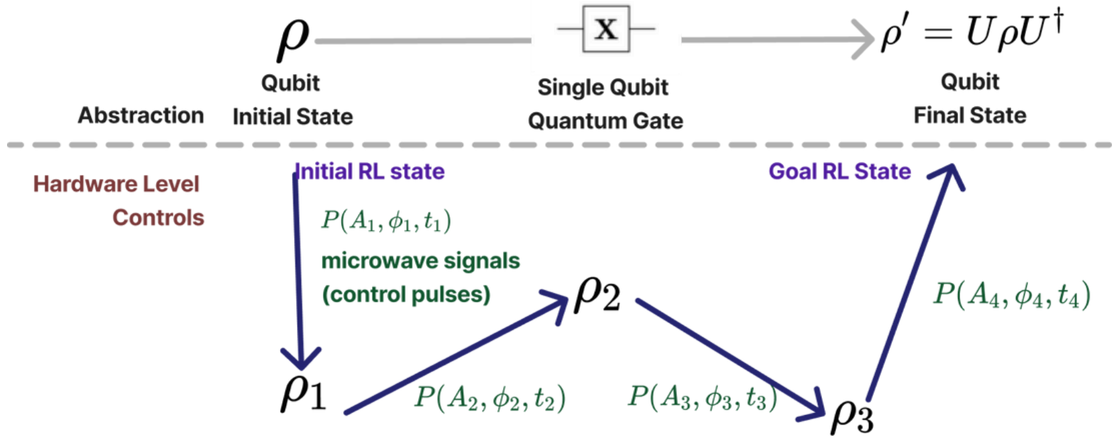
My role:

- Control pulses that act on qubits are abstracted in the form of quantum gates.
- Use **Deep Reinforcement Learning** to learn parameters of a **control pulse** to simulate a gate operation.

MY CONTRIBUTION

- Proposed a **new action space** where the agent learns parameters of **different pulse waveforms and pulse durations**, accelerating learning of an RL agent
- Explored different **DRL** algorithms such as Proximal Policy Optimization, and Temporal Difference Learning
- Improved learning rate using different reward designs to penalize longer pulse durations.

PROJECT OVERVIEW



Research Assistantship

Text Analytics (Natural Language Processing) | Feb 2023 - Apr 2023

RESEARCH AIM & MY ROLE

Research aim:

- Aimed to find if **weekly student reflections on the class** can **identify struggling students** within the cohort

My role:

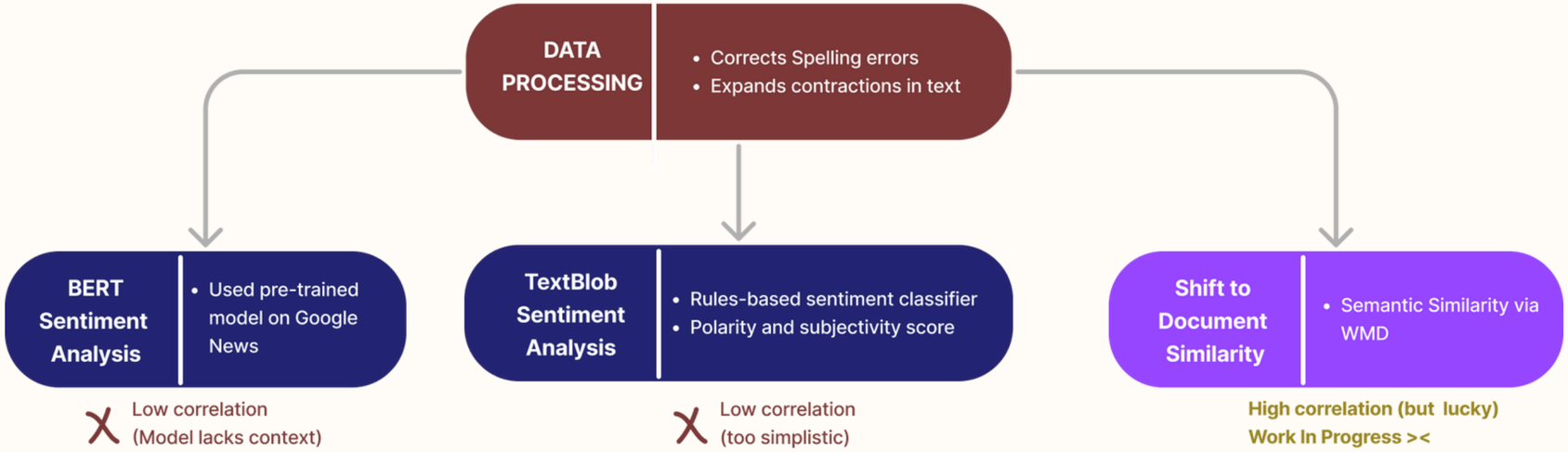
- Do sentiment analysis on the textual data to explore correlations with actual class satisfaction

Weekly Class survey

Q8: Rate learning experience of class

Q11: What topic/activity did you find challenging?

Q12: How to improve learning experience?



Research Assistantship

Social Network Analysis | Apr 2023 - Jun 2023

RESEARCH AIM & MY ROLE

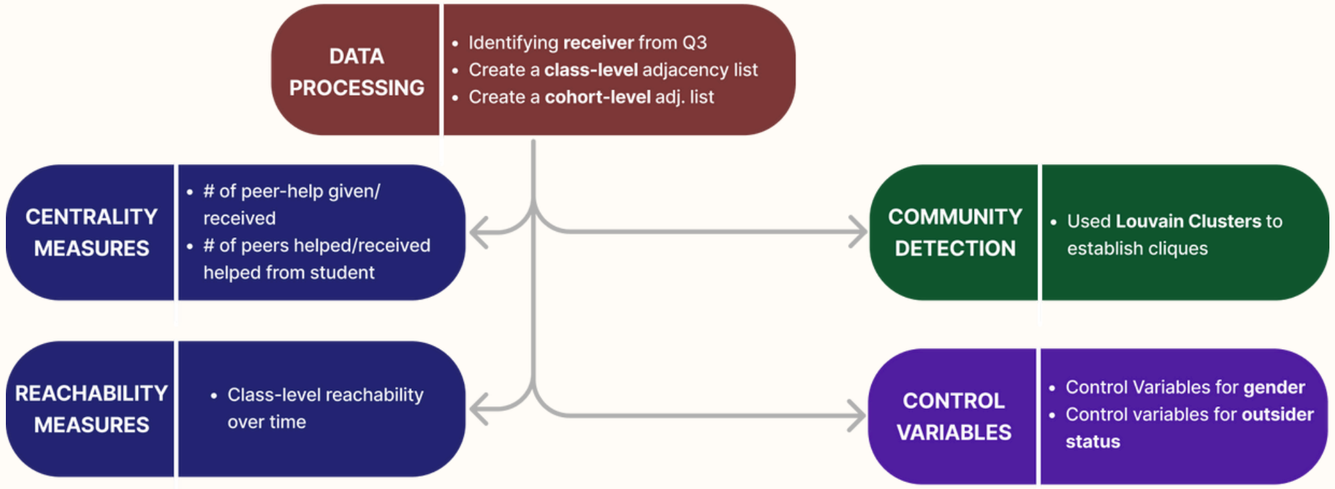
Research aim:

- To explore if **peer helping** has any influence on academic performance

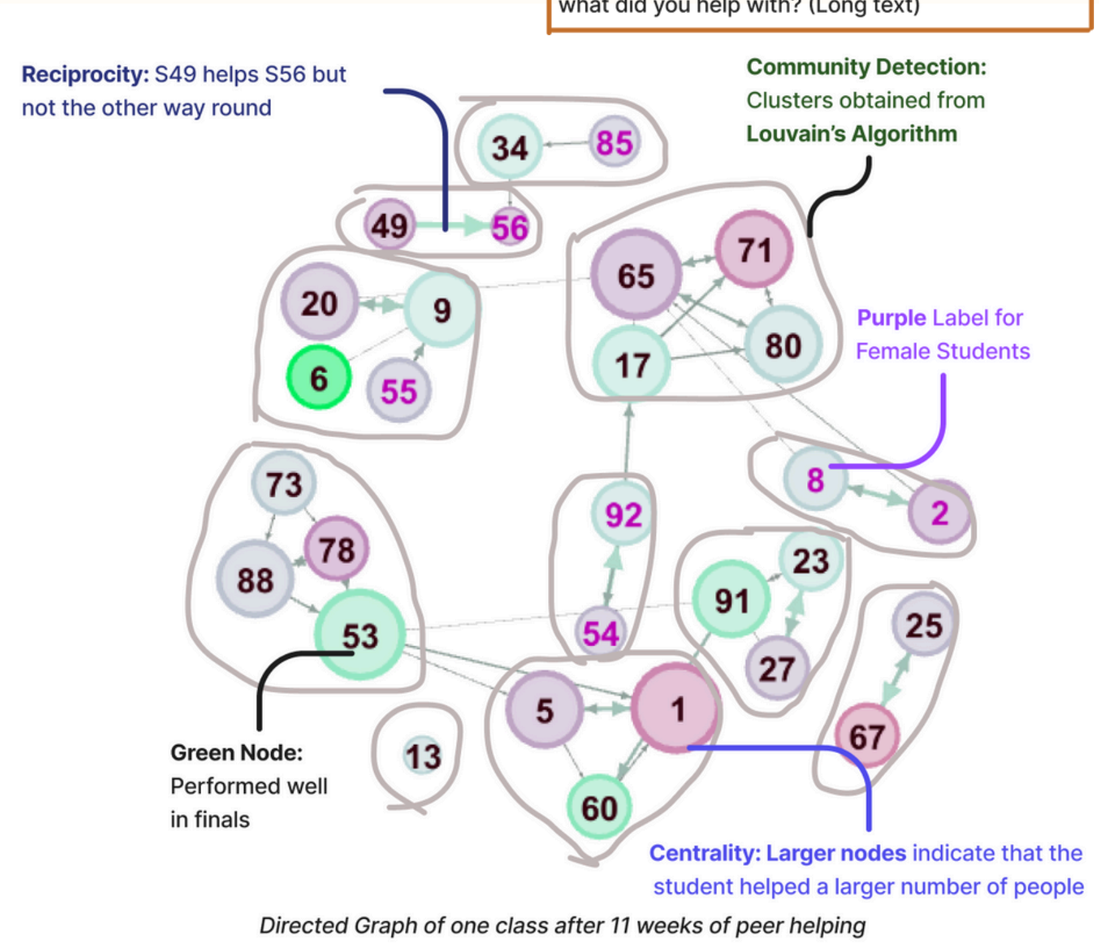
My role:

- Perform **social network analysis** to explore correlations with their final performance

METHODOLOGY



Weekly Class survey
Q2: Did you help a friend? (Answer: Yes/No)
Q3: If you did, which student did you help and what did you help with? (Long text)



Directed Graph of one class after 11 weeks of peer helping

Research Assistantship

Social Network Analysis | Apr 2023 - Jun 2023

RESEARCH AIM & MY ROLE

Research aim:

- To explore **peer helping** has any influence on academic performance

My role:

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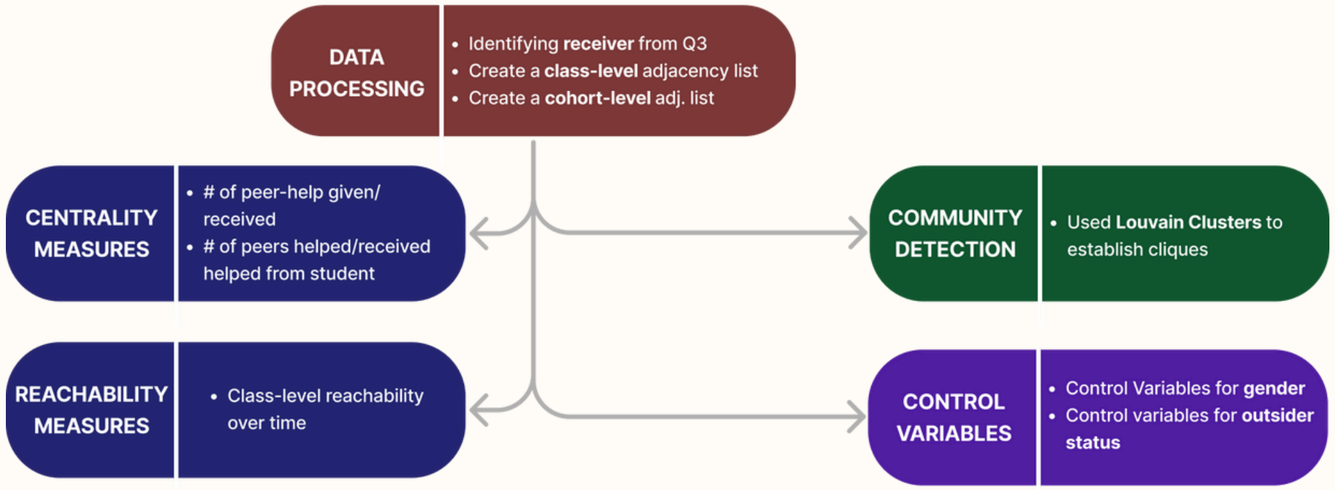
METHODOLOGY



WHAT I GAINED

- Technical Skills: **NetworkX**, and Gephi (Visualisation Tool), **Centrality, Community Detection Methods**
- Learn how to **analyse with a tight deadline**
- Learn how to collaborate in a team of different expertise

AWARDS

- **Co-authored** the publication at IEEE TALE 2023
- Achieved **Best Conference Paper Award!**

Research Assistantship

Text to Speech Synthesis | Aug 2023 - Present

RESEARCH AIM & MY ROLE

Two Research aims with different applications:

- Using VR to **simulate common scenarios** for Parkinson caregivers
- highlighting **sensitive to mispronunciations** by Singaporeans at the phoneme level

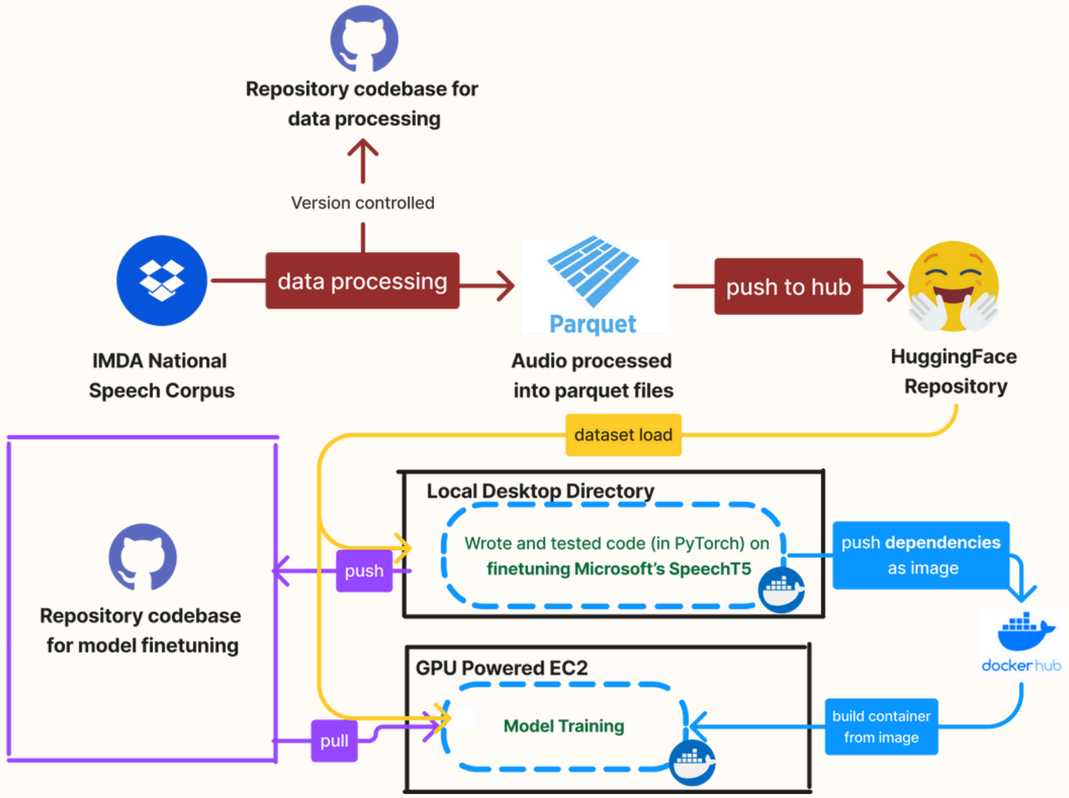
My role:

- Create a **Singaporean-sounding** model
- Improve it to **engage in conversation** (emotional TTS)

WHAT I GAINED

- **Model Development Pipeline** with large datasets
- The **use of finetuning** a pretrained model (SpeechT5)
- **Processing** unstructured data

MODEL DEVELOPMENT WORKFLOW



Data Science Intern

BOSCH SEA Corporate Research | Dec 2021 - July 2022

MY ROLE

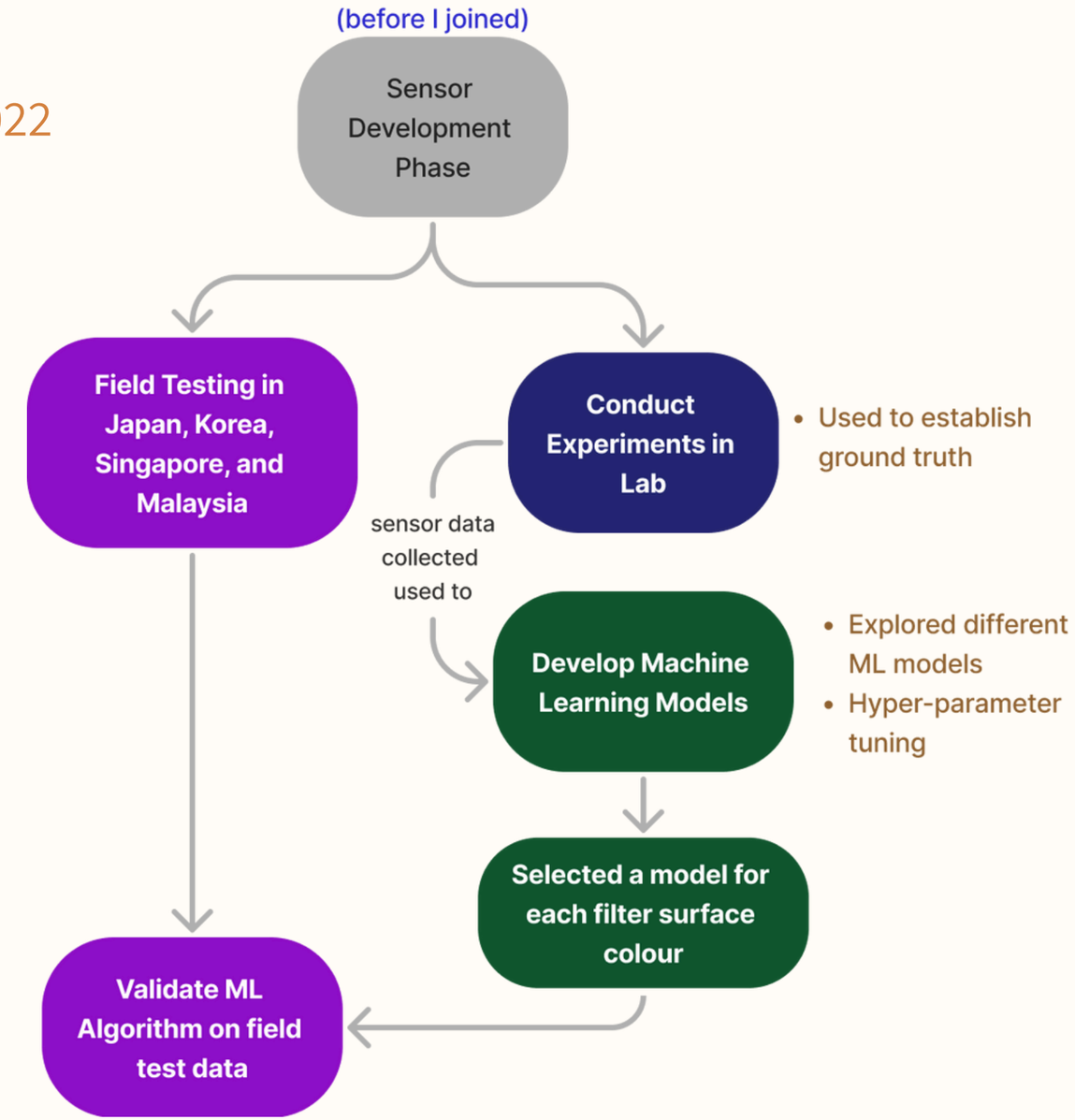
- Attached to a research project on car aircon filters
- Provided machine learning and data analysis support
  - Conducted project based experiments
  - Sensor data collected is used for machine learning model development
  - Help to visualise and interpret field test and lab data
- Prepared slide decks and pitched biweekly technical updates to internal stakeholders

WHAT I GAINED

- **Standard machine learning development process**
- Machine Learning is **NOT magic!**
- Became more quantitative and precise when I speak
- Proficiency in **Python, ScikitLearn and Data Processing**

IN RETROSPECT...

- **ML practices:** Dev and test data distributions are different!
- No concrete way to get pressure of field test data (we had to eyeball)



Data Science Intern

BOSCH SEA Corporate Research | Dec 2021 - July 2022

MODEL DEVELOPMENT & SELECTION PROCESS