



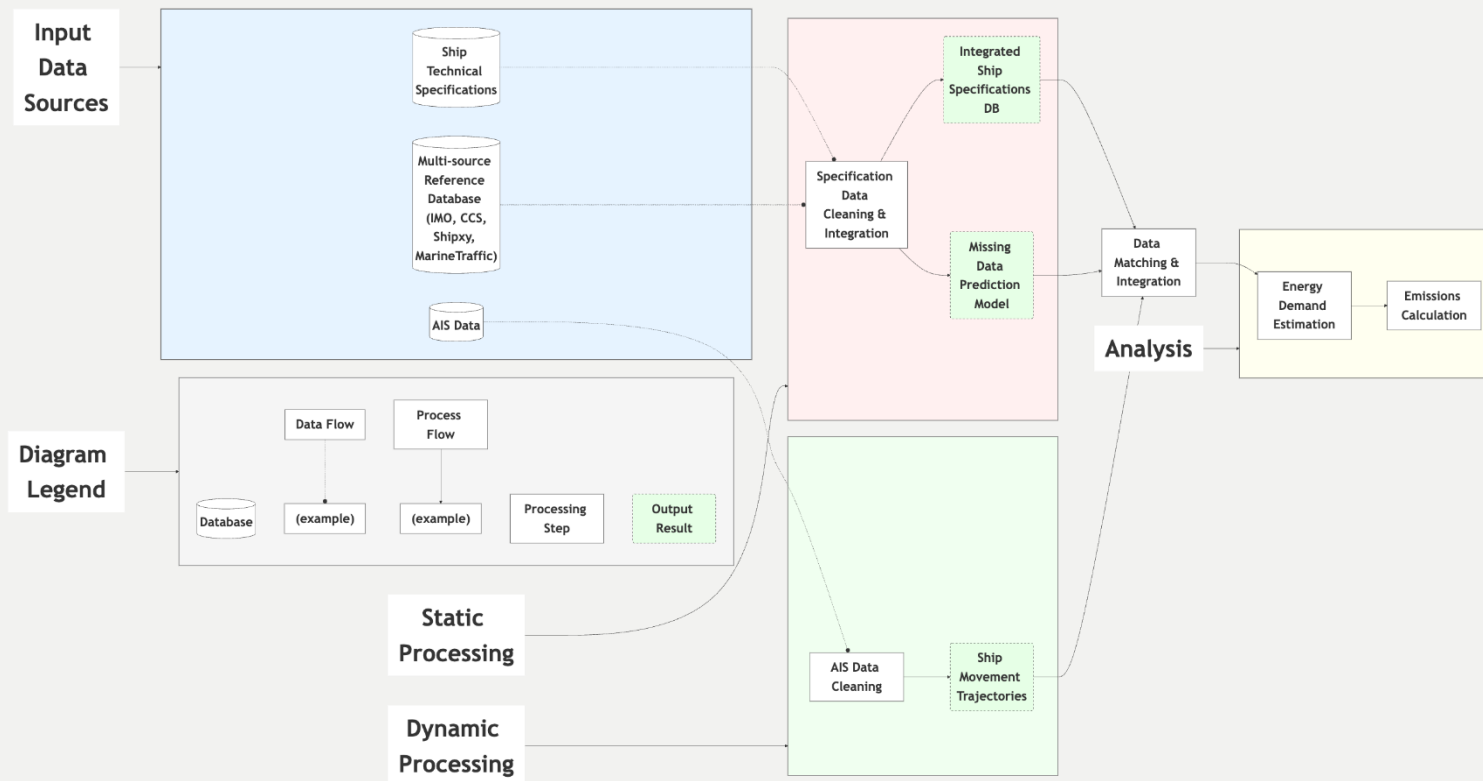
Implications and Way Forward of HKUST Shipping Emissions Research Project

Jiajing CHEN
PhD Student

Supervisor: Prof. Alexis Lau

Co-supervisor: Prof. Jimmy Chan

Research

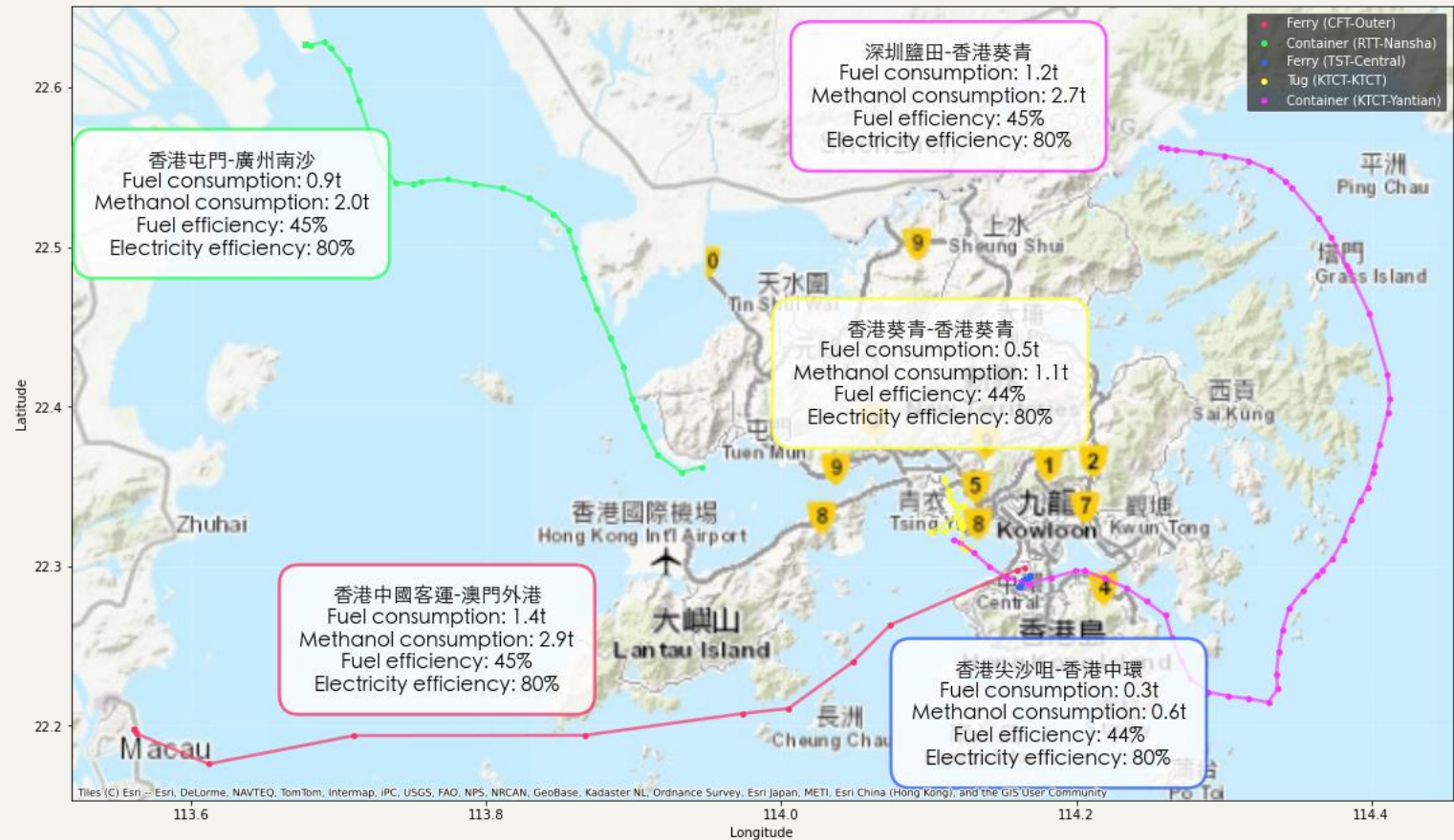


1. HKUST's Shipping Emissions Management System

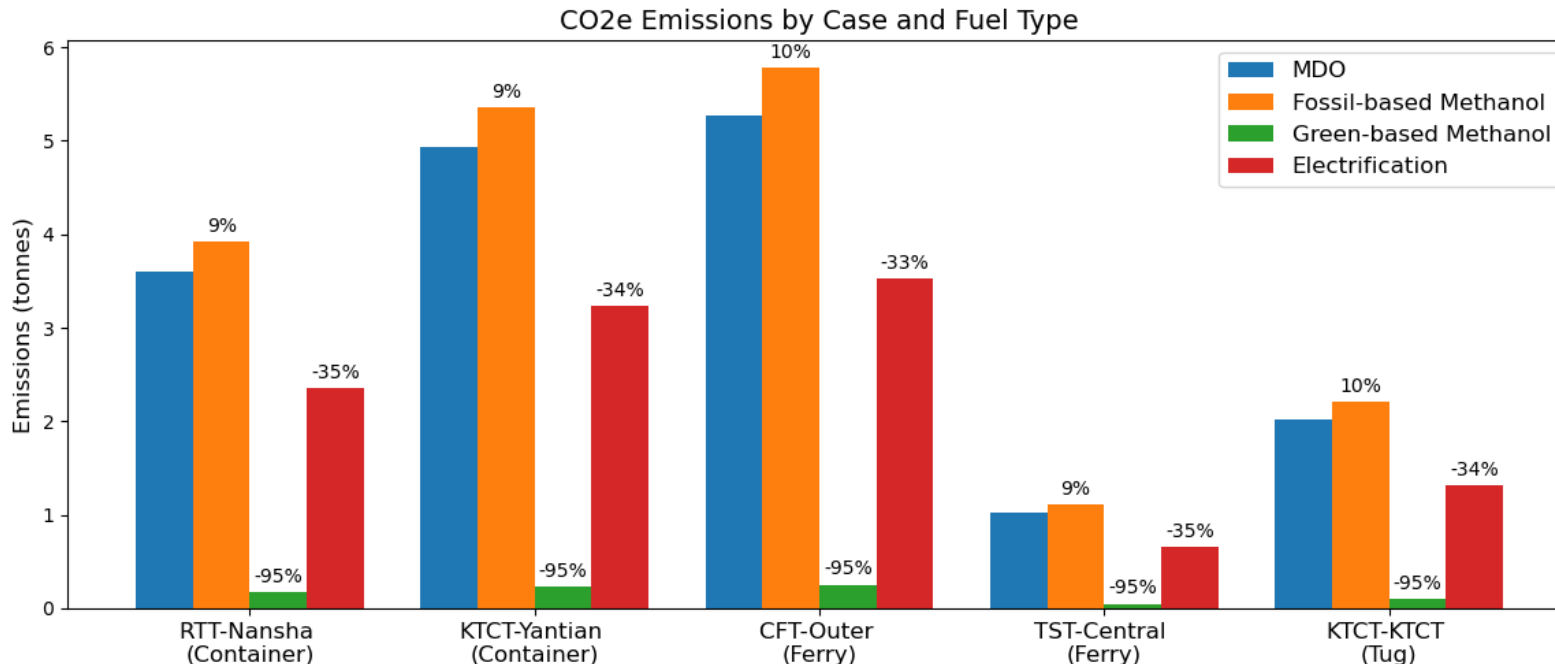
- Synthesizes **diverse data sources** into a unified analytical system
- Employs **machine learning** algo to interpolate missing values
- Implements **categorization schemes**
- Assess **health-related** outcomes and implications
- Uses specialized computational methods for **corridor-based data mining**

2. Case Study: (a) Energy demand and fuel consumption

- 5 high-traffic routes, encompassing 3 common vessel types
- Energy demand of methanol is ~double that of conventional fuels
- Electric motor offers higher energy transmission rate compared to internal combustion engines



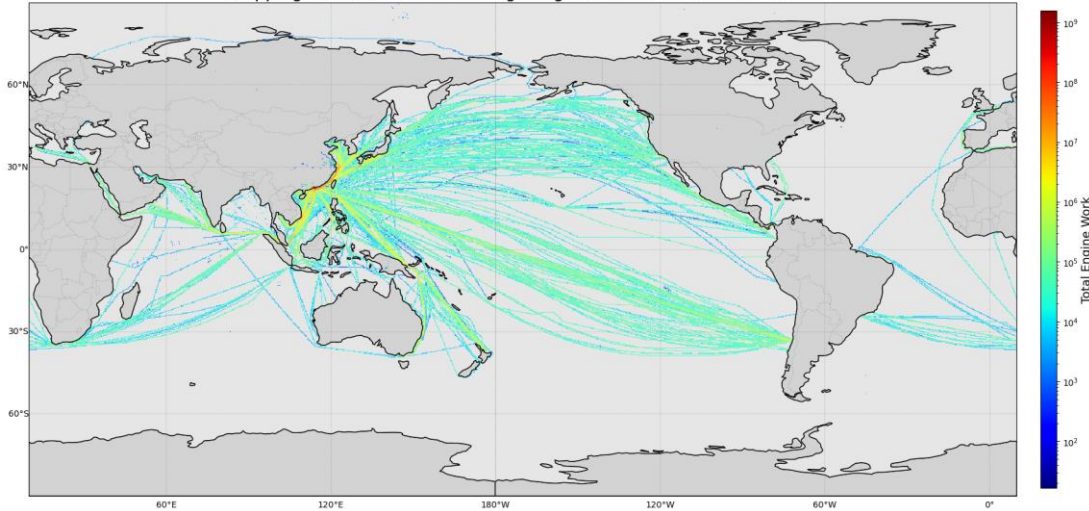
Case Study: (b) Carbon Footprint



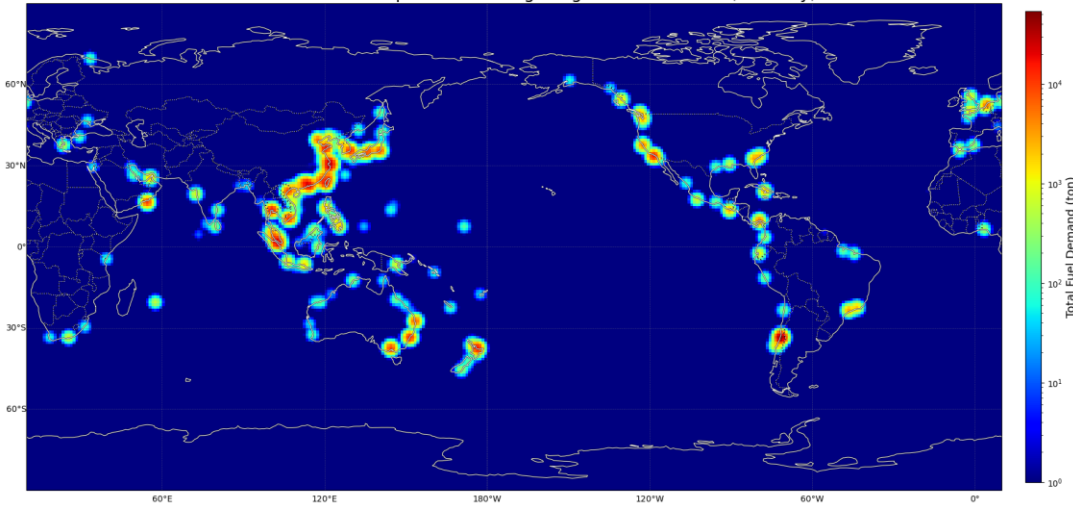
- **CFT-Outer Ferry** shows highest emissions, followed by **KTCT-Yantian and RTT-Nansha container routes**, while **local routes** (ferry and tugboat) have lower emissions.
- **Green methanol** shows 95% emission reduction across all vessel types, while **electrification** achieves 33-35% reduction based on today's fuel mix (HK has plans for cleaner fuel mix by 2030s). **Fossil-based methanol** increases emissions by 9-10%

3. Energy Needs: Routes to/from Hong Kong (per 2021)

Shipping Activities between Hong Kong and Other Cities in the World



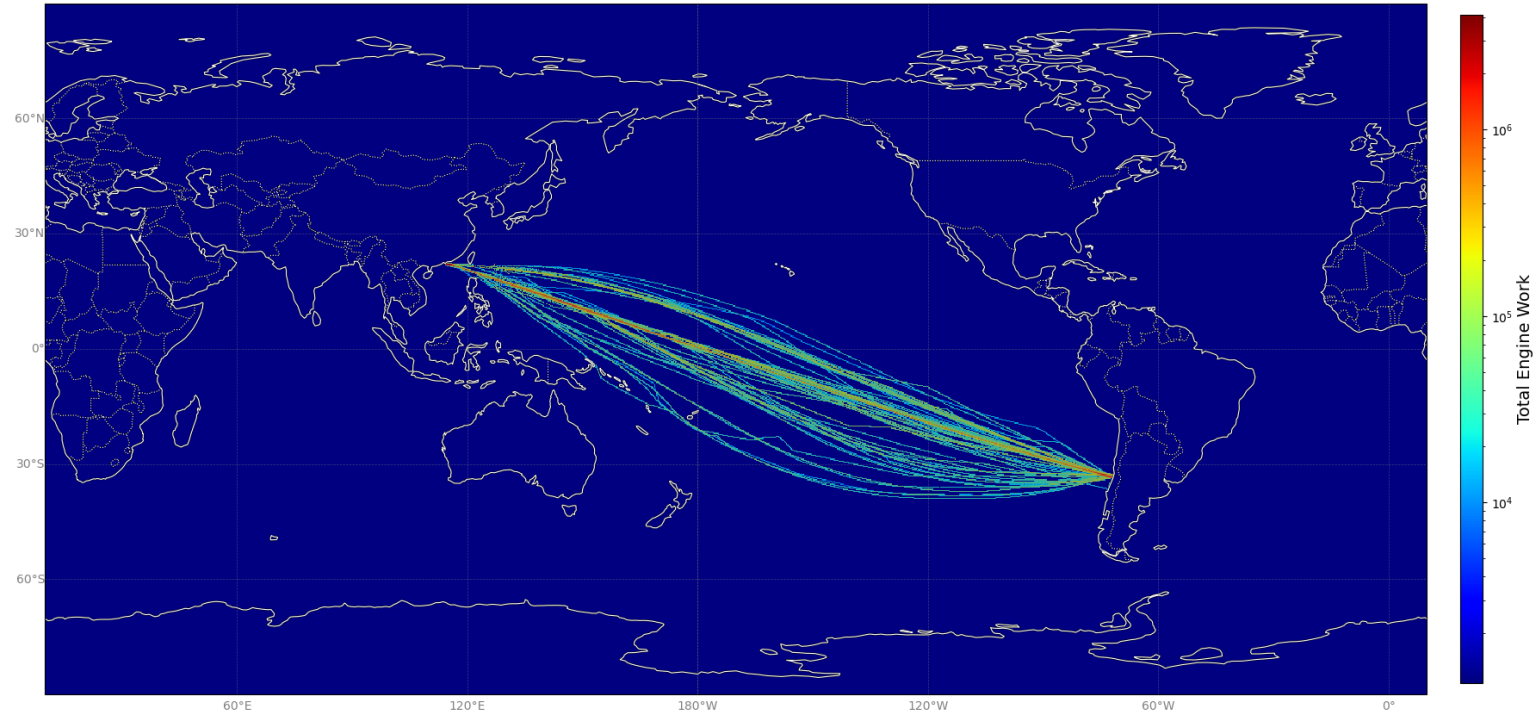
Fuel Demand Heatmap between Hong Kong and Other Cities (Two-Way)



Routes Name (Two-Way)	Country	Total Voyage Counts	Total Ship Counts	Average Voyage Days	Estimated Fuel Demand (ton)
San Antonio	Chile	52	29	23.3	243,725
Singapore	Singapore	1091	489	4.9	157,883
Tauranga	New Zealand	58	33	13.0	102,845
Laem Chabang	Thailand	907	192	4.5	100,968
Ningbo	China	484	267	3.9	98,663
Qingdao	China	443	202	4.3	98,511
Kaohsiung	Taiwan, China	2075	508	1.6	97,693
Shanghai	China	863	308	3.7	97,247
Valparaiso	Chile	20	13	22.9	93,506
Sydney	Australia	63	19	13.0	87,943

Corridor Consideration between Hong Kong-Chile

- Average cruising similar across all ship sizes/routes (23 to 25 days)
- Container ships (100,000-139,999 DWT capacity) consume most fuel per journey
- Hong Kong-San Antonio route for large ships has highest total fuel consumption, accounting for more than 70%



- **Hong Kong – San Antonio (#1)**
- **Hong Kong – Valparaiso (#7)**



Thank you for listening !

CHEN Jiajing

jchenhl@connect.ust.hk