In recent years, ride-sharing has been an alternative to public transportation or private car rental for commuters in countries around the world. It is believed that ride-sharing is a way to alleviate traffic congestion and reduce air pollution caused by vehicles. However, Hong Kong, as a world-class city which is suffering from traffic congestion, has not exploited the benefits of ride-sharing. One possible reason for this is the absence of an extensively used ride-sharing mobile application in Hong Kong up to this date.

In an effort to increase the popularity of ride-sharing in Hong Kong, this project aimed to design and implement a fully-featured handy ride sharing mobile application for Android and iOS platform and related web services which adapted matching algorithms from cutting-edge research. Two algorithms were implemented and evaluated using real-world test cases and a virtual grid world simulator in this project.

### Methodology

#### Algorithm 1: Simple Greedy Algorithm

- **Input:** Requests \( R \), Vehicles \( V \), Locations \( C \)
- **Output:** Requests \( R' \) that cannot be matched
- **Steps:**
  1. \( C = \{ (r, d) \mid r \in R, d \in V \} \)
  2. Sort \( C \) in ascending order by straight-line distance from origin to destination
  3. \( M = \{ (r, d) \mid r \text{ and } d \text{ satisfy } 2 \text{ where } c = (r, d) \} \)
  4. \( R' = \{ r \mid r \in R \land (r, M) \in M \} \)
  5. Remove \( M \), \( R' \)

#### Algorithm 2: Dynamic Algorithm

- **Input:** Requests \( R \), Vehicles \( V \), Locations \( C \)
- **Output:** Requests \( R' \) that cannot be matched
- **Steps:**
  1. \( C = \{ (r, d) \mid r \in R, d \in V \} \)
  2. Sort \( C \) in ascending order by straight-line distance from origin to destination
  3. \( M = \{ (r, d) \mid r \text{ and } d \text{ satisfy } 2 \text{ where } c = (r, d) \} \)
  4. \( R' = \{ r \mid r \in R \land (r, M) \in M \} \)
  5. Remove \( M \), \( R' \)

### Experiments and Results

The results show that the dynamic algorithm has a better performance in general compared to the greedy algorithm. This project has created a free-of-change and usable ride-sharing app.

In the future, the mobile application can be fine-tuned to production ready and be published to iOS App Store and Android Play Store. In addition, the UI/UX of the mobile application and the time efficiency of the matching algorithm can also be improved.

### References