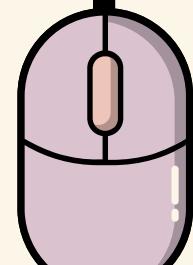
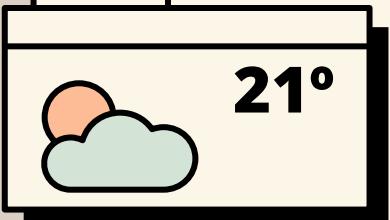
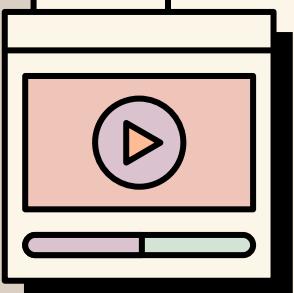


# Final Project Updates

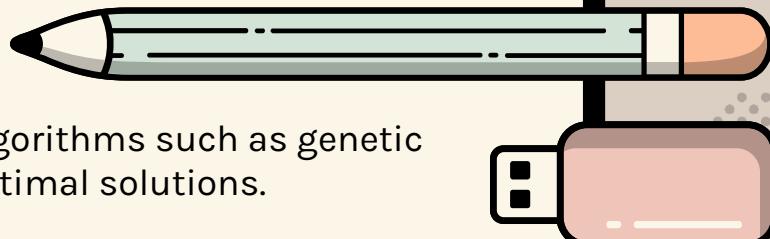
--Yinuo Xu, Junyi Pan



# Methodology



## Different Algorithms



**Heuristic Algorithms:** Use heuristic algorithms such as genetic algorithms to quickly generate near-optimal solutions.

**Local Search:** 2-opt or 3-opt to improve existing routes by iteratively swapping edges to reduce total distance



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# What we finished .....

- Heuristic Algorithm
  - Genetic Algorithm
- Idea
  - Chromosomes with a number of genes
    - encoded decision
    - Randomly generated tracks with random routes
  - Crossover
    - Swap parent genes
    - Alternating edges crossover

p1 (5 1 7 8 4 9 6 2 3)  
p2 (3 6 2 5 1 9 8 4 7)  
c (5 1 9 6 2 3 ...)
  - Mutation





# What we plan for next phrase?

## Parallel Small task

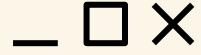


- Parallelize by using tbb::parallel\_for to generate a subset of the total number of chromosomes concurrently
- Apply parallelism to the cost calculation which is independent of others.
- Make sure each subset of cost can be processed concurrently by different threads or tasks, like tbb::parallel\_reduce or \_for

## Parallel Data Structure



- Utilize concurrent data structures from Intel TBB, like tbb::concurrent\_vector
- Store or share solution and subsets of chromosomes accessed by multiple threads.



# Speed UP - OSRM

- The Open Source Routing Machine (OSRM) is a high-performance routing engine designed to efficiently compute shortest paths and travel distances between locations.
- It offers an API for querying routing information, including distances, travel times, and optimized routes. OSRM is open-source, actively maintained, and optimized for performance.

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- We could use in the crossover step to select a subset of genes from the parents for recombination.
  - It is efficient to deal with a large number of locations and optimize the vehicle routes by using preprocessed road network data
  - Integration of ORSM could reduce the computational overhead and faster the execution times.



# Reference

[https://www.researchgate.net/publication/268043232\\_Comparison\\_of\\_eight\\_evolutionary\\_crossover\\_operators\\_for\\_the\\_vehicle\\_routing\\_problem](https://www.researchgate.net/publication/268043232_Comparison_of_eight_evolutionary_crossover_operators_for_the_vehicle_routing_problem)

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