# OPTIROUTES - Deliver with Ease Optimal Delivery Route System Using TSP Algorithms

Team 3 - Algo Wizards

CPSC 535: Advanced Algorithms (Fall 2023)
Project 5

#### Team Members & Roles

**GUI Developers - Anthony Martinez & James Kim** 

Algorithm Specialists - Param Venkat Vivek Kesireddy, Anshika Khandelwal & Pravallika Bahadur

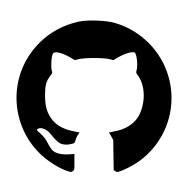
API integration Experts - Anthony Martinez & James Kim

Testing Lead - Rishitha Bathini

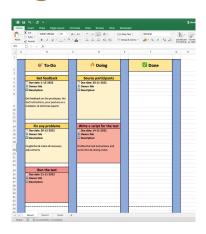
Documentation Lead - Tejashwa Tiwari

Project Coordinator - Param Venkat Vivek Kesireddy

#### Software Development & Project Management







We used Kanban & GitHub - They offer a complete solution for software development teams, enabling team members to work more productively, maintain order, and produce high-quality software.

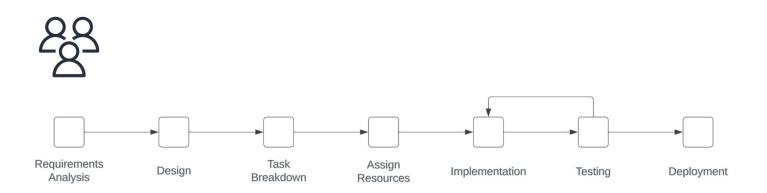
#### Introduction

- Welcome to our Delivery Route Optimization Project! Leveraging advanced algorithms such as Ant Colony Optimization, Genetic Algorithm, Brute Force TSP and Nearest Neighbour, we streamline delivery routes for efficiency.
- Users can input their choice of locations for delivery and the output is an optimized route to be followed. Data visualization has also been implemented.



### Objective & Overview

Optimize delivery routes to enhance operational efficiency, reduce transportation costs, and improve delivery timelines by using the key TSP algorithms.



## TSP Algorithms

SP algorithms can be used to optimize delivery routes, which can save businesses time and money.

There are many different TSP algorithms, each with its own strengths and weaknesses.

Nearest neighbor algorithm: This algorithm starts at a random city and visits the nearest unvisited city until all cities have been visited.

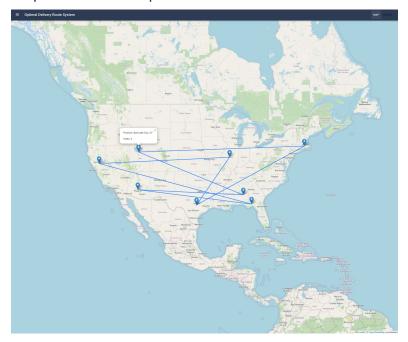
Genetic algorithms: These algorithms use principles of natural selection to evolve solutions to the TSP.

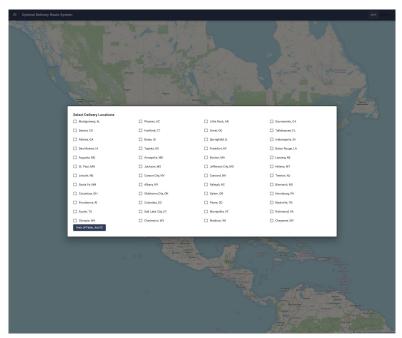
Ant colony optimization: This algorithm mimics the behavior of ants to find routes between cities.

The brute-force solution for the Traveling Salesperson Problem (TSP) involves generating all possible permutations of cities and calculating the total distance for each permutation.

## Integration with OSM Maps

We integrated the OpenStreetMap (OSM) maps into our Traveling Salesperson Problem (TSP) application to provide visual representations of routes.





## Target Users

The "Optimal Delivery Route System Using TSP Algorithms" is appealing to a wide range of people, including Delivery Managers, Delivery Personnel, Logistics Managers, Courier and Shipping Companies, Transportation Companies, E-commerce Platforms etc.

#### **Use Cases**

- E-commerce
- Food Delivery
- Pharmacy
- Courier Services
- Logistics
- Newspaper Delivery
- Transportation
- Construction
- Laundry Services



## Challenges

- Creating an easy-to-use interface was challenging. We had to create a straightforward layout for users to submit data, choose algorithms, and view results without becoming lost or confused.
- User testing is crucial for developing a valuable and user-friendly product. We must gather feedback and make modifications based on user preferences and pain spots to achieve this.
- Ensuring the correct operation of the implemented sorting algorithms is critical. To identify and fix any algorithmic flaws, we need to implement rigorous testing and debugging procedures.
- We employed project management tools like Kanban and others to keep the team organized and track activities, issues, and progress.
- Using the OSM maps needed quite a bit of research. We spent good amount of time to understand its working.

## Testing

- Verified that every UI component is operating as expected.
- Tested how the Flask server interacts with the front-end templates.
- Evaluated how well the system scales with an increasing number of delivery locations to ensure it remains efficient.
- Assess the system's performance by testing its response time and resource usage for different problem sizes and complexities.
- Verified that each optimization algorithm produces correct and optimal routes for sample data.
- Test the integration with the OSM Maps API to ensure accurate distance calculations.
- Thorough testing across these scenarios will helped us ensure the reliability, performance, and user-friendliness of the delivery route optimization application.

#### Conclusion

In conclusion, the Delivery Route Optimization project leverages advanced algorithms to revolutionize logistics and enhance operational efficiency. By addressing the complexities of route planning, the system ensures timely deliveries, minimizes transportation costs, and adapts to real-time conditions. With a user-friendly interface, scalability, and a range of features, this project significantly improves the delivery experience, making it a valuable asset for businesses across diverse industries.



## Thank you! Any Questions?

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