EDI SEM-6

DOCUMENT-1

CSA – Batch: 1

Group: 5

Student details:

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**Problem Statement**:

VEHICLE ROUTING PROBLEM.

**IDEAS we will be trying to implement in our website:**

1. Education: We can provide information about VRP, including its history, definition, mathematical formulation, and various algorithms used to solve it. Also include interactive visualizations to help users understand the concept better.
2. Demonstration: We can add demonstrations that allows users to input their own VRP instances and visualize the optimized solution.
3. VRP Variants: Adding one or more variants of VRP, such as VRP with time windows, VRP with stochastic demands, or VRP with multiple depots. You can provide information about these variants and also allow users to input instances and get optimized solutions.
4. User-Friendly Interface: Design the website with a user-friendly interface so that it's easy for users to navigate and use. Consider using responsive design so that the website works well on different devices, such as laptops, tablets, and smartphones.
5. Integration with Other Tools: Consider integrating the website with other tools, such as Google Maps, to display the optimized routes on a map. We can also consider integrating with other optimization algorithms or solvers to provide users with more options.
6. Data Visualization: Use data visualization techniques, such as charts and graphs, to help users understand the optimization results better. We will try to display various metrics, such as the total length of the routes, the number of vehicles used, and the total time taken.

**Algorithms we studied:**

1. Clarke-Wright Heuristic Algorithm:

The Clarke Wright heuristic is an algorithm used to solve the capacitated vehicle routing problem (CVRP), which is a variant of the vehicle routing problem. In the CVRP, each vehicle has a limited capacity, and the goal is to find the shortest route for each vehicle that visits all the customers and returns to the depot, while not exceeding the vehicle's capacity.

The Clarke Wright heuristic is a constructive heuristic that starts with an empty solution and iteratively adds customers to the routes until all customers have been served. The algorithm uses a savings matrix to calculate the potential cost savings that could be achieved by combining two routes. The customer pair with the highest savings is merged into a single route, and the process is repeated until all customers have been assigned to a route.

To use the Clarke Wright heuristic to solve the CVRP, you need to first create a savings matrix that represents the cost savings achieved by merging two routes. You then sort the matrix in descending order based on the savings values, and iteratively combine the two routes with the highest savings. The process is repeated until all customers have been assigned to a route, or until a stopping criterion is met. To ensure that the routes do not exceed the vehicle capacity, you need to check the total demand of each route before combining it with another route.