Optimization Challenge 2025

FINAL Round

In the final stage of the challenge, we focus on enhancing the deployment strategy for healthcare units by introducing additional fairness and reliability constraints. These new requirements address key issues in equitable and efficient service delivery.

Please note that in this final round, the second-stage problem involving the distribution of equipment from the depot to the deployed healthcare units will be disregarded. Furthermore, the public health authority has decided to deploy *at most* M healthcare units to serve N underserved communities across the country.

Fairness in Workload: To ensure balanced resource utilization, the absolute difference between the workloads (i.e., number of people served) of the most and least utilized healthcare units must not exceed a threshold α. You can compute α by first calculating the total demand (i.e., the total population summed over all communities), dividing it by the number of healthcare units M, and then taking 20% of that value (rounded to the nearest integer). This ensures that no unit is significantly over- or under-utilized compared to others.

Equity in Access: To avoid disadvantaging certain communities, the difference between the maximum and minimum travel distances experienced by any community must not exceed a threshold β. To compute β, examine the full distance matrix provided in the data and identify the largest entry (i.e., the maximum possible distance between any two communities). Then, take 20% of this value. This constraint ensures that no community is forced to travel disproportionately farther than others to access healthcare services.

Your task is to extend your solution from Part 1 (i.e., the first-stage problem) to incorporate these additional fairness constraints. Your output should include:

- The deployment decisions for the healthcare units.
- The assignment of communities to deployed units.
- The difference in workloads between the most and least utilized healthcare units.
- The difference between the maximum and minimum distances traveled by any community.
- The maximum population-weighted distance traveled by any community.

To reduce the workload during the final round, you will not be required to solve all 24 instances. Instead, a designated subset of instances will be shared with all participants. You are expected to submit your solutions only for these selected instances.

Expected Deliverables

Please submit the following via email (opt-challenge@sabanciuniv.edu) by **10:00, Monday, May 19, 2025**:

1. Your code file(s).
2. A zip folder containing your solution files:

- A solution file for each instance you solve, strictly following the format provided in the "*Final Round Solution Template.txt*" (see the instances folder). Submissions that do not conform to this format will not be evaluated.
- Submit a separate solution file for each assigned instance, using the naming convention `Sol_Instance_ID`, where `ID` refers to the ID number of that instance. You are only responsible for the subset of instances that will be announced prior to the submission deadline.
- Each group must fill out the table provided in the *"Final Round Results Table.pptx"* (see the instances folder) and include this file within the zip folder submitted as part of their deliverables.

In addition, please submit a slide deck summarizing your solution approach and final round results table by **12:00 on the same day**.

Evaluation Criteria

Solutions will be evaluated based on their quality, measured by the following primary criterion:

- The maximum population-weighted distance traveled by any community (lower is better).

All submitted solutions must satisfy the fairness constraints defined by parameters α and β.