Business Report
Optimizing Accident & Emergency (A&E) Department Locations

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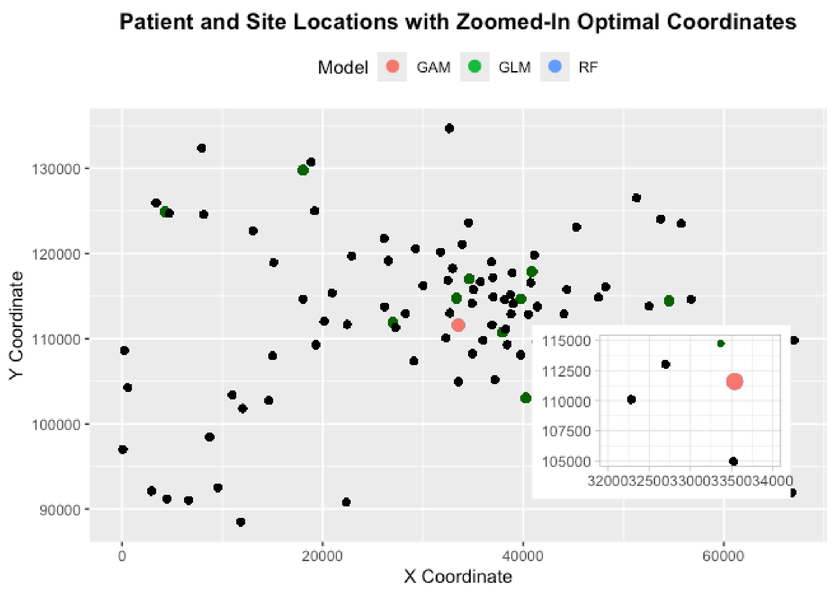
Introduction

This report presents the outcomes of the Undergraduate Operational Research Challenge for Public Health Scotland.
The project's goal was to **optimize** the **locations** for one or more **new A&E departments** to address patient wait times effectively.
Two distinct solutions were identified, each focusing on a unique objective:

Centrally Located A&E Department (Heuristic Approach)

Coordinates: (33537, 111593)



Objective: Reduce wait times and driving times for all patients uniformly across the region.

Key Insights: Location was selected using Linear, Poisson and Gamma models. It is designed to ease the pressure on all other departments.

Key Metrics:
- Average Wait Time Reduction: 28 minutes
- Average Distance to Nearest A&E: 4,243 units.

Benefits: Maximizes the system's overall efficiency. Addresses system-wide inefficiencies.

Challenges: Works under the assumption that the main demand is concentrated in the center and habits will not change with a new department.

Strategically Located A&E Department (Empirical Approach)

Coordinates: (10640, 105691)

Objective: Achieve a large total reduction in patient wait times and driving times in a specific high demand area.

Key Insights: Location was selected using Voronoi mapping and analysis of patient distribution. This solution addresses the overarching need for equitable healthcare access.

Key Metrics:
- Average Wait Time Reduction: 13 minutes
- Average Distance to Nearest A&E: 4,094 units.

Benefits: Enhances the overall equity of patient care. Provides targeted relief in high-demand areas.

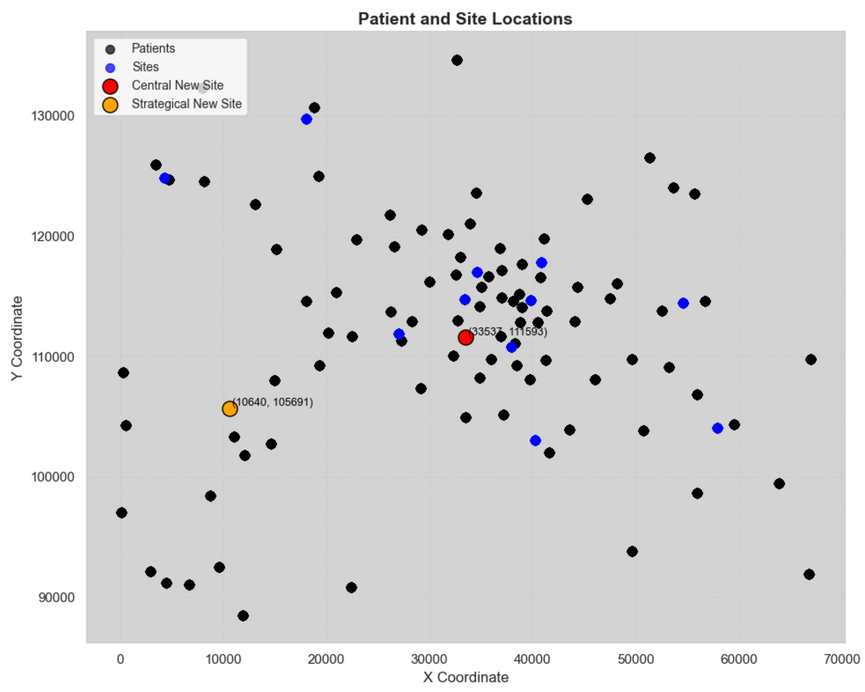
Challenges: The model assumes that patients always choose the nearest department. Under this assumption, patients in the city center may not experience substantial benefits.

Combined Solutions

The combined solution involves the implementation of two departments. This approach integrates both system-wide efficiency and targeted relief.

Key Metrics:
- Overall Average Wait Time Reduction: 40 minutes.
- Overall Average Distance to Nearest A&E: 4,012 units.

Challenges: Increased initial investment and resource a location are required to establish two departments.



Benefits:

- Balances system-wide efficiency with equity by providing both universal and targeted benefits.
- Mitigates the limitations of individual models, ensuring benefits reach both centralized and peripheral patient populations.
- Promotes a resilient healthcare system by accommodating potential future changes in patient distribution and demand patterns.