Graph-Based Adversarial Thinking Assignment

Title: Navigating the Obstructed Path: Evaluating Route Optimization Challenges in El Paso

Prompt:

In this assignment, you will engage in an evaluative process to optimize routes between key locations in El Paso based on minimizing the number of stop signs while considering potential adversarial challenges. Assume a scenario where traditional route optimization algorithms fail due to the deliberate placement of stop signs by a competitor aiming to slow down delivery times. Your task is to evaluate current and alternative routes between the specified locations, considering these adversarial disruptions, and design a robust path that circumvents the competitive disadvantage imposed by these additional obstacles.

Adversarial Angle:

The challenge involves evaluating and mitigating the impact of a competitor's manipulation of city infrastructure-specifically, the placement of stop signs-to obstruct efficient logistics operations. This vulnerability is being exploited to increase travel time and costs for delivery services in the area.

Steps for Students:

1. **Analyze Graph Data**: Utilize the provided geographical data of El Paso and plot the locations on a map. Identify the stop signs in the region and consider their impact on potential routes.

2. **Apply Adversarial Strategies**:

- Assess the existing routes in terms of stop signs encountered.

- Identify key areas where stop signs disproportionately affect route efficiency.

- Determine if any heuristic or algorithm can be applied to bypass these inefficiencies.

3. **Propose Solutions or Defenses**:

- Develop alternative routes with fewer stop signs.

- Suggest infrastructure improvements or technology solutions (e.g., machine learning algorithms) that could counteract the adversarial strategy.

- Prepare a comparison of the efficiency gains from current to optimized routes.

Expected Output:

Students should submit a report that includes:

- Analysis of the stop sign distribution and current route inefficiencies.

- Description of the adversarial strategies applied and rationale.

- Route optimization proposals, including maps showing the original and improved pathways.

- A discussion of potential technological solutions to predict or adapt to such adversarial challenges.

Bloom's Alignment:

This assignment aligns with the "Evaluating" level of Bloom's Taxonomy by requiring students to make judgments regarding the effectiveness of existing routes, the impact of adversarial factors, and the merits of proposed solutions. This level involves assessing strategies, critiquing conditions, and justifying decisions, all crucial for high-level critical thinking and problem-solving within adversarial settings.