MATHEMATICS
UC CLERMONT

SUMMER RESEARCH OPPORTUNITIES FOR UNDERGRADUATE students

FOR APPLICATION YEAR: 2025

PROJECT TITLE: <u>Traffic Flow Optimization Research</u>

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Project Description

Purpose: The purpose of this research is to apply mathematical models and real-world traffic data to optimize traffic flow within a specific area, in Clermont County. By analyzing traffic patterns and road conditions, this study aims to reduce congestion, improve safety, and enhance the overall efficiency of the transportation network. The research will explore potential improvements in traffic management, including optimizing signal timings, recommending alternate routes, and identifying high-risk zones for further action. Some potential specific area/s of research are listed on page 2 and 3.

Research Question: How can mathematical models and traffic data be used to optimize traffic flow and reduce congestion in a specific region, in Clermont County, Ohio? Specifically, how can traffic signal timings, alternate routes, and high-risk areas be identified and improved based on real-world traffic data?

Data Collection: Data for this research will be collected from publicly available traffic databases, sensor data, or through local government sources. The types of data may include:

• Traffic volume data (e.g., number of vehicles at specific intersections or along roadways)

- Traffic speed data
- Intersection and road layout data
- Accident and congestion reports (if available)
- Demographic data (optional, to analyze the impact of traffic on different populations)

Levels of Research based on student's background:

- Basic Level: Suitable for beginners or students with limited experience in data analysis.
Focuses on foundational techniques like averages, trends, and simple visualizations.
- Intermediate Level: For students with some background in data analysis and statistics. Involves
more detailed comparisons, regression, and deeper statistical analysis.
- Advanced Level: For students with strong mathematical and analytical skills. Involves complex
predictive modeling.

Summary of Minimum Skills Needed

- Data Analysis: Basic statistical analysis, Excel proficiency - Reading material will be
provided
- Problem-Solving and Critical Thinking: Applying models to real-world traffic problems.
- Communication Skills: Writing, data visualization, presentation skills.