

# CS4632 UML and Initial Design

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## 1 Introduction

The purpose of this milestone is to present a well-structured UML diagram and supporting documentation for our simulation model. This document provides an overview of the system's design, interactions, and components to ensure clarity and accuracy in our model development.

## 2 System Architecture and UML Design

The UML diagram visually represents the structure of our simulation system, illustrating the relationships between components. Each module plays a distinct role in the process, ensuring efficient data flow and decision-making.

### 2.1 Key Components

- **SUMO**: Handles traffic simulation, updating traffic models dynamically.
- **DataCollector**: Gathers and processes class schedule data.
- **BuildingOccupancyPredictor**: Estimates crowd density and occupancy data.
- **TrafficPredictor**: Predicts traffic flow based on collected data.
- **RouteOptimizer**: Suggests optimal paths by analyzing obstructions and predictions.
- **MappingModule**: Displays visualized traffic maps and generates reports.

### 2.2 Relationships and Interactions

The UML diagram includes multiplicities and dependencies to clarify interactions:

- Data flows from **DataCollector** and **BuildingOccupancyPredictor** to **TrafficPredictor**.
- **TrafficPredictor** refines this data and sends predictions to **RouteOptimizer**.
- **RouteOptimizer** optimizes the routes and updates **MappingModule** for visualization.
- **SUMO** oversees the entire process, ensuring accurate traffic modeling.

## 3 System Workflow and Activity Diagram

The activity diagram outlines the sequential flow of data processing, traffic prediction, and optimization.

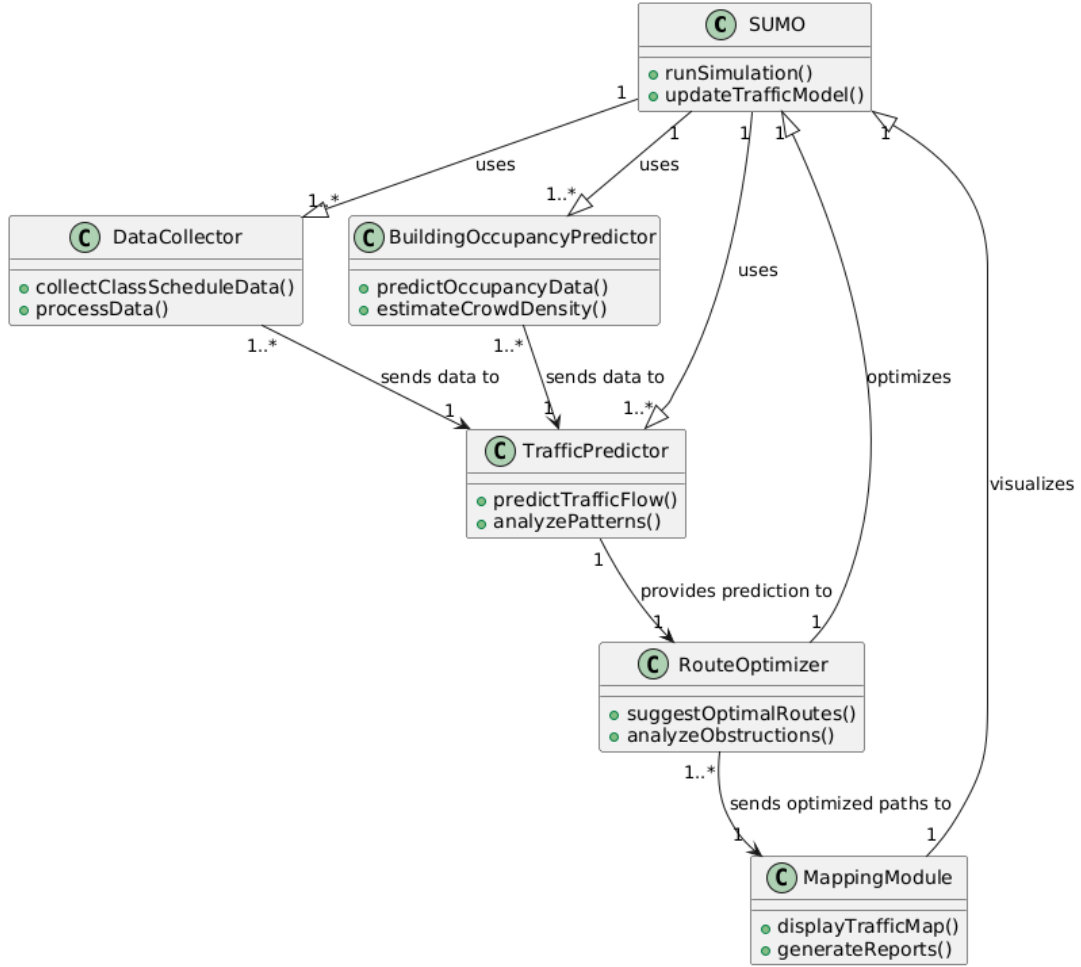


Figure 1: System UML Diagram

### 3.1 Workflow Overview

The activity diagram follows these key steps:

1. Collect class schedule and building occupancy data.
2. Validate data integrity; request more data if needed (up to 3 attempts).
3. Process and send data to the traffic predictor.
4. Analyze patterns and predict traffic flow.
5. Optimize routes based on predictions.
6. Generate visual traffic maps.

## 4 Conclusion

This milestone ensures that our system's design is well-documented and logically structured. The UML and activity diagrams serve as blueprints for further implementation and validation. Our next steps involve refining the model and integrating real-world data for simulation accuracy.

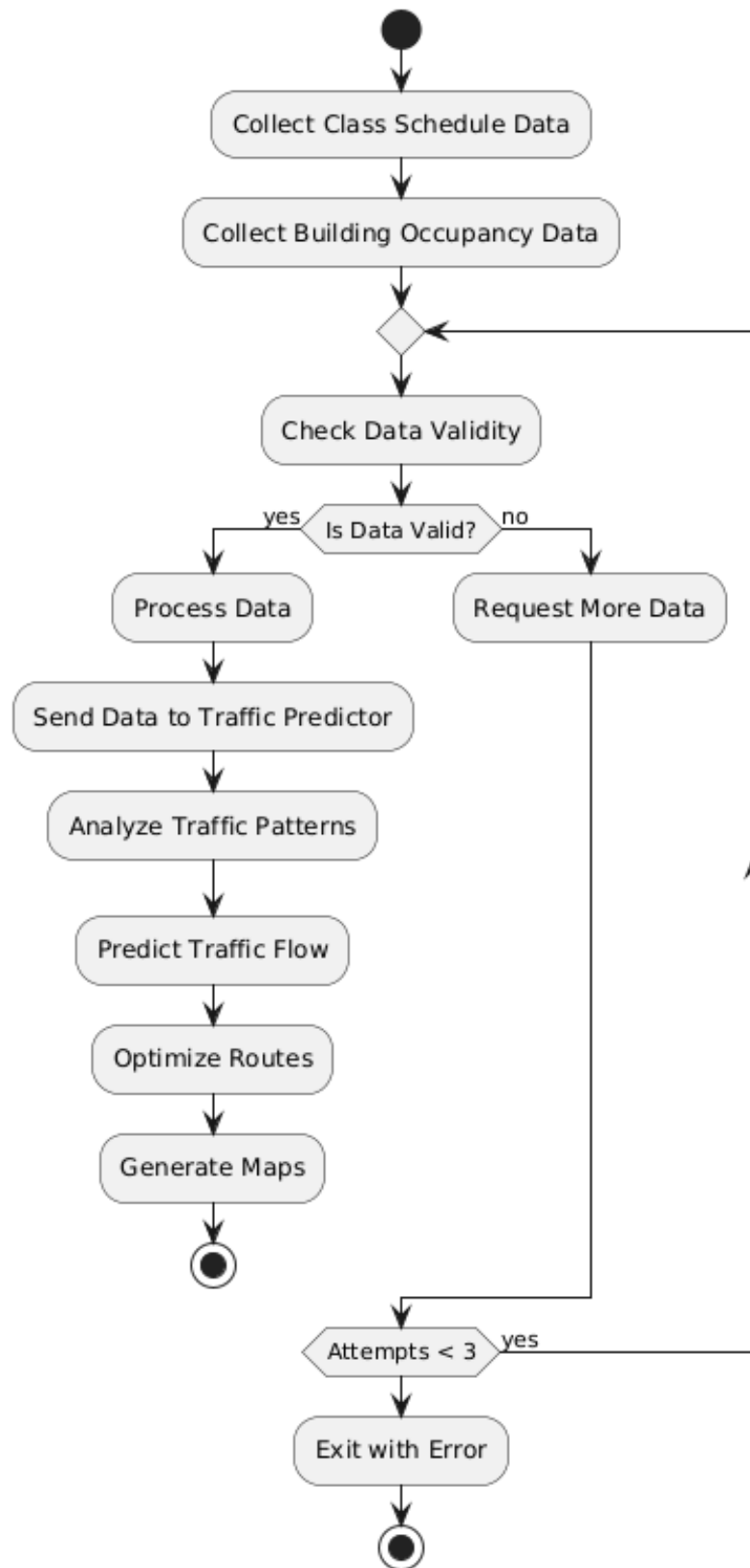


Figure 2: System Activity Diagram