

# EMS Priority Traffic Control Capstone

Connor Sweeney and Donte DiFrancesco

University of Pittsburgh – School of Computing and Information – CS Capstone Project

## INTRODUCTION

EMS (Emergency Medical Service) vehicle travel time should be the top priority on the road.

Adaptable traffic signals (signals that change according to EMS presence) are used to attempt to reduce EMS travel time.

### Objectives

- Develop scenarios that mimic real-world traffic
- Gather data about how adaptive traffic signals affect the network
- Analyze the data

### Traffic Signal Policies

- Green Corridor
  - This policy activates green lights for the next three signals in the EMS vehicle’s route. The signals resume normal operation after the EMS vehicle passes each intersection.
- Red Freeze
  - This policy makes all lights in the next intersection red while the EMS vehicle is passing through it.

### Data Metrics to Analyze

- EMS Travel Time
  - Measured in seconds it takes the EMS vehicle to get from point A to point B
- Congestion Clearing Time
  - Measured in seconds it takes resulting congestion to clear

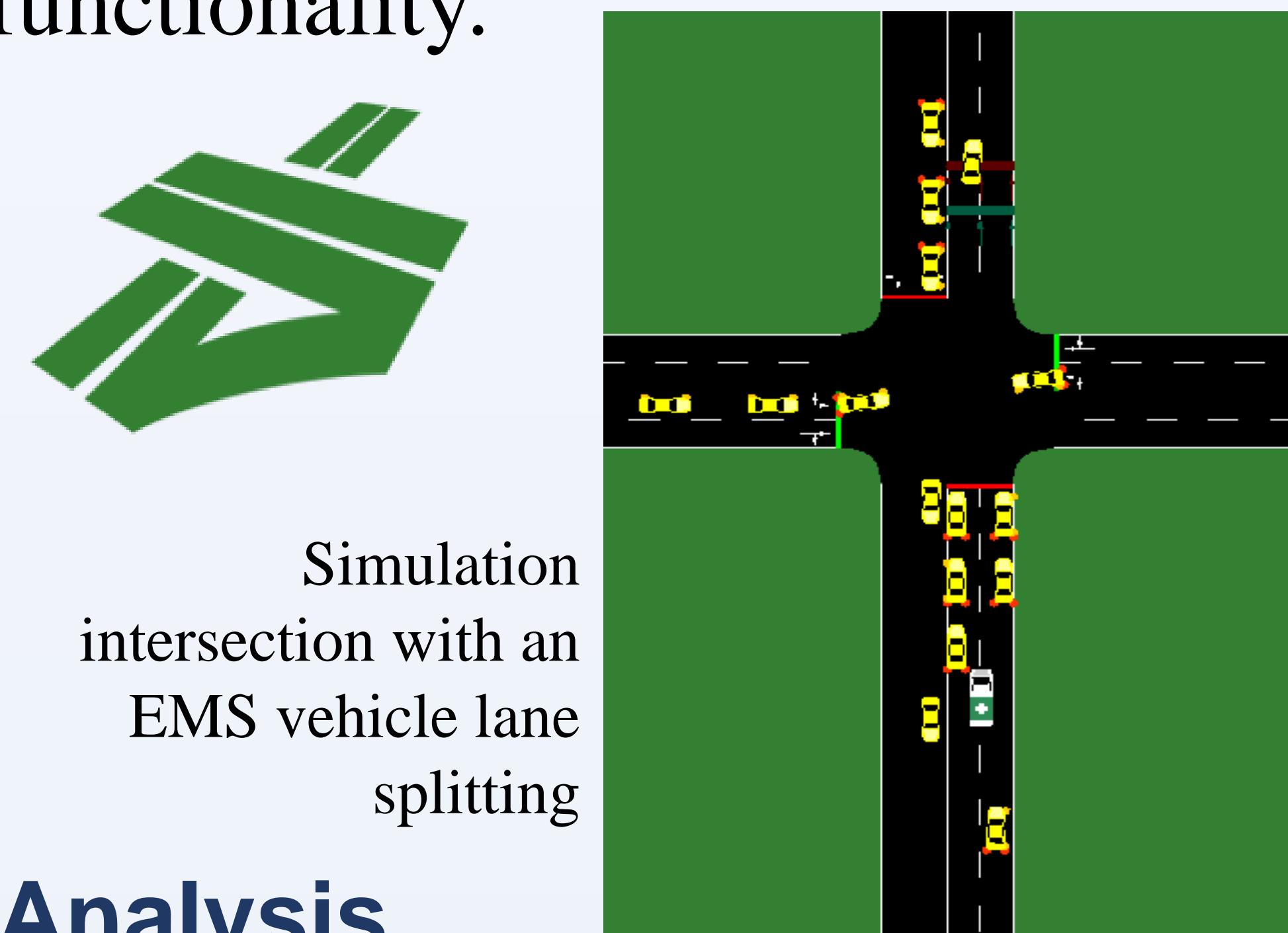
## TOOLS

### Initial Hurdle

We initially planned on using CityFlow because of its efficient performance with reinforcement learning, however we discovered that it did not have the functionality our research required.

### Simulation of Urban Mobility

We transitioned to another program, SUMO, because it had fully implemented EMS vehicle functionality.



### Analysis

- SUMO – Create simulations
- Traci – Modify traffic signal behavior and collect data
- Excel – Visualize data

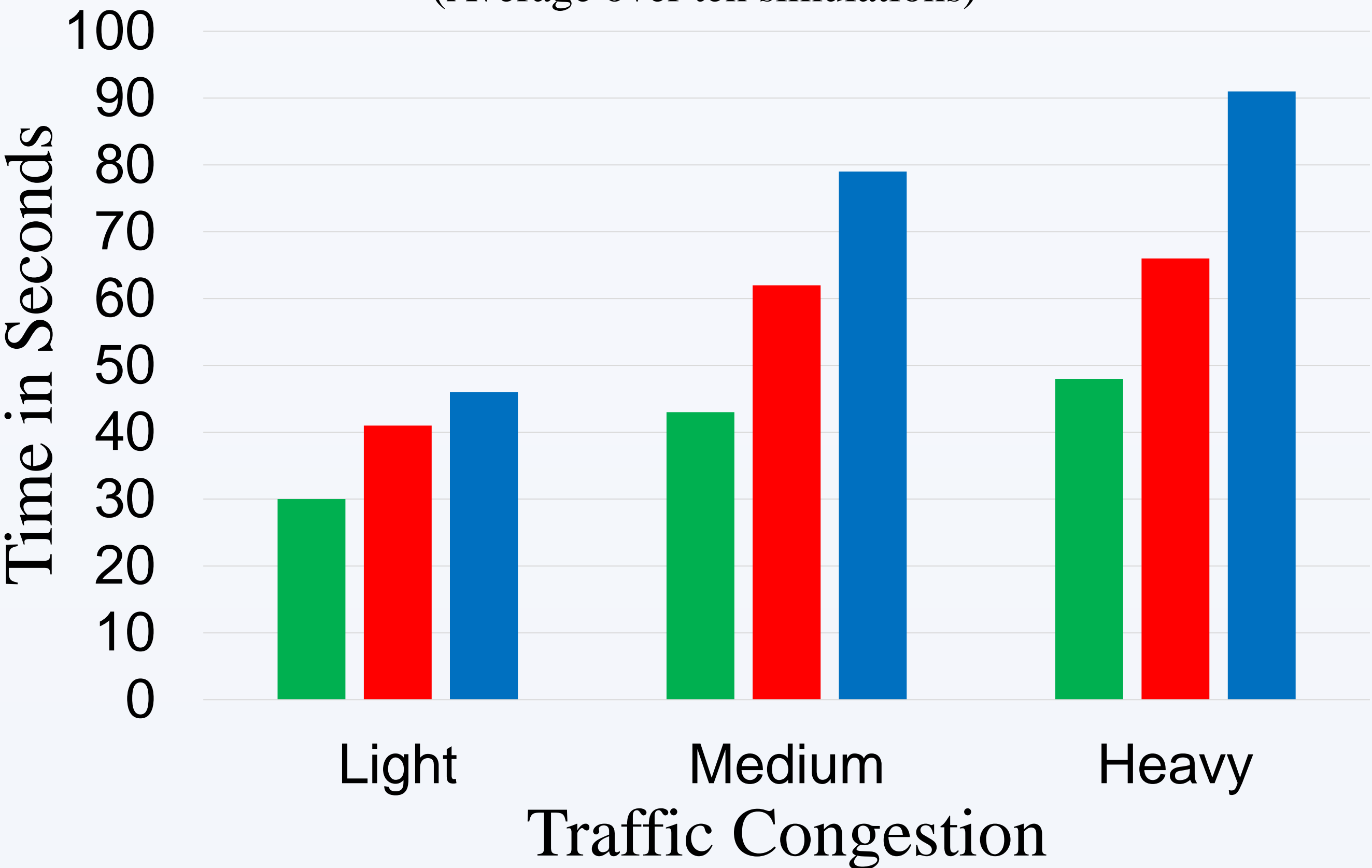
### Collaboration

- Discord
- Trello
- GitHub



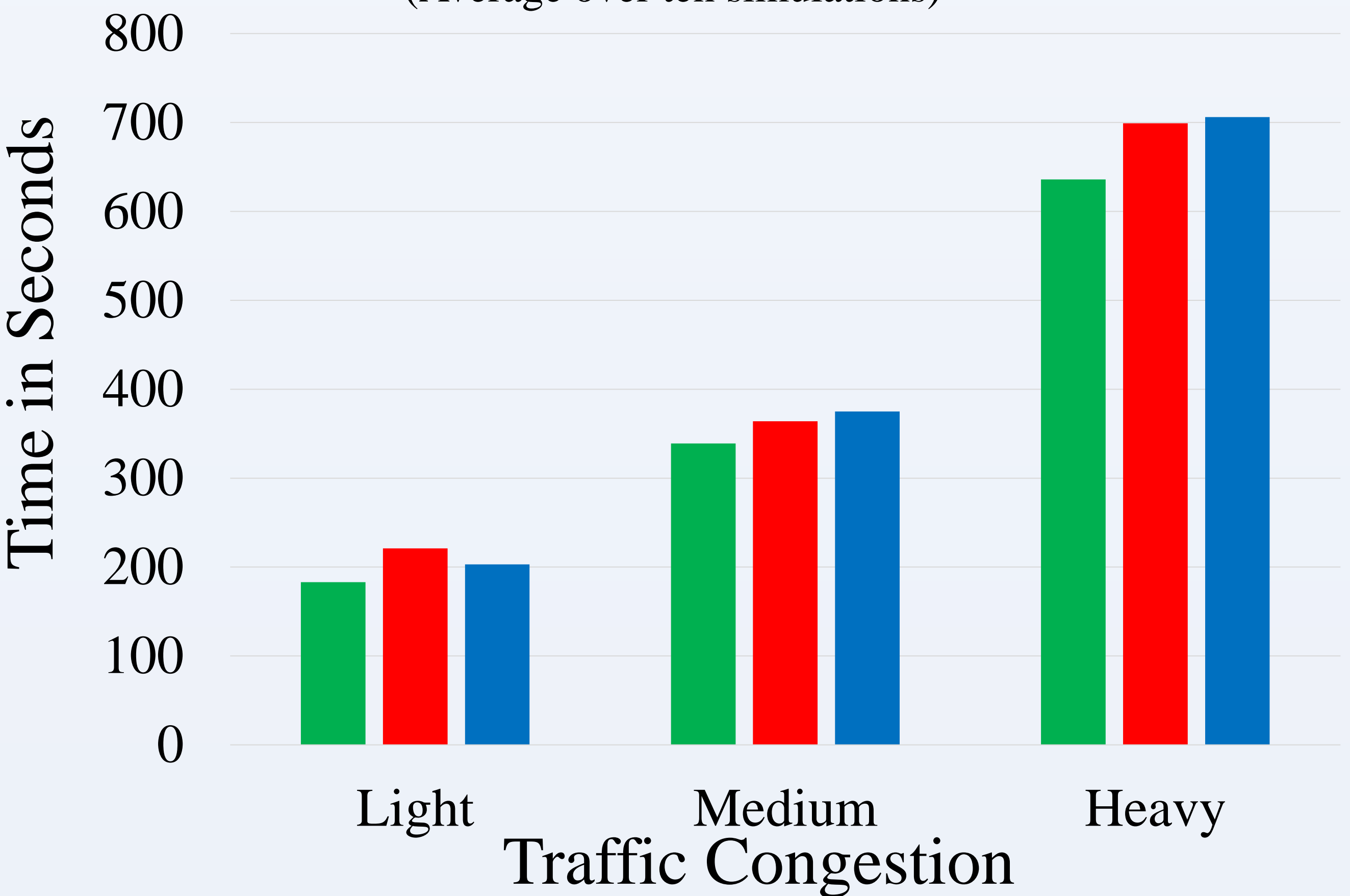
## RESULTS & CONCLUSIONS

EMS Travel Time vs Traffic Density  
(Average over ten simulations)



Our first metric, EMS Travel Time, shows that both the Green Corridor and Red Freeze traffic policies decrease the travel time of EMS vehicle, with the Green Corridor reducing it by 47.25% in heavy traffic.

Congestion Clearing Time vs Traffic Density  
(Average over ten simulations)



Our second metric, Congestion Clearing Time, shows that the traffic policies – which temporarily change the pattern of traffic signals – do not significantly increase congestion after their use. In fact, the Green Corridor reduces it by 9.92% in heavy traffic.

These results are exciting because they suggest that not only was our implementation of EMS priority policies able to get EMS vehicles to their destinations faster but, in most cases, it did not increase resulting congestion. This means that in our simulations, the implementation of EMS priority policies has a net benefit to the performance of traffic systems.