UNIVERSITY OF BUCHAREST

FACULTY OF MATHEMATICS AND COMPUTER SCIENCE

MASTERS OF ARTIFICIAL INTELLIGENCE

**Dissertation Thesis**

**Spatial-Temporal Neural Networks for Traffic Prediction**

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Abstract

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# Introduction

# Theory

## Traffic Flow

Traffic Flow represents the study of interaction between travelers of different types, including vehicles and pedestrians with infrastructure having the goal to create an optimal transport network with efficient and optimal traffic movement such that traffic congestion is reduced to a minimum.

Traffic networks are complex and nonlinear, depending on external factors such as current time of day/year, weather, and also on internal factors such as infrastructure, number of vehicles and their types or unexpected vehicle crashes. Due to the fact that traffic is based on human interaction, or rather individual reactions to other pedestrians or vehicles, the system does not follow any rules and is rather chaotic.

The traffic system is composed of roads/pavement on which the participants in traffic travel at a certain speed to reach their individual goal. The size can vary and is objective, it can range from a neighborhood to a countries entire traveling system. There are traffic systems which are unique to a single type vehicle, for example the railway system in which just the train travels. Traffic flow is focused on city sized traffic systems for cars, which exhibit the biggest congestion.

Participants in traffic are pedestrians and vehicles (bikes, motorbikes, cars or public transportation). Different types of vehicles can be more effective than others. An example is the underground metro system which is supervised by an entity, thus the participants travel restrictively to preserve the entire system efficiency and can take thousands of passengers. Another example is a car which can take up to a maximum of 5 passengers legally. Although a car can travel to any point but a metro system has predetermined stations.

## Machine Learning

## Convolutional Neural Networks

## Long Short-Term Memory

## Graph Convolutional Networks

# Related Work

# Methodology & Experiments

## Dataset

## Models

# Results & Conclusions

# Bibliography