

Project Title: Traffic Forecasting App for Urban Cities

Team Names

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Project Objectives

I come from Kathmandu, Nepal, a city known for its severe traffic congestion, particularly during rush hours. I have often wondered how helpful it would be to know in advance how much time I might spend stuck in traffic while traveling. While apps like Google Maps provide real-time traffic data to help us navigate congested areas, but predicting traffic ahead of time could be even more useful. For example, how bad will traffic be next Saturday, a week from now, or during a holiday like Christmas, considering factors such as snow and other weather conditions.

In this project, I aim to explore the possibility of forecasting traffic volume in urban areas using time series methods. The goal is to predict traffic patterns by integrating various factors such as time of the day, weather conditions, holidays, and special events to generate more accurate traffic predictions.

Project Description

Usefulness

This traffic forecasting application will help urban commuters, transportation authorities, and city planners by predicting future traffic conditions. While there are several applications (like Google Maps, Waze) that provide real-time traffic data, they do not predict future traffic. My project will focus on forecasting traffic conditions by considering a wide range of factors such as weather conditions, holidays, and time of day.

- The application will be beneficial to

Commuters- Helps in planning daily travel or weekend trips with predictive insights into traffic patterns.

Urban Planners and Transportation Authorities- Helps in managing traffic flow, improving public transport scheduling, and planning road maintenance or construction projects.

Delivery Services- Assists delivery companies in planning optimal routes to avoid delays.

- The project aims to explore these Key Questions
 - I. How can we predict traffic volume in specific areas (cities, highways, etc.) at different times of the day or week using historical data?
 - II. What are the main factors influencing traffic flow, such as time of day, day of the week, weather, holidays, and special events?
 - III. Can time series models predict both short-term and long-term traffic trends?
 - IV. How can these predictions help optimize traffic management in cities?
 - V. How can we improve prediction accuracy by considering additional factors like public transportation schedules or road construction?

Dataset

For this project, I will use the Metro Interstate Traffic Volume dataset, available on Kaggle. The dataset contains hourly traffic data for westbound I-94, a major highway connecting Minneapolis and St. Paul, Minnesota. The dataset includes important features such as weather conditions, traffic volume, temperature, and holiday information, which will help in predicting traffic patterns.

- Dataset Details

Source - The dataset was collected by the Minnesota Department of Transportation (MnDOT) between 2012 and 2018 at a station on I-94, located roughly halfway between Minneapolis and St. Paul.

The purpose of data collection was to monitor traffic patterns and assist in transportation planning.

Kaggle data owner - John Hogue

Link to dataset on Kaggle - <https://www.kaggle.com/datasets/anshtanwar/metro-interstate-traffic-volume/data>

- Key Features – There are 9 columns and 48204 rows.

traffic_volume – Numeric, hourly traffic volume on I-94

holiday – Categorical, indicates national or regional holidays

temp – Numeric, temperature in Kelvin

rain_1h – Numeric, amount of rain (mm) during the hour

snow_1h – Numeric, amount of snow (mm) during the hour

clouds_all – Numeric, percentage of cloud cover.

weather_main – Categorical, general weather condition

weather_description - Detailed description of the weather

date_time - Date and time of the recorded data (in CST)

Sharing Plan

I will share the project's progress, code, and results through a GitHub repository. Here is the link to the repository: https://github.com/bkkurmi/D590_TS-Final-Project.git

Main Tools

I will primarily use Python for data processing, analysis, and modeling. I will be using Python libraries like Pandas for data manipulation, Matplotlib and Seaborn for data visualization, Scikit-learn and TensorFlow for building time series forecasting models.

If time permits, I plan to develop an interactive web application using Flask. This application will allow users to input specific dates and locations to receive predictions on future traffic conditions.

Conclusion

This project aims to predict traffic conditions in urban areas using time series forecasting methods. The goal is to create a more accurate traffic prediction tool by incorporating data such as weather, time of day, holidays, and other influencing factors. This tool will be valuable to commuters, city planners, and delivery services, helping them plan routes more effectively and avoid congested areas.

Group Contribution

Name	Task	Average Time Spent (per milestone)
Babita Kurmi	Researched the project idea, Dataset, and prepared the project proposal	10 hours

Reference

xreina8. (2023, July 31). Traffic volume prediction. Kaggle.
<https://www.kaggle.com/code/xreina8/traffic-volume-prediction>

Tanwar, A. (2023, July 27). Interstate Traffic Dataset (US). Kaggle.

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