

Traffic Flow Forecasting Using LSTM

Internship Project

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Domain: Data Science & Machine Learning



Context

Introduction

Traffic congestion is a major issue in growing urban cities. Predicting future traffic flow helps in:

**Better traffic signal
management**

Reduced congestion

Improved travel efficiency

In this project, traffic flow is predicted using a Deep Learning model (LSTM) based on historical vehicle count data.

Problem Statement

Traffic varies with time of day, weekdays, weekends, and events. Traditional fixed traffic signal systems cannot adapt to changing traffic conditions.

Therefore, we need a system that:

- Learns traffic patterns automatically
- Predicts future vehicle count accurately
- Helps optimize traffic management

Dataset Description

Traffic Data

Traffic	橋上	橋下	橋上	橋下	橋上	橋下
20200101	20.784	30.07	1.06	27.28	1.48	1.48
20200102	20.177	23.58	1.13	27.28	1.94	2.22
20200103	20.363	23.98	1.43	27.28	1.45	1.29
20200104	20.148	31.38	1.11	27.28	2.15	2.43
20200105	20.198	75.98	1.45	27.28	1.90	1.45
20200106	20.350	26.98	1.45	27.25	2.15	2.43
20200107	20.198	20.98	1.90	21.43	1.40	1.22
20200108	20.190	23.46	1.84	27.28	2.86	2.20
20200109	20.168	28.96	1.55	27.26	1.45	1.45
20200110	20.254	23.06	1.20	27.45	1.46	1.23
20200111	20.298	23.96	1.95	27.28	1.96	2.23
20200112	20.197	20.90	1.95	27.47	2.88	2.43

- Contains timestamp-based vehicle count from multiple junctions
- Columns include: Date-Time, Junction ID, Vehicle Count
- Data is time-series in nature
- Suitable for sequence and trend analysis

Data Preprocessing

01

Converted Date and Time into a proper datetime index

02

Grouped and resampled data to uniform time intervals

03

Handled missing values using interpolation

04

Extracted time-based features

05

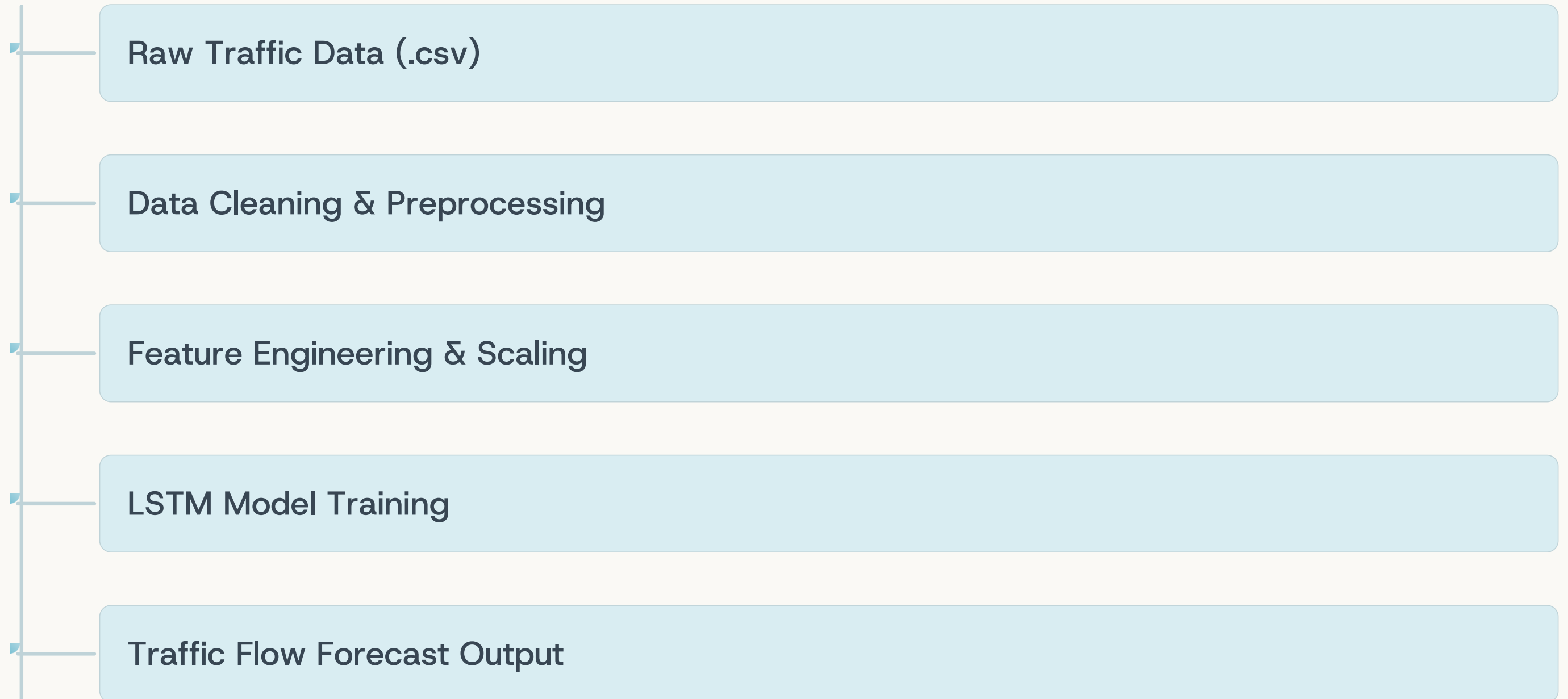
Applied Min-Max Normalization for smooth model training



Extracted time-based features:

- Hour of the day
- Day of the week
- Weekend indicator

Proposed System Flow



Why LSTM Model?

- LSTM (Long Short-Term Memory) is designed for sequential data
- Remembers long-term traffic behavior patterns
- Handles time dependency better than traditional models
- Ideal for time-series forecasting problems like traffic prediction



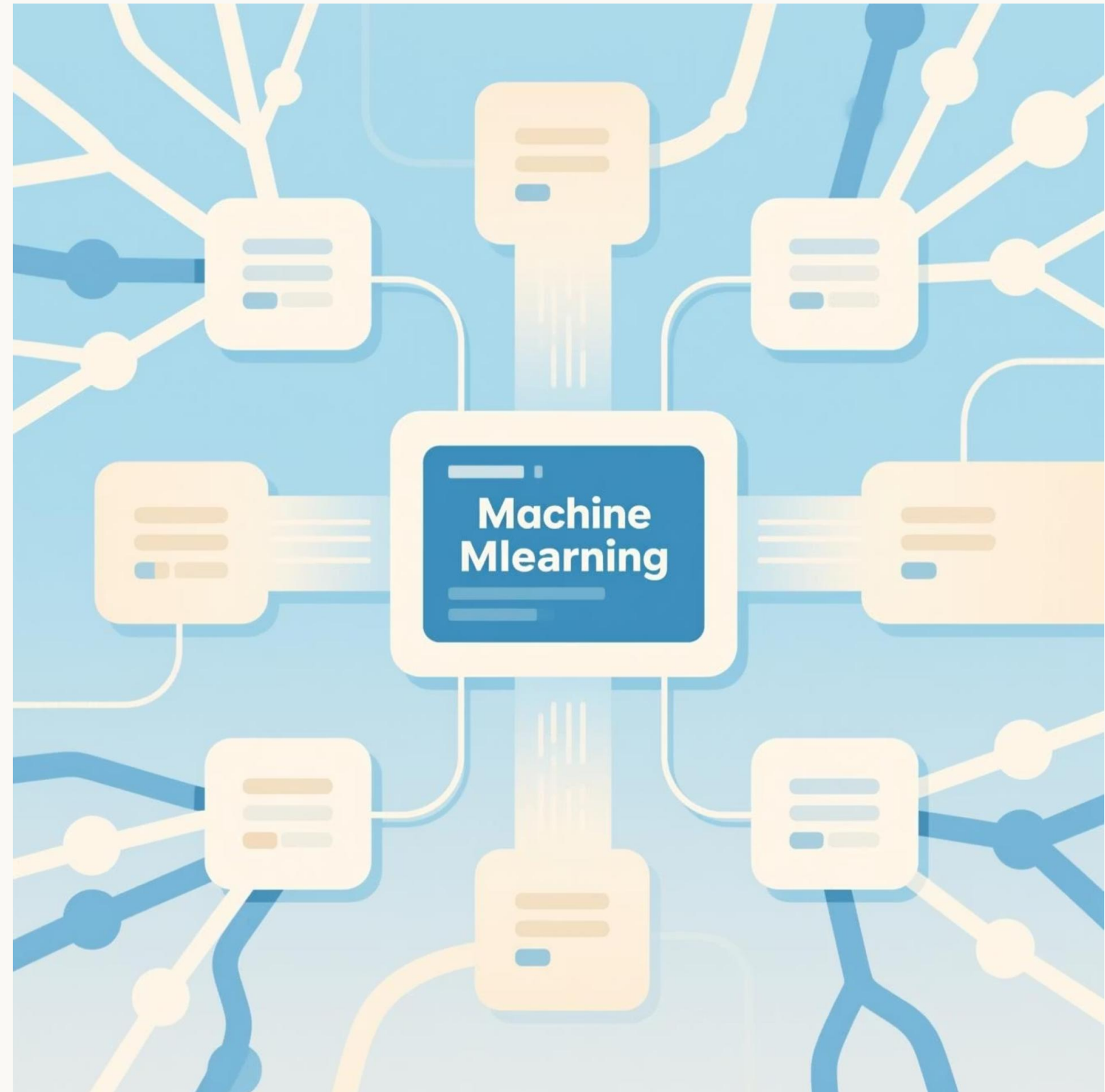
Model Training

Input:

Previous traffic values (look-back window)

Model Structure:

- LSTM Layer
 - Dense Output Layer
-
- Loss minimized during training to improve accuracy
 - Model predicts next-hour traffic count for each junction



Results

Model successfully captured daily traffic patterns

Predicted future traffic values were realistic and trend-consistent

Predictions saved in submission_lstm.csv format

Can be used for:



Traffic signal timing optimization



Peak hour analysis



Road planning assistance

Conclusion

LSTM-based forecasting provides meaningful traffic predictions

Helps in planning and managing city traffic efficiently

Can be extended for real-time smart city applications