



# Smart City: Traffic prediction using Deep Learning

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# INTRODUCTION

## BRIEF DESCRIPTION

- Traffic is a PROBLEM!
- Smart cities can avoid the problem.

## PROJECT OBJECTIVE

- Analyzing and predicting traffic.
- Help smart cities understand traffic patterns.



# DATASET

## DATA SOURCE

- Kaggle as an open-source.
- Sensors at every junction.



RECORDS



# TOOL & LIBRARIES



JUPYTER

PYTHON

PANDAS

NUMPY

SEABORN



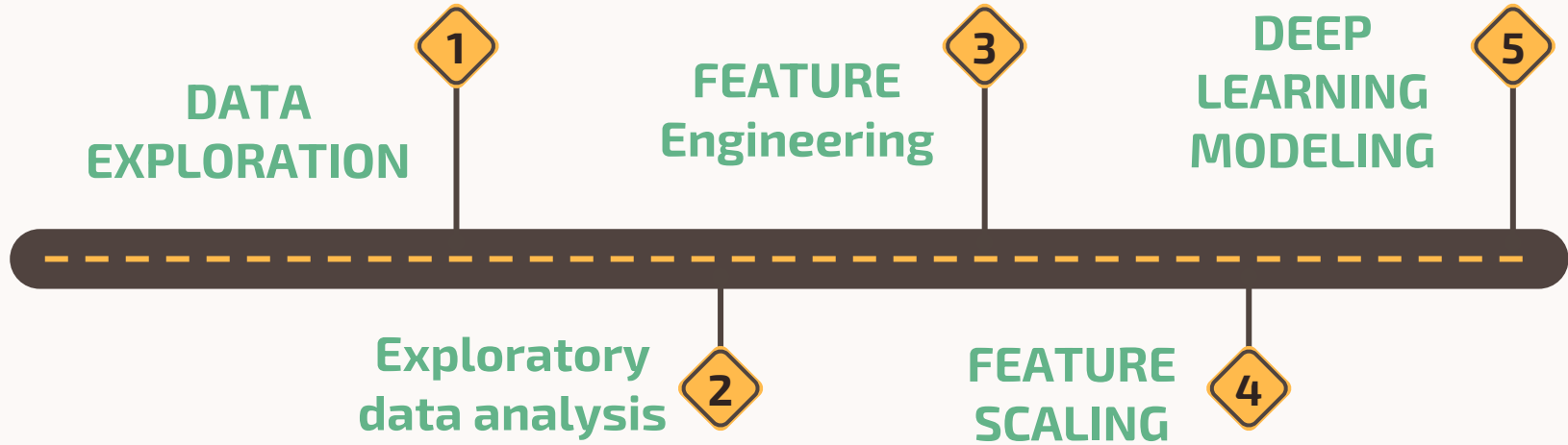
MATPLOTLIB

SCIKIT-LEARN

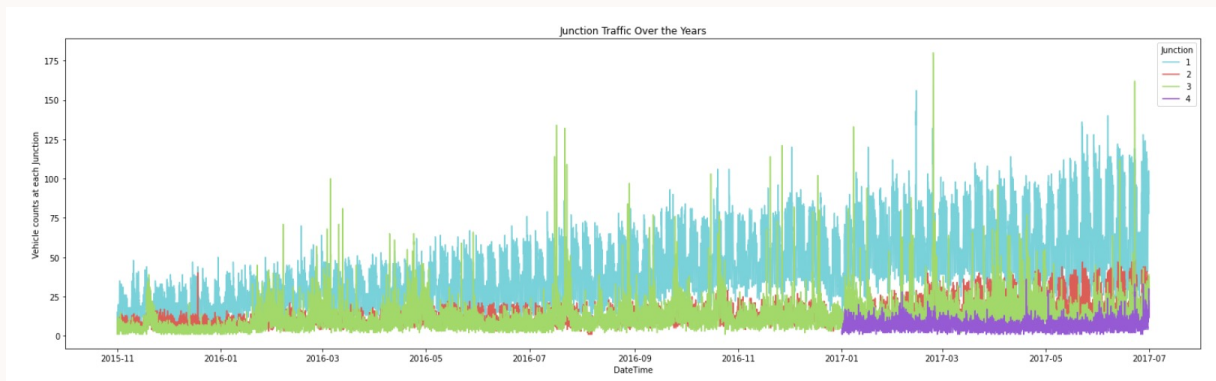
KERAS

TENSORFLOW

# METHODOLOGY



# EXPLORATORY DATA ANALYSIS



Traffic increases over the year.

**48000+**

Total observations



**4**

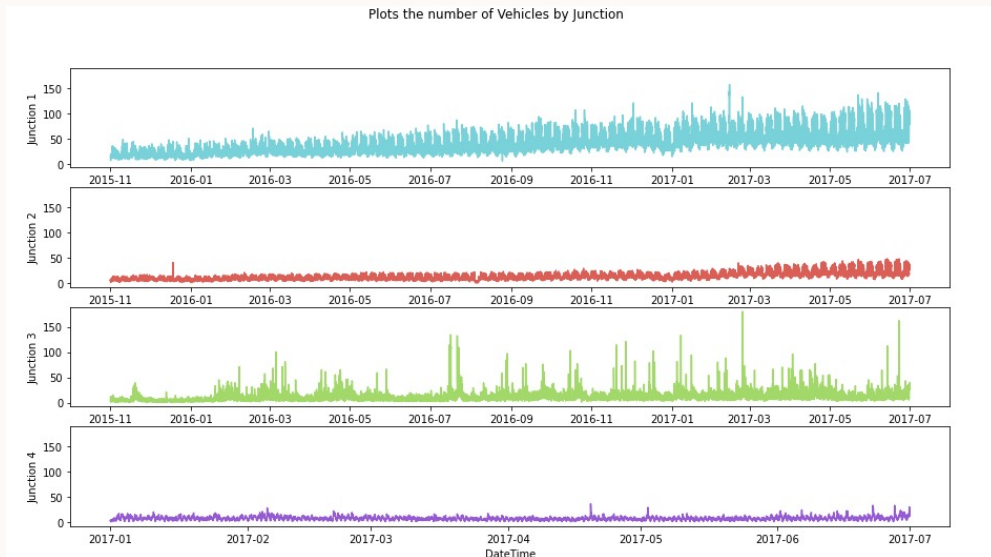


**+1,000,000**



**2015-2017**

# EXPLORATORY DATA ANALYSIS



Timeseries of traffic for each junction over the year.

**48000+**

Total observations



**4**



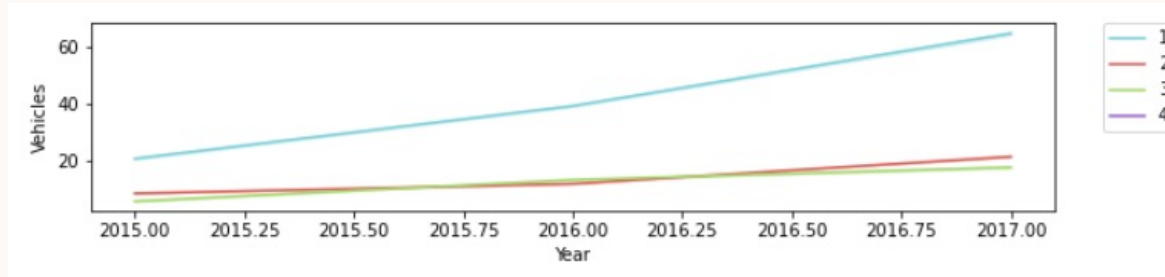
**+1,000,000**



**2015-2017**



# EXPLORATORY DATA ANALYSIS



All three junctions have an upward trend except the fourth.

**48000+**

Total observations



**4**



**+1,000,000**



**2015-2017**

# FEATURE ENGINEERING

1

Formatting the  
datetime

2

Dropping unnecessary  
columns

	DateTime	Junction	Vehicles	ID	Year	Month	Day_Num	Hour	Day	Year_Quarter
0	2015-11-01 00:00:00	1	15	20151101001	2015	11	1	0	Sunday	4
1	2015-11-01 01:00:00	1	13	20151101011	2015	11	1	1	Sunday	4
2	2015-11-01 02:00:00	1	10	20151101021	2015	11	1	2	Sunday	4
3	2015-11-01 03:00:00	1	7	20151101031	2015	11	1	3	Sunday	4
4	2015-11-01 04:00:00	1	9	20151101041	2015	11	1	4	Sunday	4

# FEATURE SCALING

1

## Normalization

Average & STDV

2

## Differencing

- Week difference
- Day difference
- Hour difference

# DEEP LEARNING MODEL

## Split data:

- Split on junction base
- Split data for 85% training and 15% testing

## Gated Recurrent Unit (GRU)



# GATED RECURRENT UNIT (GRU)

- The Developed Model of RNN
- Solves the short time memory
- Solves the vanishing gradient



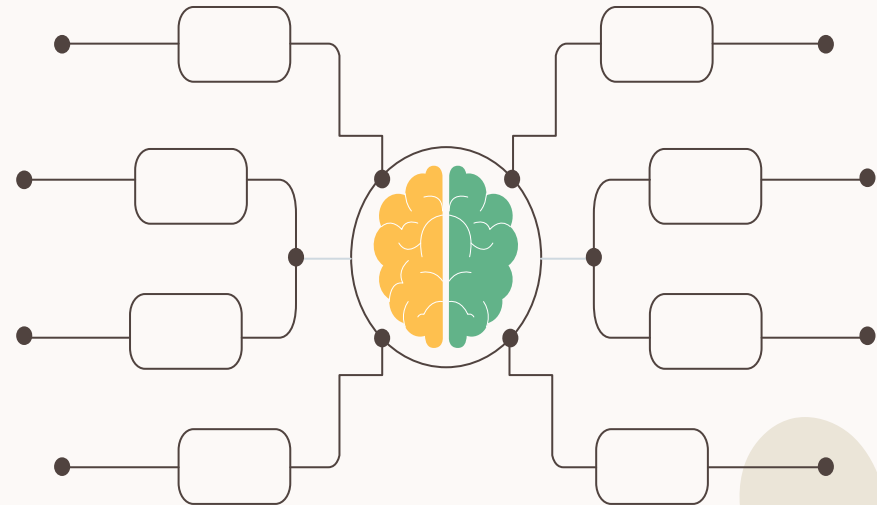
Six Layers



Tanh as the activation function



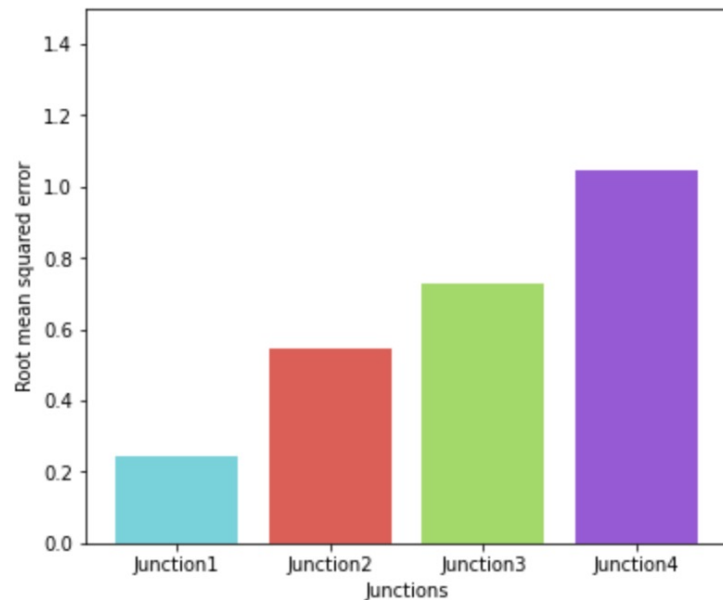
SGD as the optimizer



# RESULTS AND ANALYSIS

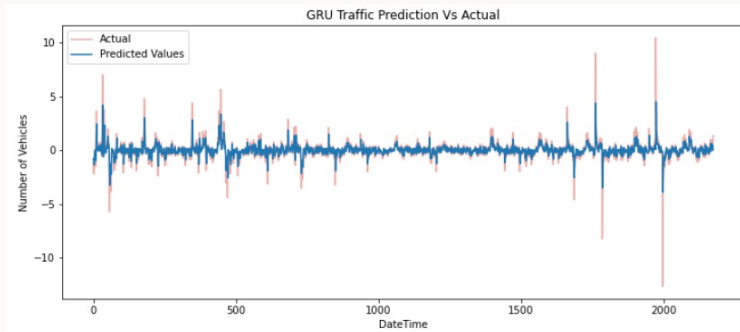
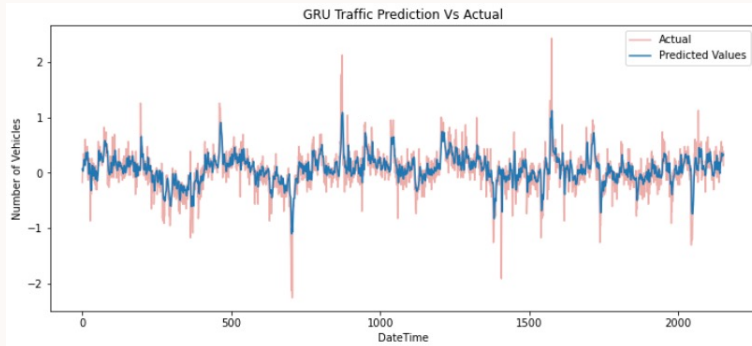
Epochs 35

JUNCTIONS	RMSE
Junction 1	0.2443
Junction 2	0.5470
Junction 3	0.7337
Junction 4	1.0391

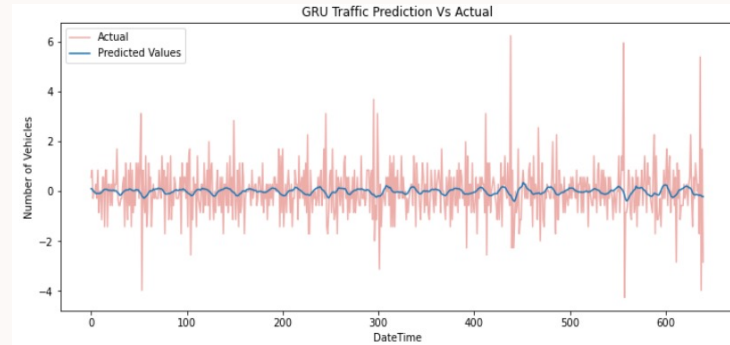
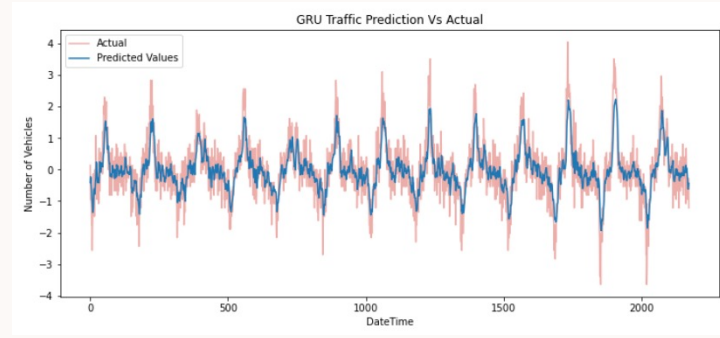


# RESULTS AND ANALYSIS

Junction 1



Junction 2



Junction 3

Junction 4

# CONCLUSION

## Summary

- Traffic Prediction
- Junctions Data
- GRU model

## Recommendations:

- Infrastructure
- Smart cities
- Improve Traffic Management





# THANKS!

Do you have any questions?

