Ahmedabad University

CSE-523 Machine Learning

Weekly Report-7

Project Title: Use fuzzy logic to find the direction of motion of a vehicle.

Submitted to faculty: Mehul Raval

Team Name: Model Maverick
Date of Submission: 06/04/24

Enrolment No.	Student Name	Programme
AU2140034	Preet Patel	BTech CSE
AU2140032	Dhruv Hingu	BTech CSE
AU2140149	Het Patel	BTech CSE
AU2140151	Dhruvesh Panchal	BTech CSE

Summary:

Fuzzy logic is implemented to know the direction of a vehicle that is moving. We further performed a time series analysis to predict the future direction in which the vehicle will be moving. We applied an Auto-Regressive Integrated Moving Average (ARIMA) model to achieve this feat. We were able to predict the direction of the vehicle for the next few frames given as an input parameter model to the model.

Activities:

Time Series Analysis:

- Explored various other fuzzy logic membership functions.
- Tried those membership functions and finalized the triangular membership function.
- Explored various time series models such as ARIMA, moving average, exponential smoothing, FBProphet, etc.
- Preprocessed the data so that the data can be used for time series analysis.
- In terms of ML, we gave 15 instances as an input and expect that the model will give us the next 5 states as an output and then compare it with ground truth.

Challenges Faced:

While implementing time series analysis for future direction prediction, we encountered the following challenges:

- Data Preprocessing: Since the time series model can’t work on categorical data, we had to perform one hot encoding which creates dummy variables for each class.

- Inferences: The output provided by the model was not a direction instead it was a float value lying between 0 and 1. So it was quite challenging to infer what direction the vehicle would be moving. This was handled taking the inspiration from logistic regression where if the probability is greater than 0.5 than it predicts the positive class.

Next Steps:

- To refine the ARIMA model to get better and more accurate outputs. Basically, to make the model robust.

Conclusion:

By the end of this week, now we are almost there and we can conclude that our project is done with only a few changes. It was a beautiful journey where we learned about machine learning and implemented it for fuzzy logic. Also, it was fascinating to apply the time series model to get future predictions.