Mini-project: AI Trajectory Prediction

Saran Sankar

# Problem statement and analysis

- Develop an AI trajectory prediction system for accurately forecasting object paths in diverse applications, enhancing decision-making.

- Scope: Create a machine learning model for trajectory prediction using historical data.

Use-case scenarios

- Autonomous vehicles predicting the moves of other vehicles

- Predicting the trajectory of a ballistic missiles

  - By analyzing launch parameters and atmospheric conditions

AI algorithm and model

Example trajectory: Pedestrians
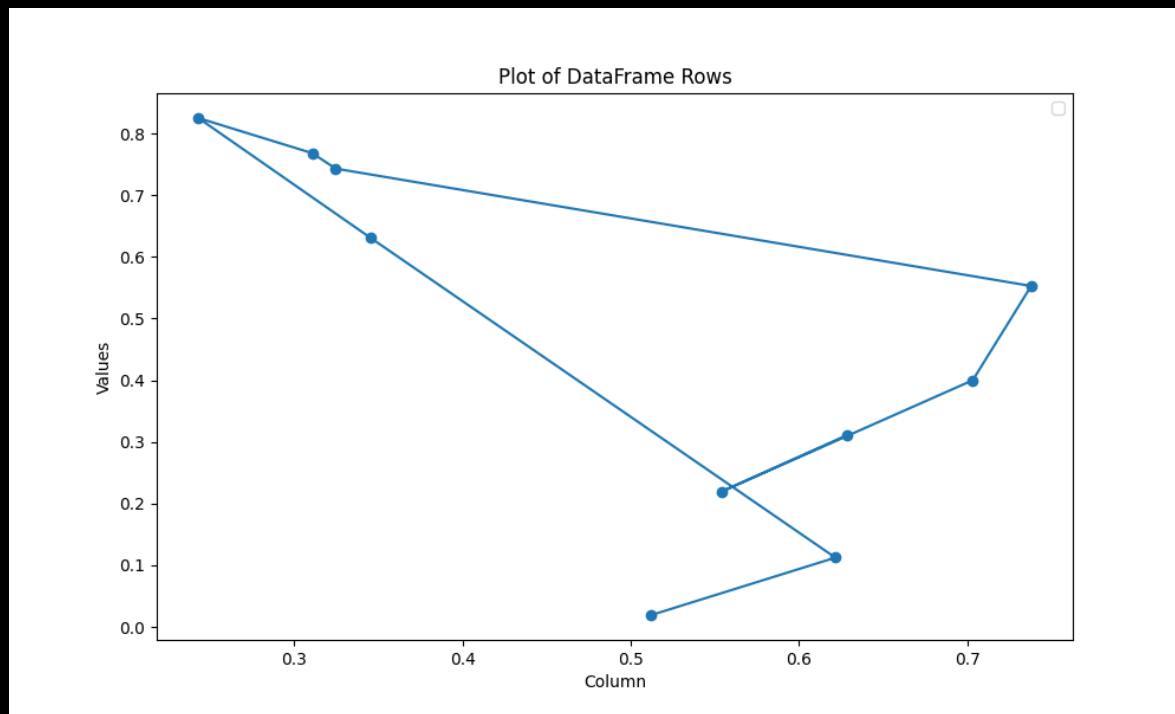
Solution: Use a sequence model

11	11	11	11	11	11	11	11	11	11	21	21	21	21	21
1	2	3	4	5	6	7	8	9	10	3	4	5	6	7
0.61979	0.56076	0.66667	0.73611	0.32465	0.31076	0.24306	0.34549	0.62674	0.51215	0.625	0.72917	0.32465	0.31076	0.24306
0.26389	0.175	0.43056	0.60417	0.74306	0.76806	0.83889	0.63056	0.069444	0.020833	0.47222	0.65278	0.74306	0.76806	0.84722

AI algorithm and model

Long Short-Term Memory (LSTM)
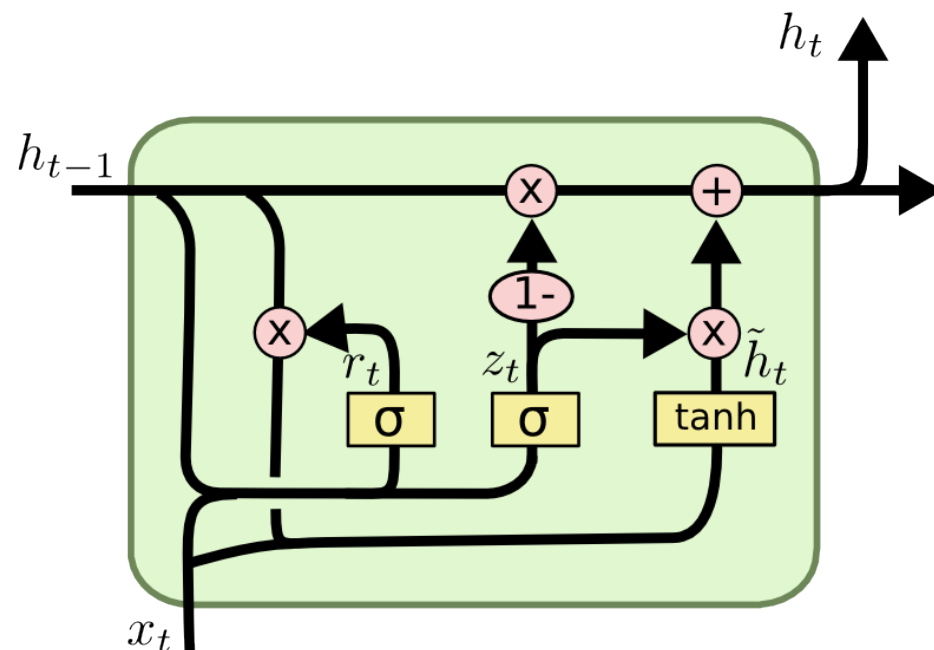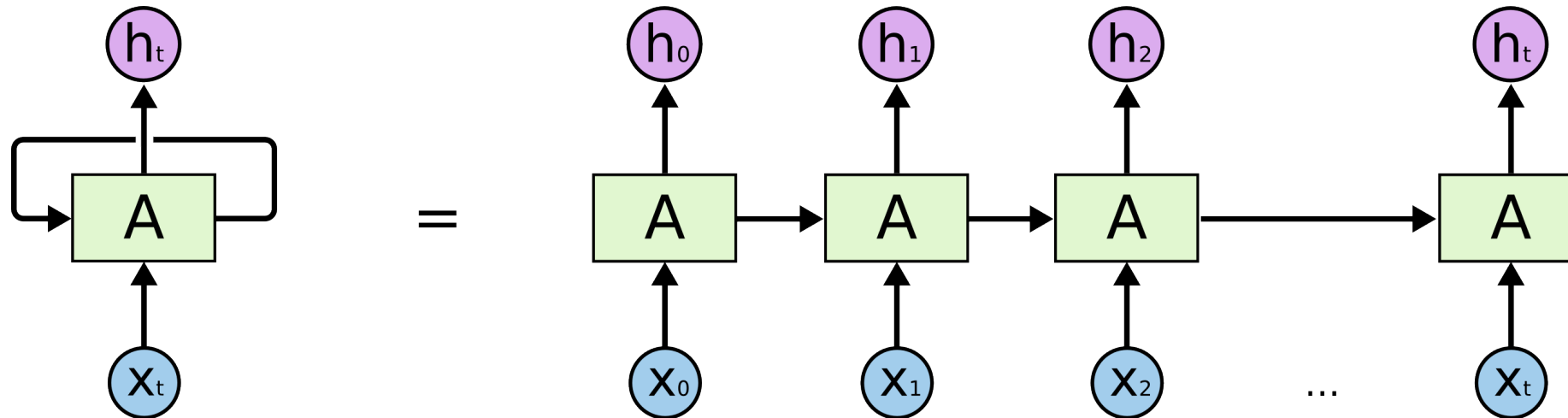
$$z_t = \sigma\left(W_z \cdot [h_{t-1}, x_t]\right)$$

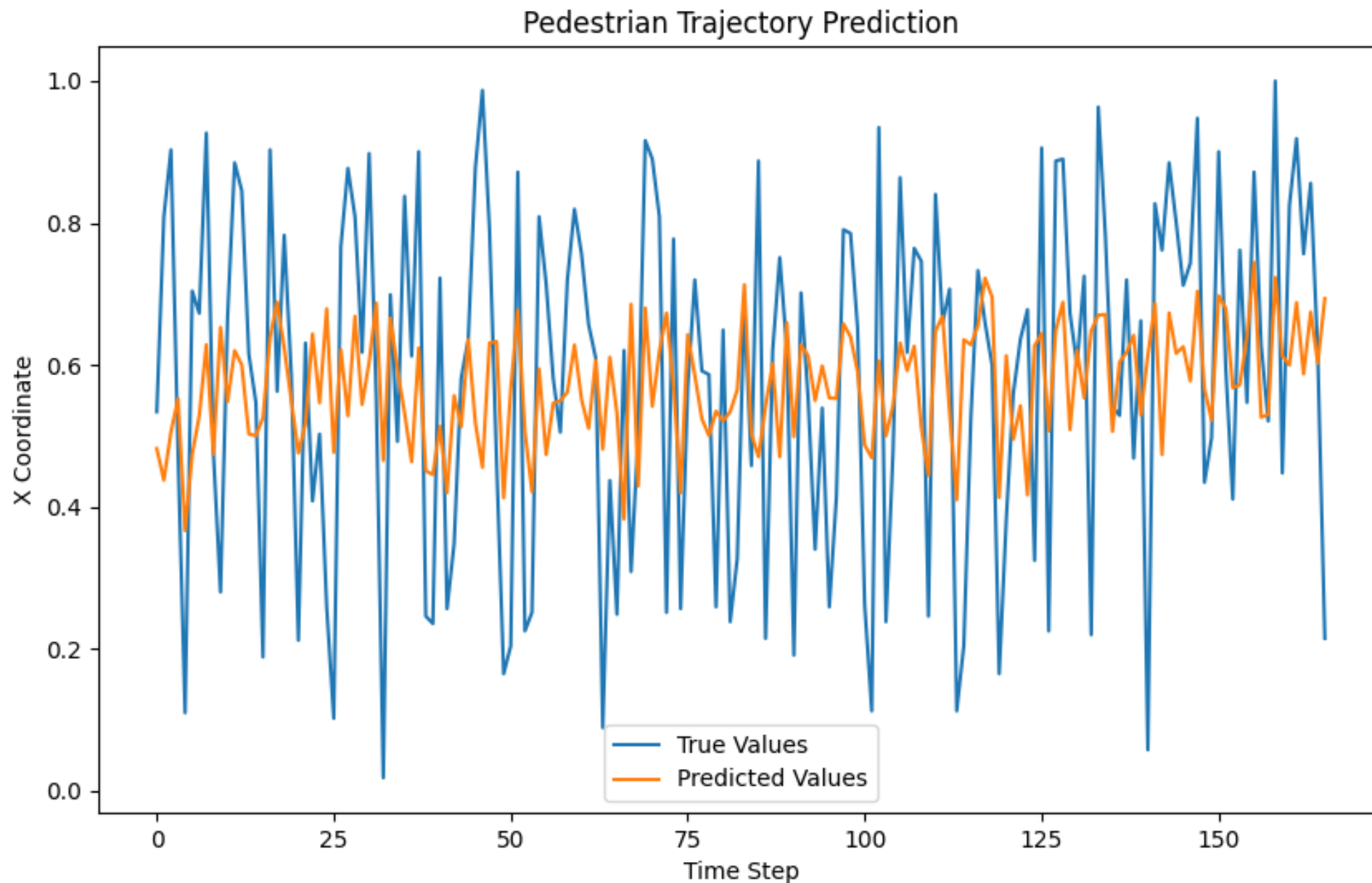$$r_t = \sigma\left(W_r \cdot [h_{t-1}, x_t]\right)$$

$$\tilde{h}_t = \tanh\left(W \cdot [r_t * h_{t-1}, x_t]\right)$$

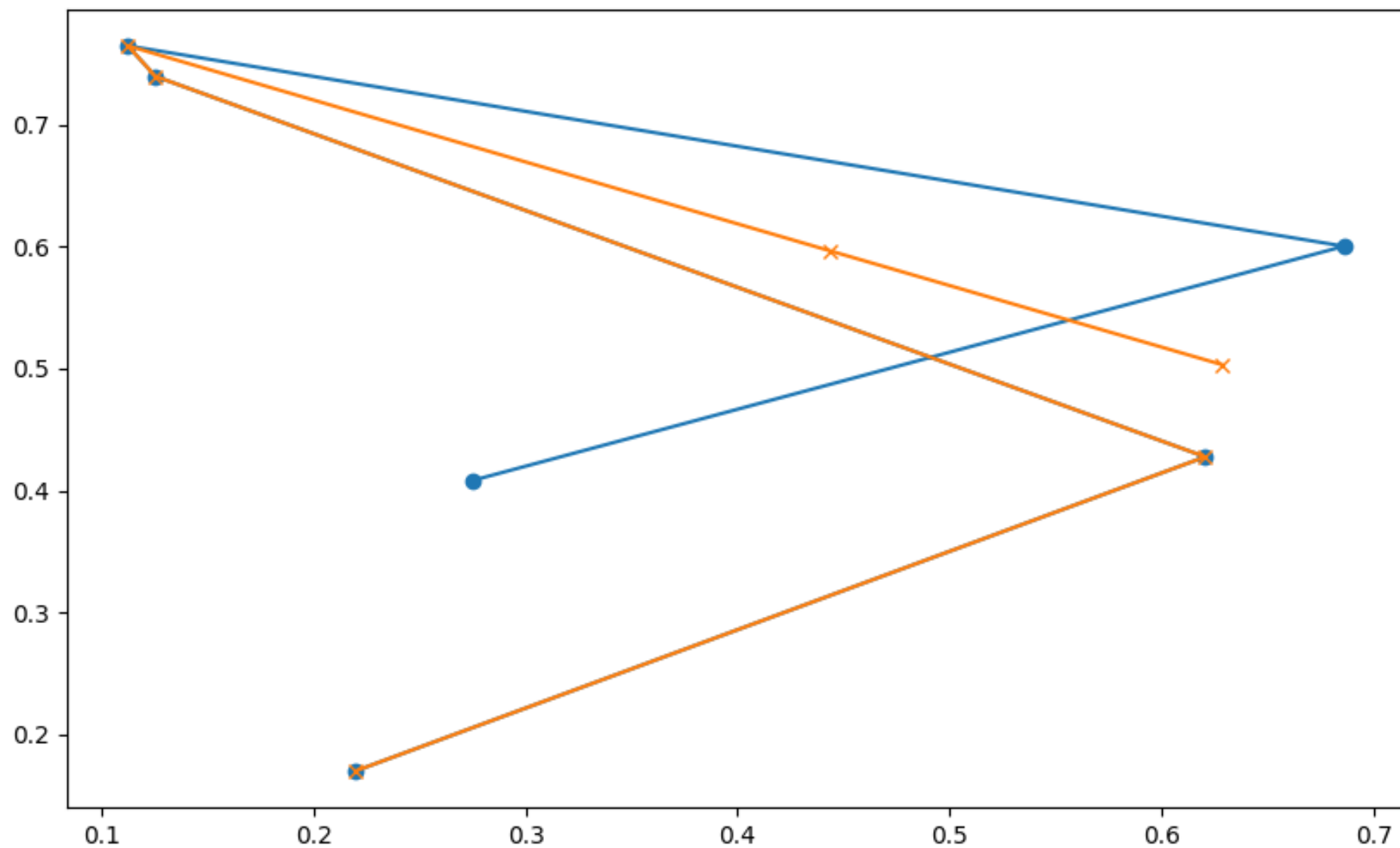$$h_t = (1 - z_t) * h_{t-1} + z_t * \tilde{h}_t$$
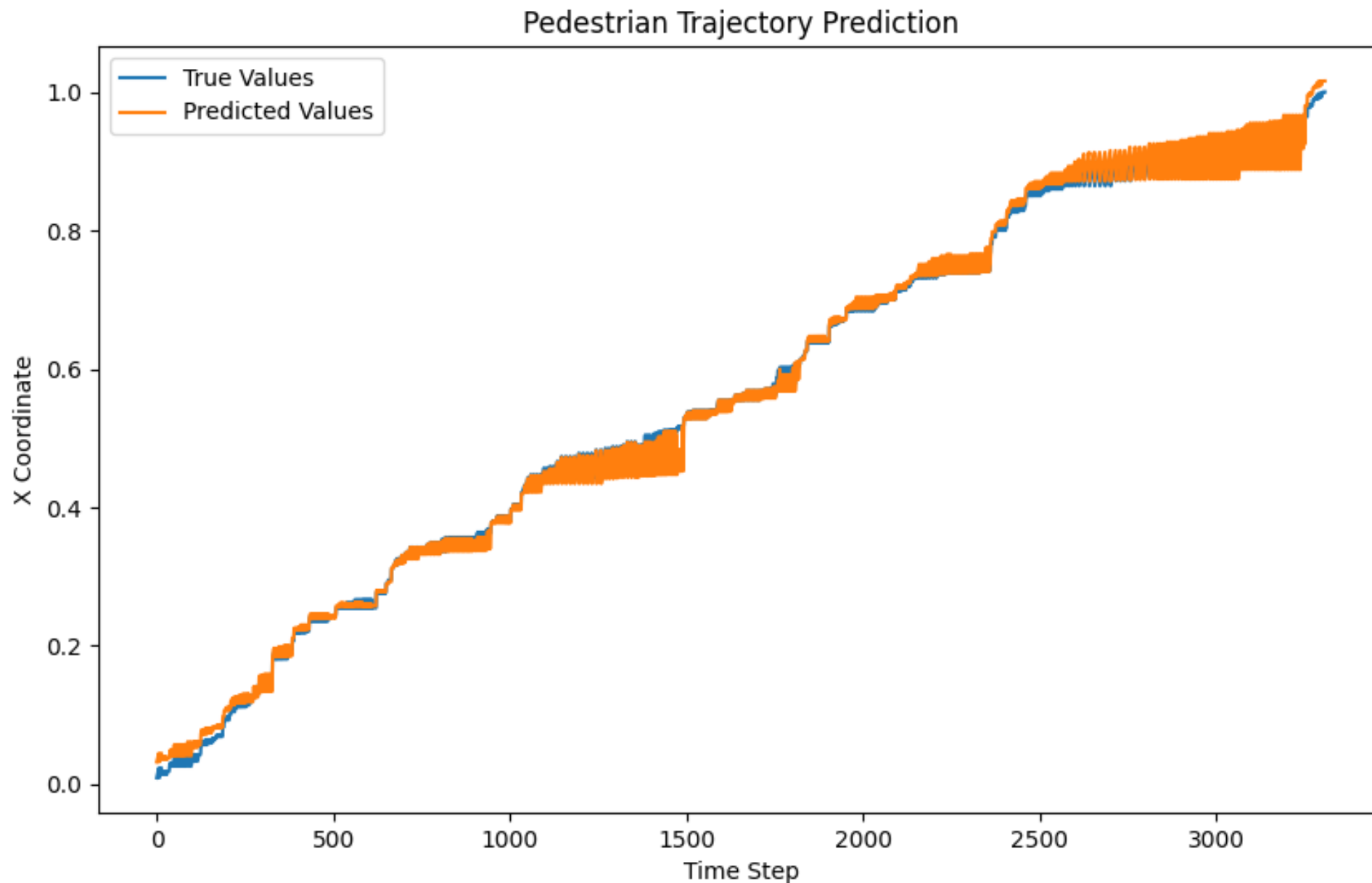
Results and demonstration

Results and demonstration

Pedestrian Trajectory Prediction

Results and demonstration

Lesson learned

- It is possible to predict trajectory with some accuracy by training sequence models on historical data

- More information in addition to historical data might be necessary for better accuracy