



# Event Prediction: Model Implementation and Evaluation

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#### **Presentation Outline**

- Chicago Bike Station Dataset
- Model Implementation
- Evaluation
- Future Work



A prediction model using single LSTM layer  $station_1^{t+1}$  $station_2^{t+1}$  $station_n^{t+1}$ t refers time-step(unit: an hour) Output n refers number of stations  $LSTM_{t-1}$  $LSTM_{t-167} \\$  $LSTM_t$  $input_{t-167}$  $input_{t-1}$  $input_t$  $station_1^{t-167}$  $station_1^{t-1}$  $station_1^t$  $station_2^{t-167}$  $station_2^{t-1}$ station<sup>t</sup><sub>2</sub>  $station_n^{t-167}$  $station_n^{t-1}$  $station_n^t$ 



## Implementation: errors in previous trial

- A historical station dataset acquires station logs in every 10 mins
- The results in previous seminars are not predictions for the next 1 hour
- Percentage based normalization
  - ▶ Input: 1680 mins, Output: 10 mins
  - ► Hidden dimension(LSTM): 256
  - ► Accuracy: 93.46
- Max value-based normalization
  - ▶ Input: 1680 mins, Output: 10 mins
  - ► Hidden dimension(LSTM): 256
  - Accuracy: 83.46

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 $station_1^{t+1}$  $station_2^{t+1}$ Output A prediction model using single LSTM layer  $station_n^{t+1}$ **FCNN FCNN FCNN** t refers time-step(unit: 10mins) n refers number of stations  $\mathsf{LSTM}_{t-167}$  $LSTM_{t-1} \\$  $LSTM_t$  $input_{t-1}$  $input_t$ offset  $input_{t-167}$  $station_1^{t-167}$  $station_1^{t-1}$  $station_1^t$  $station_2^{t-167}$  $station_2^{t-1}$ station<sup>t</sup><sub>2</sub>  $station_n^{t-167}$  $station_n^{t-1}$  $station_n^t$ 



- 1008 (168×6) time-steps
- Offset up to 2 hours (12 time-steps)
- Overall Accuracy: 94.9% of 3,424,655 test cases
  - ▶ under acc(0.08%/94.9%) 2.21% of 128,707 test cases
  - ▶ upper acc(0.001%/94.9%) 2.54% of 3,461 test cases
  - ▶ normal acc(94.819%/94.9%) 98.62 out of 3,292,487 test cases



- t+1: all acc 81.24
- t+2: all acc 96.13
- t+3: all acc 96.13
- t+4: all acc 96.13
- t+5: all acc 96.14
- t+6: all acc 96.14
- t+7: all acc 96.14
- t+8: all acc 96.14
- t+9: all acc 96.14
- t+10: all acc 96.15
- t+11: all acc 96.15
- t+12: all acc 96.15



#### Future Work

- Find time period when both historical and trip data are available
- Generate bike transition matrix using trip data
- Add fusion layers in the model to train the matrix with historical data