

Vehicle Interaction Prediction

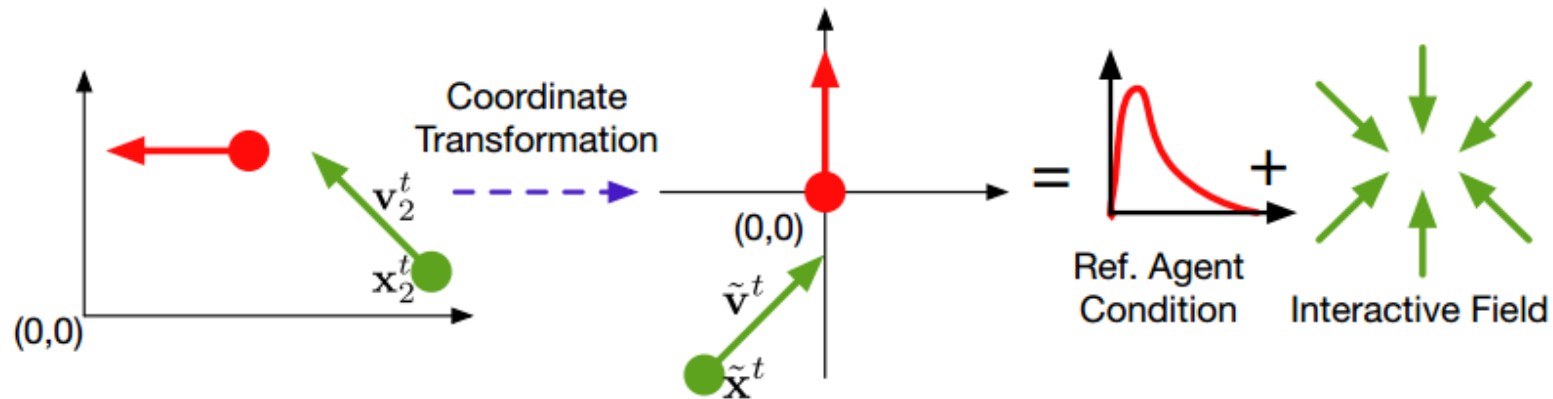
Supervised Learning

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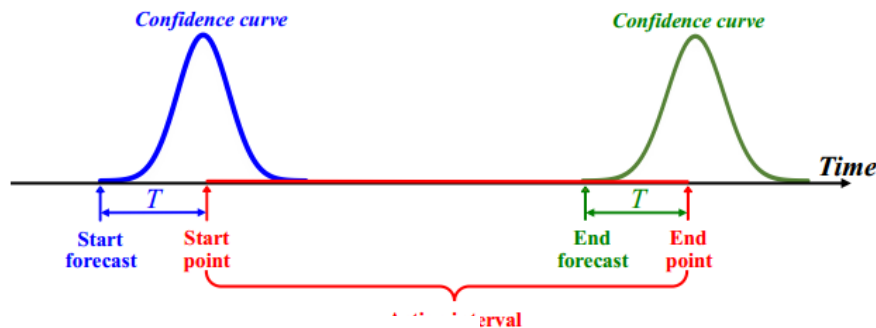
Data Preprocessing

- Reference Agent (0,0) at time 0 to make sure each **set** of data i.i.d. instead of each **frame**.



Supervised model

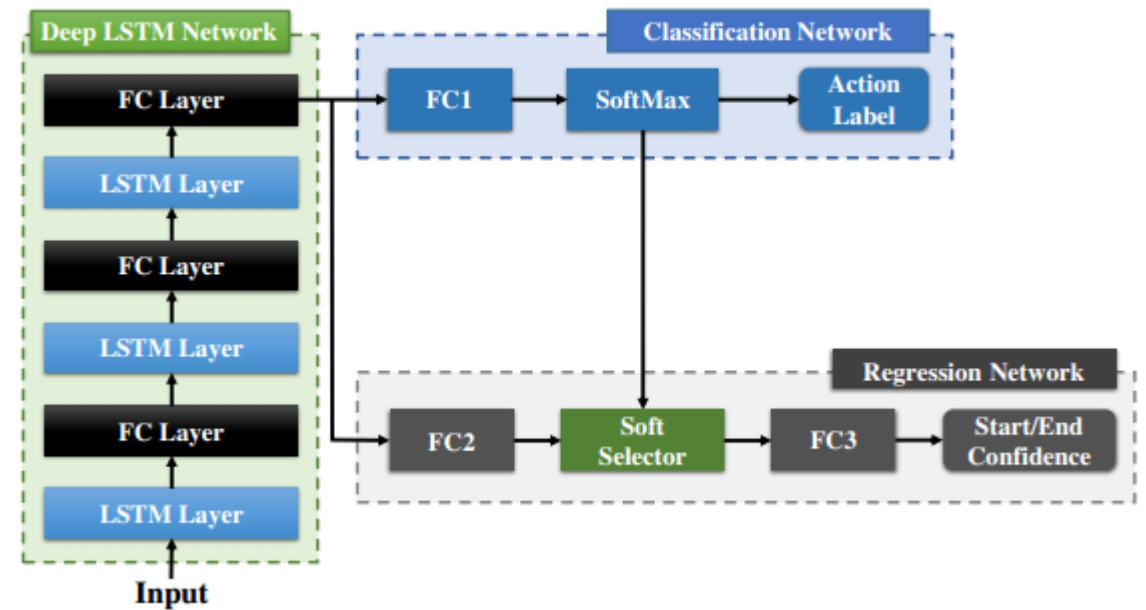
- Problem: $[0 \ 1 \ 1 \ 0 \ 1 \ 0] \times [0 \ 1 \ 1 \ 1 \ 1 \ 0] \checkmark$
- Sol: joint classification-regression RNN [Yanghao et. al. ECCV 2016]



$$c_t^s = e^{-(t-s_j)^2 / 2\sigma^2}$$

$$\mathcal{L}(V) = \mathcal{L}_c(V) + \lambda \mathcal{L}_r(V)$$

$$= -\frac{1}{N} \sum_{t=0}^{N-1} \left[\left(\sum_{k=0}^M z_{t,k} \ln P(y_{t,k} | v_0, \dots, v_t) \right) + \lambda \cdot \left(\ell(c_t^s, p_t^s) + \ell(c_t^e, p_t^e) \right) \right],$$



Model and training

- Shared encoder: At the beginning , encoding the front and follow car's features in same encoders.
- 2-layer LSTM
- Learn classification first, then learn to find start and end point.
- Learning rate decays (times 0.1) every 3 epoch.

Metric

- Metric for interval prediction: define correction as $\alpha > 0.6$, then calculate acc

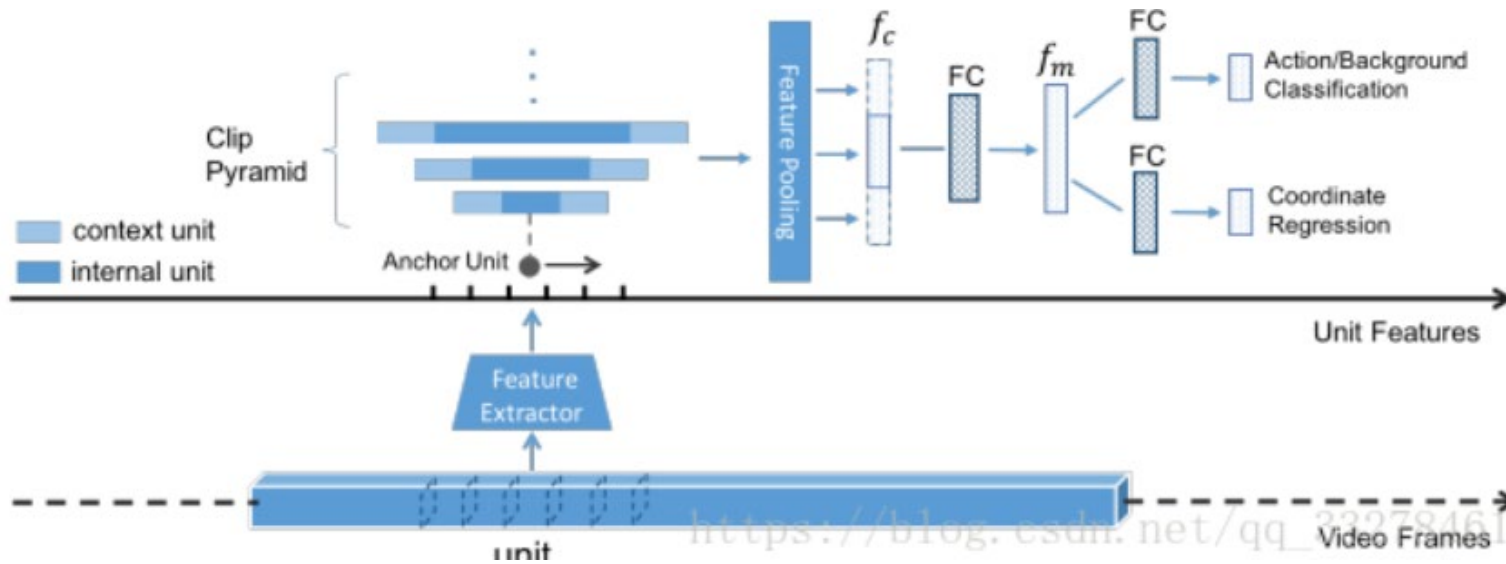
$$\alpha = \frac{|I \cap I^*|}{|I \cup I^*|}$$

Result

- 4121 training samples, 1031 test samples
- Raw Accuracy (Frame wise): 96.7%
- Interval Accuracy ($\alpha = 0.6$): 99.3%

Further Work

- 1. Problem: some samples do not include any interactions
Sol: Segment based model (Sliding Window)



Further Work

- 2. Shared LSTM, Rotation invariance, Symmetry
- 3. New dataset