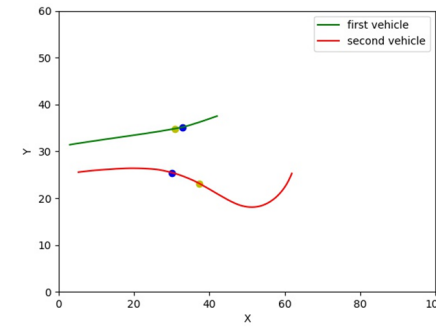
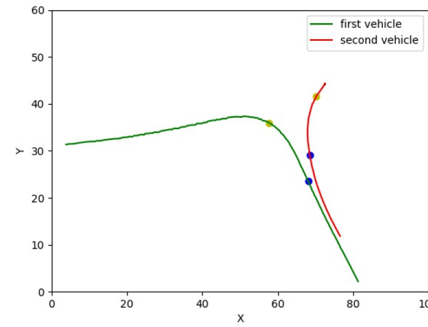


# Vehicle Interaction Prediction

Xiaosong Jia

07/01/2019

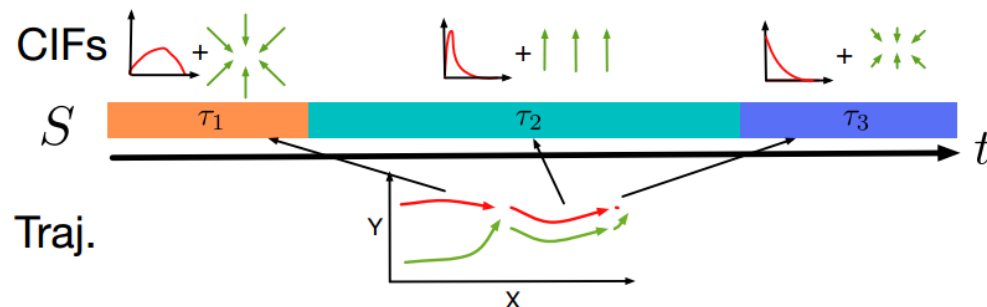
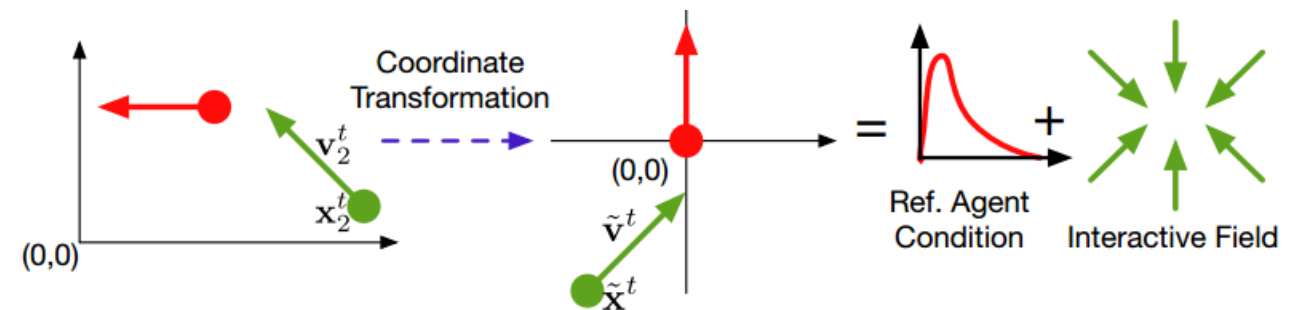
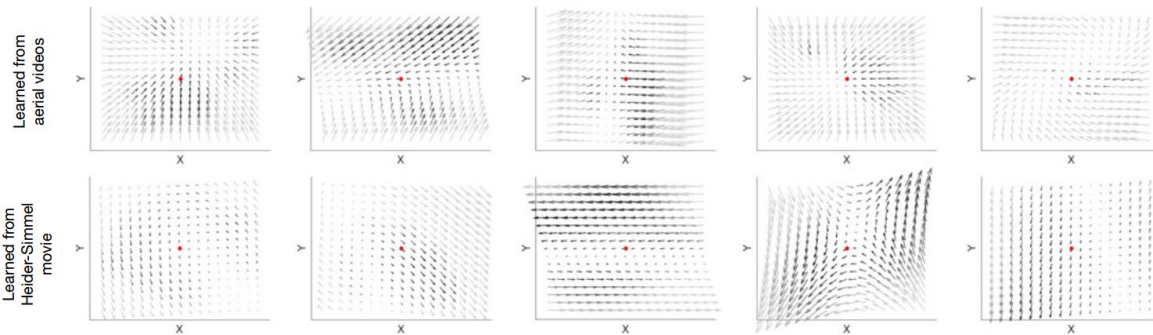
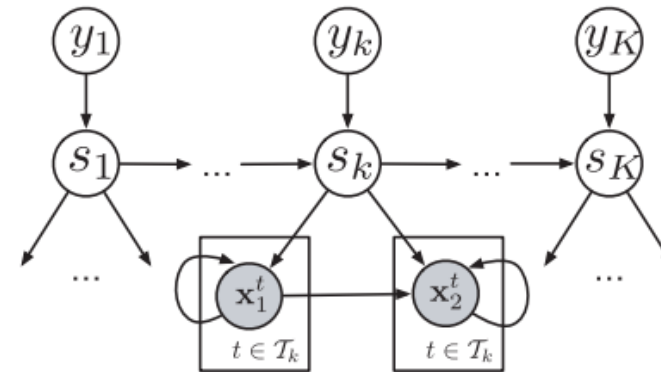
# Existing Try



- Define interaction by rule to generate labels -> classification task: given a trajectory, predict whether or not the interaction happens at each time point
- Why interaction directed?
- Confliction: Why not directly classify according to the rule?
- Define more reasonable application scenarios: Given a window of historic trajectory, predict whether the two vehicles are interacting right now.
- Data preprocessing

# [Tianmin et. al. TOPICS 2018]

- Bayesian model
- Multiple Interactive Fields
- Supervised Learning!

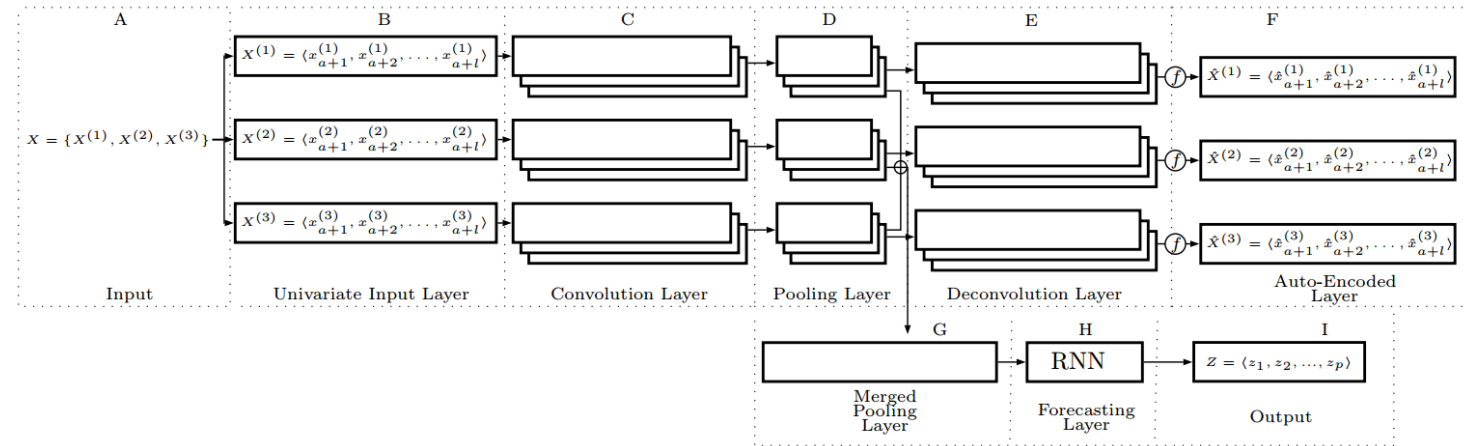
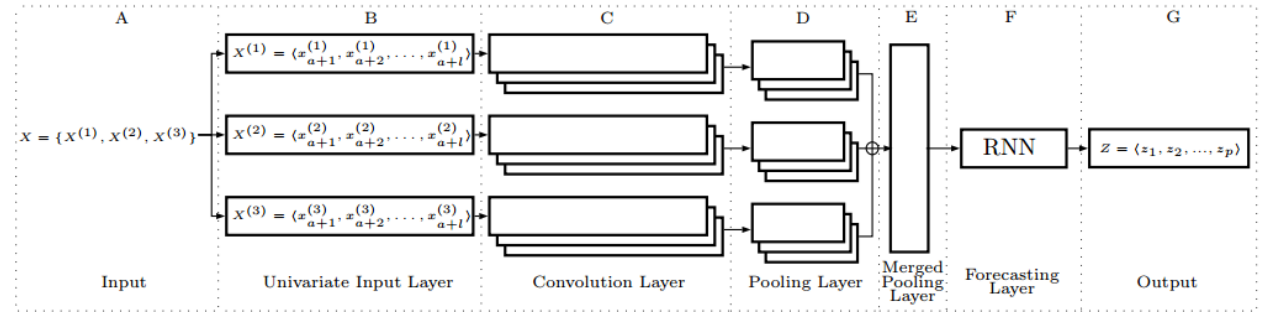


$$U(\tilde{\mathbf{v}}^t, \tilde{\mathbf{x}}^t, \mathbf{v}_1^t | s^t = s_k, y^t = y_k) = \mathbf{w}_{s_k, y_k}^\top \phi(\tilde{\mathbf{x}}^t, \tilde{\mathbf{v}}^t, \mathbf{v}_1^t) + \beta_{s_k, y_k}$$

$$\text{where } \phi(\tilde{\mathbf{x}}^t, \tilde{\mathbf{v}}^t, \mathbf{v}_1^t) = [\tilde{\mathbf{x}}^{t\top}, \tilde{\mathbf{v}}^{t\top}, \mathbf{v}_1^{t\top}, \tilde{\mathbf{x}}^{t\top} \tilde{\mathbf{v}}^t, \|\tilde{\mathbf{x}}^t\|, \|\tilde{\mathbf{v}}^t\|, \|\mathbf{v}_1^t\|]^\top$$

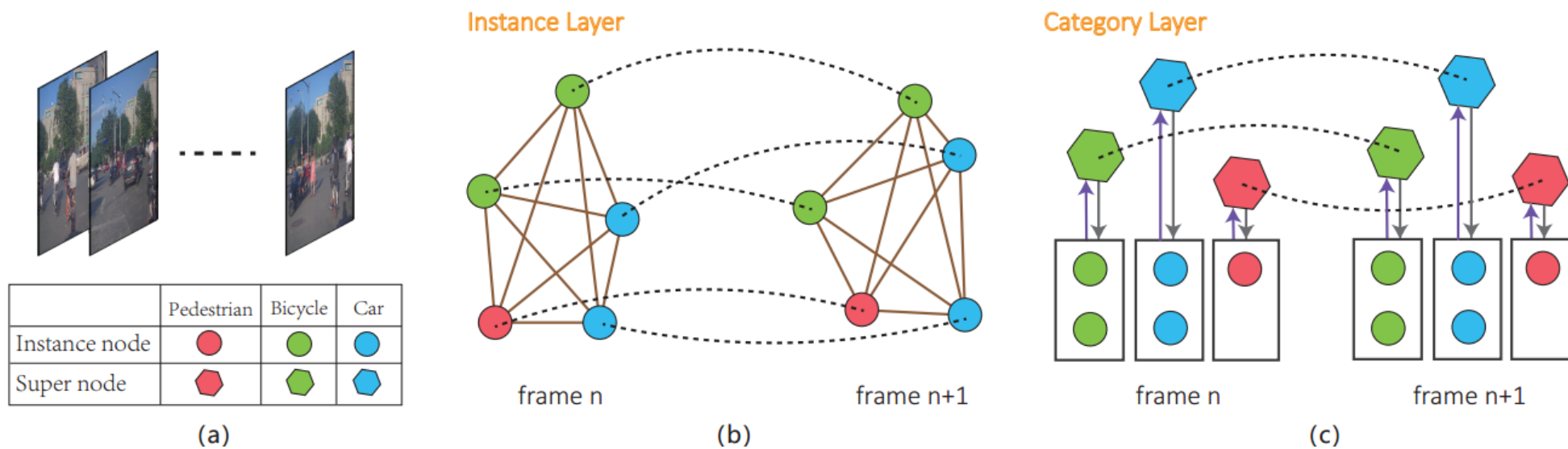
# [Razvan-Gabriel et. al. CIKM 2018]

- CNN for 1xl sequence to extract features
- Use another task as a kind of regularization



[Yuexin et. al. AAAI 2019]

- Heavily using LSTM
- Multi-agent + temporal + Multi-class agent





# My thinking

- P1: What are the downstream tasks (applications)?
  - P2: Data Preprocessing/Feature Engineering for DNN?
  - P3: X and Y heterogeneous? -> Shared Parameters
- 
- Idea:
    1. More hand-design labels
    2. Use different features (Auto-encoder, series prediction) -> unsupervised learning
    3. Do a downstream task and explicitly learn interaction patterns