Syntax Aware LSTM model for Semantic Role Labeling

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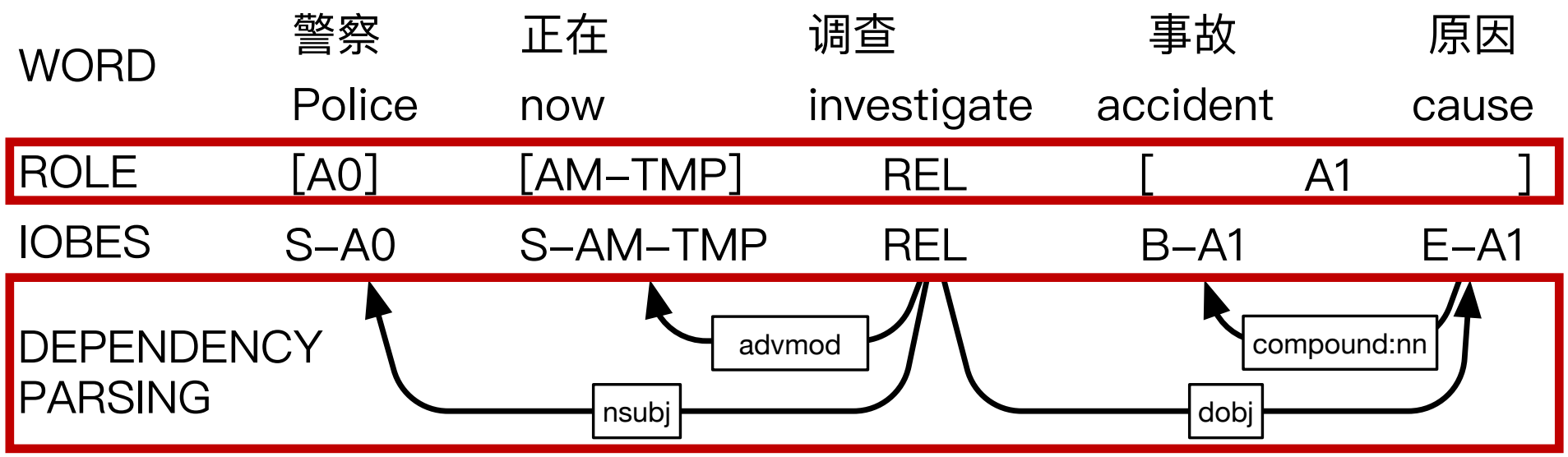
Motivation

- Semantic Role Labeling (SRL) is important for a lot of NLP tasks because of the semantic information SRL provides.
- Dependency relationships can help SRL.
- Previous methods can not model the tree structure of dependency relationships.

An Example of SRL Label and Dependency Relationships



Conventional bi-LSTM

$$z_t = f(W_1 x_t)$$

$$\widetilde{C} = f(W_c z_t + U_c h_{t-1} + b_c)$$

$$g_j = \sigma(W_j z_t + U_j h_{t-1} + b_j) \quad j \in \{i, f, o\}$$

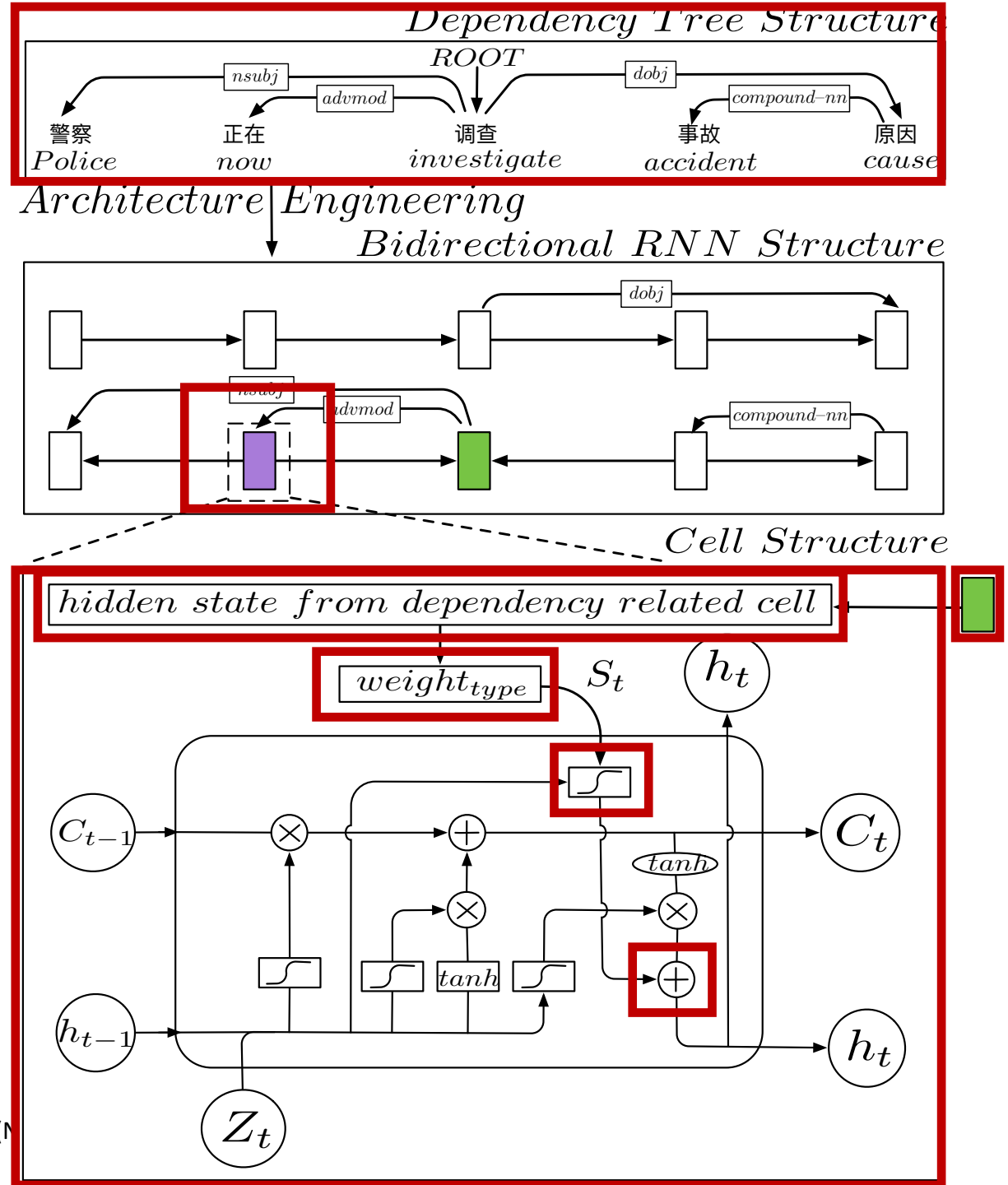
$$C_t = g_i \odot \widetilde{C} + g_f \odot C_{t-1}$$

$$h_t = g_o \odot f(C_t)$$

$$a_t = [\overrightarrow{h_t}^T, \overleftarrow{h_t}^T]$$

$$o_t = W_3 f(W_2 a_t)$$

- Module Architecture



Syntax-Aware LSTM

$$\alpha = \begin{cases} \alpha_m & \text{exists } type_m \text{ dependency} \\ & \text{relation from } w_i \text{ to } w_t \\ 0 & \text{Otherwise} \end{cases}$$

$$S_t = f(\sum_{i=0}^{t-1} \alpha \times h_i)$$

$$g_s = \sigma(W_s z_t + U_s h_{t-1} + b_s)$$

$$h_t = g_o \odot f(C_t) + g_s \odot S_t$$

Syntax Aware LSTM Model For Chinese Semantic Role Labeling

- Result
- Chinese
- CPB 1.0

Method	F_1%
Xue(2008)	71.90
Sun et al.(2009)	74.12
Yand and Zong(2014)	75.31
Wang et al.(Bi-LSTM)(2015)	77.09
Sha et al.(2016)	77.69
Path LSTM, Roth et al. (2016)[3]	**79.01**
BiLSTM+feature engineering dependency	77.75
SA-LSTM(**Random Initialized**)	**79.81**
SA-LSTM(**Pre-trained Embedding**)	**79.92**

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- Result
- English
- CoNLL 2009

Method	F_1 %
Bi-LSTM(2 layers)	74.52
Bi-LSTM + SA-LSTM(2 layers)	**76.63**
He(2017)(Single Model, state of the art)	81.62
He(Single Model, 8 layers) + SA-LSTM	**81.90**

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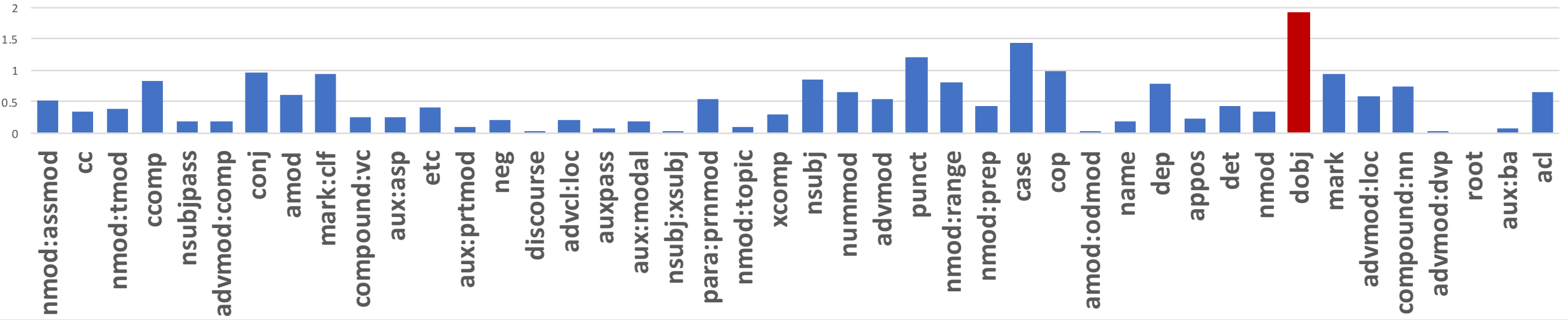
- Weight accordance to grammar intuition



Thank You For Your Attention!