

# Few-Shot Sequence Labeling with Label Dependency Transfer and Pair-wise Embedding

Yutai Hou, Zhihan Zhou, Yijia Liu,  
Ning Wang, Wanxiang Che, Han Liu, Ting Liu,

# In this paper

Address sequence labeling in Few-shot Learning setting with CRF

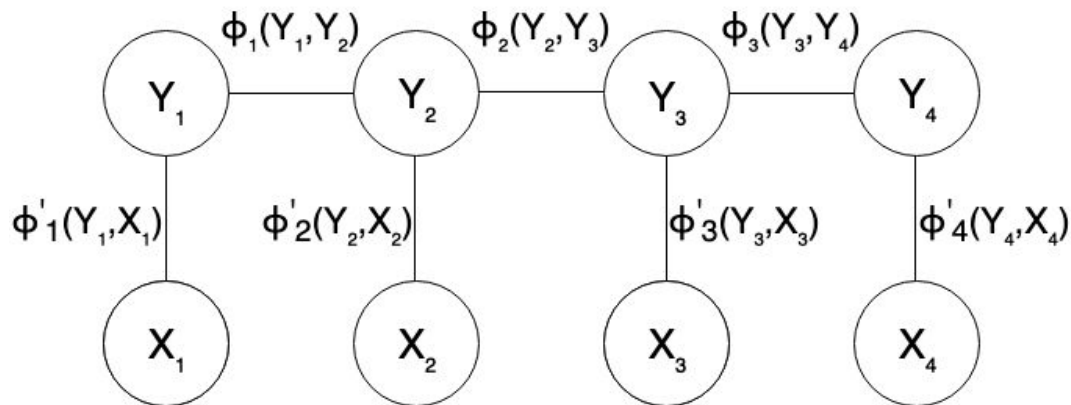
Dependency transfer mechanism: transfer label into abstract label transition pattern

Pair-wise embedder: embed query and support sentence pair wisely.

# CRF revisits

Requires transition matrix and emission matrix calculated from large data

In few-shot learning, this transition/emission matrices are mostly missing and skew



# CRF in this paper

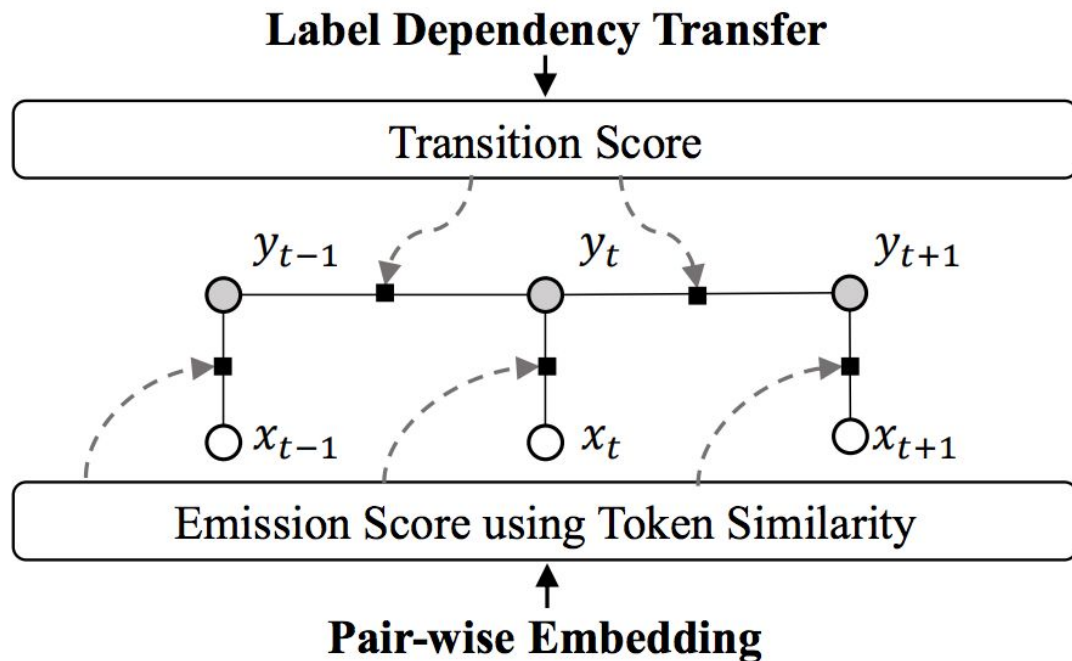


Figure 1: Linear-chain CRF for few-shot sequence labeling.

# Transition scorer

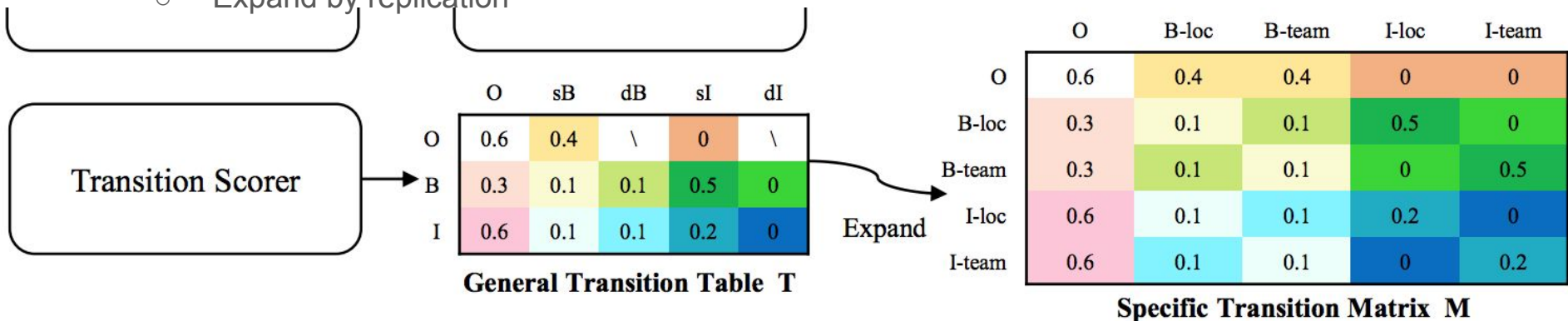
- Traditional CRF:

- Learn from large data
- Store in transition matrix

$$f_T(y_{j-1}, y_j) = p(y_j \mid y_{j-1})$$

- Label conversion

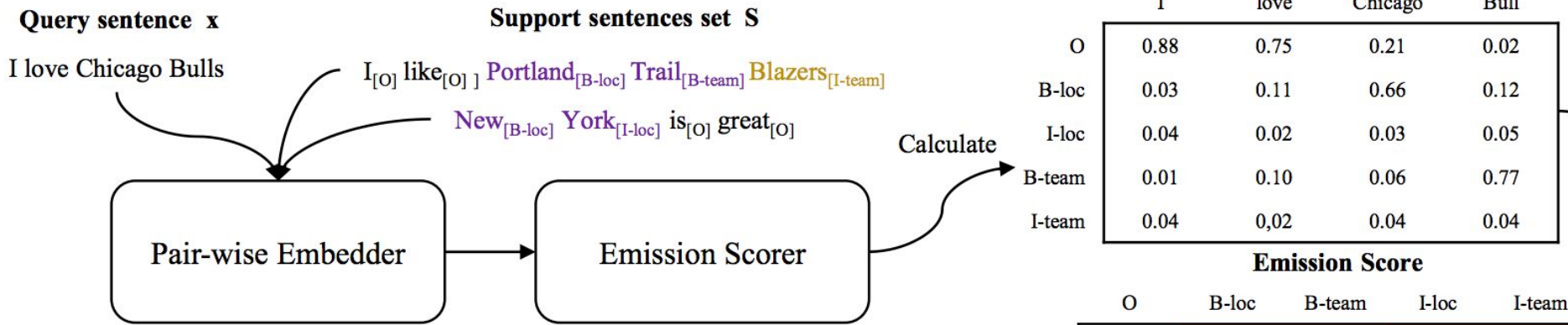
- B, I, O only not B-X, I-X
- Introduce sB (same B) dB (different B) sI (same I) and dI different I) into the transition system
- Transition matrix is 3x5
- Expand by replication



# Emission scorer

Pairwise embedding: pair a query sentence with each support sentence and pass to BERT

Using FSL model to classify based on vector similarity



# Result

Model	Slot Tagging							Named Entity Recognition					
	We	Mu	Pl	Bo	Se	Re	Cr	Ave.	News	Wiki	Social	Mixed	Ave.
Bi-LSTM	25.44	39.69	45.36	73.58	55.03	40.30	40.49	45.70	6.59	8.34	0.87	12.20	7.00
SimBERT	53.46	54.13	42.81	75.54	57.10	55.30	32.38	52.96	32.01	10.63	8.20	21.14	18.00
TransferBERT	56.01	43.85	50.65	14.19	23.89	36.99	14.29	34.27	4.93	0.91	3.71	15.64	6.30
WPZ	9.35	14.04	16.71	47.23	19.56	11.45	13.41	18.82	4.15	3.13	0.89	0.90	2.27
WPZ+GloVe	27.15	34.09	22.15	50.40	28.58	34.59	23.76	31.53	16.84	5.26	5.42	3.51	7.76
WPZ+Bert	69.06	57.97	44.44	71.97	74.62	51.01	69.22	62.61	49.85	9.60	18.66	13.17	22.82
MN	38.80	37.98	51.97	70.61	37.24	34.29	<b>72.34</b>	49.03	20.33	5.73	7.84	8.04	10.49
NMN	63.76	55.38	43.81	73.72	73.37	64.71	71.69	63.78	49.94	9.13	16.55	11.10	21.68
MN+P&D	51.30	61.00	68.73	70.93	59.84	33.03	47.46	56.04	17.53	4.80	6.68	12.29	10.33
WPZ+Bert+P&D	<b>71.38</b>	<b>67.48</b>	71.38	69.33	58.09	72.81	68.05	68.36	<b>49.25</b>	10.85	31.81	<b>26.98</b>	<b>29.72</b>
NMN+P&D	70.90	64.63	<b>75.19</b>	<b>83.64</b>	<b>78.23</b>	<b>78.07</b>	62.73	<b>73.27</b>	46.56	<b>12.46</b>	<b>33.59</b>	22.81	28.86