Hybrid Syntactic Graph Convolutional Networks for Chinese Event Detection

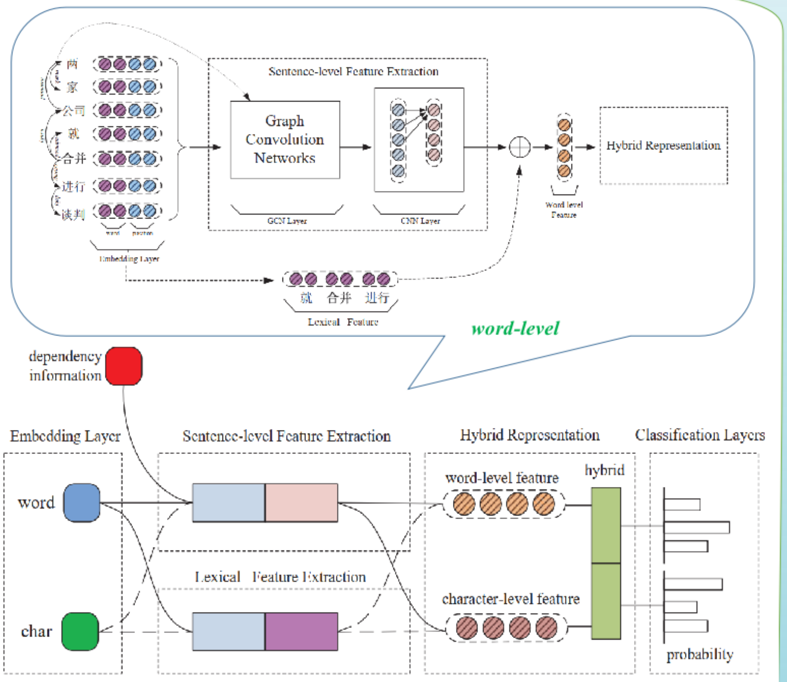
Xiaobo Ma, Yongbin Liu, and Chunping Ouyang

School of Computing, University of South China

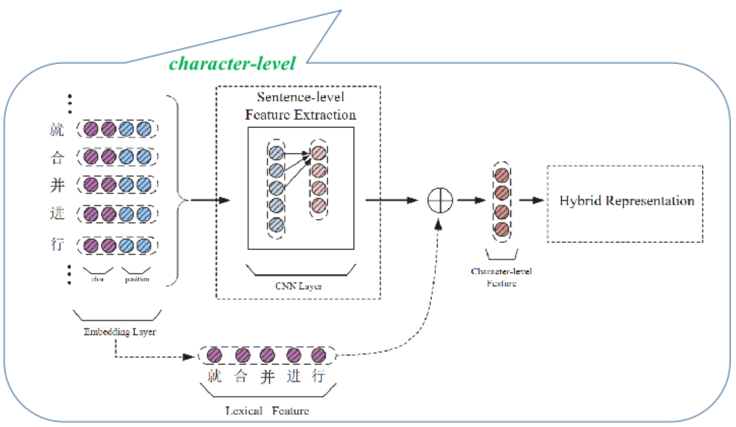
Introduction:

Chinese Event Detection is more complex than English Event Detection, because triggers are not always exactly match with a word. In Chinese Event Detection, a trigger can be the part of a word or cross multiple words. And traditional word embedding is difficult to consider cue words because they are scattered and far away from the triggers. To solve these problems, we proposed a model called HSGCN (Hybrid Syntactic Graph Convolutional Networks). The contributions of our model include: (i) an important feature for triggers identification, syntactic dependency, is introduced to our model, and exploiting graph convolutional networks which is well-suited for handling dependency tree to represent syntactic dependency, (ii) considering the semantic characteristics of Chinese vocabulary, combining word-level feature and character-level feature could keep the original semantic of Chinese word to improve the triggers identification, and (iii) provides state-of-the art performance on ACE 2005 and KBPEval2017 datasets in Chinese event detection.

Architecture of HSGCN:



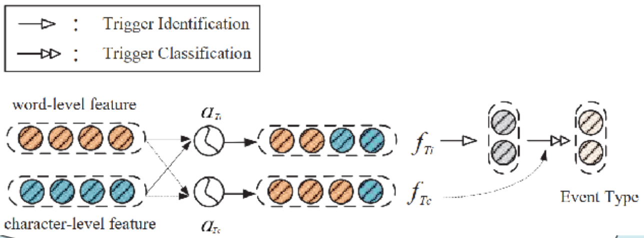
The overall architecture of our model



Approach:

The Architecture of HSGCN consists of the following four components: (a) sentence encoding that represents the sentence in both word-level and character-level; (b) sentence-level feature extraction based on syntactic graph convolutional networks and lexical feature extraction; (c) hybrid representation learning by combining word embedding and character embedding; (d) trigger generator and event type classifier.

We use the Skip-gram model to obtain the character embedding and word embedding , and represent syntactic dependency in sentence level based on GCN to improve the triggers identification. For trigger identification may rely on more structural information from character-level feature, while trigger classification need more semantic information from word-level feature. Consequently, we train two gates to model the information flow for trigger identification and trigger classification.



Experiments & Results:

Experiment results on ACE 2005 dataset

Model	Trigger Identification (%)			Trigger Classification (%)		
	P	R	F1	P	R	F1
C-BiLSTM	65.6	66.7	66.1	60.0	60.9	60.4
FBRNN	64.1	63.7	63.9	59.9	59.6	59.7
HNN	**74.2**	63.1	68.2	**77.1**	53.1	63.0
NPN(Task-specific)*	64.8	**73.8**	69.0	60.9	**69.3**	64.8
HSGCN	71.5	68.9	**70.2**	66.9	64.6	**65.7**

We evaluate HSGCN on KBPEval2017 dataset and test the model on five most common event subtype (Attack, Broadcast, Transport Ownership, Die and Transfer Money) of KBPEval2017 dataset. For comparison purposes, we select NPN (Task-specific) as baseline in this subsection.

The result of HSGCN and baseline in trigger identification and trigger classification.

Event Type	Baseline (%)			HSGCN (%)			ΔF1
	P	R	F1	P	R	F1	
Trigger Identification							
Attack	61.93	55.81	58.71	68.12	52.44	59.26	+0.55
Broadcast	65.29	48.20	55.46	68.21	48.81	56.90	+1.44
Transport Ownership	66.79	45.22	53.93	70.10	46.25	55.73	+1.80
Die	64.17	55.45	59.49	66.93	54.49	60.07	+0.58
Transfer Money	69.55	50.20	58.31	71.63	51.12	59.66	+1.35
All Event Type	63.72	53.56	58.20	67.91	52.24	59.05	+0.85
Trigger Classification							
Attack	58.10	47.29	52.14	62.06	46.91	53.43	+1.29
Broadcast	60.07	42.55	49.81	63.57	43.65	51.76	+1.95
Transport Ownership	55.75	48.76	52.02	59.85	47.78	53.14	+1.12
Die	62.83	49.73	55.52	67.68	47.53	55.84	+0.32
Transfer Money	59.90	49.12	53.98	62.74	46.94	53.70	-0.28
All Event Type	56.97	47.68	51.91	63.65	45.47	53.05	+1.14

Conclusions :

We propose a hybrid syntactic graph convolutional networks (HSGCN) for Chinese event detection that exploit the syntactic information to effectively model the sentence-level feature. Our model also consider the different effects of words and characters in trigger identification and trigger classification. Compared with traditional event detection methods, our approach efficiently capture syntactic dependency and generate a sentence-level feature based on GCN, thus can take advantage of event information that scattered in the sentence. Furthermore, in order to keep the original semantic of Chinese vocabulary, word embedding and character embedding are concatenated, which improve the accuracy of triggers identification.