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HMEAE: Hierarchical Modular Event Argument Extraction

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Juanzi Li[1], Peng Li[2], Maosong Sun[1], Jie Zhou[2], Xiang Ren[3]

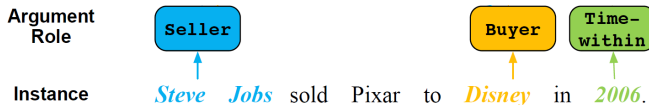[1]Department of Computer Science and Technology, Tsinghua University
[2]Pattern Recognition Center, WeChat, Tencent Inc
[3]Department of Computer Science, University of Southern California.

November 7, 2019
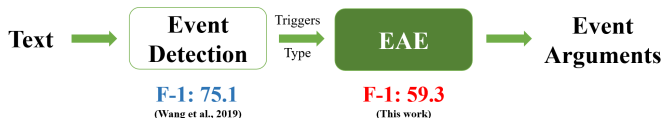
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- Event argument extraction (EAE):
    - Identify the entities serving as event arguments
    - Classify their argument roles

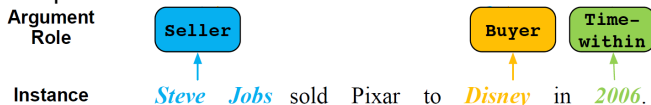- Second stage of Event Extraction

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- The second stage of Event Extraction
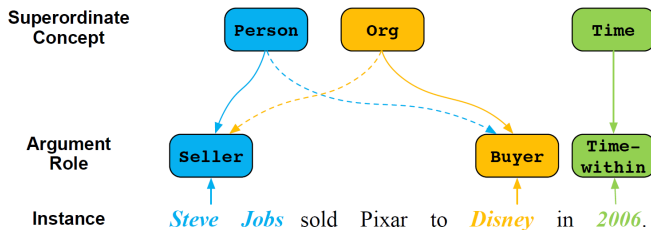

- The bottleneck of Event Extraction

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Motivation

- Existing methods treat argument roles as mutually independent

Argument Role

| Seller | | Buyer | Time-within |

Instance   *Steve* *Jobs* sold Pixar to *Disney* in *2006*.

- Some argument roles are conceptually closer than others

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Motivation

- Some argument roles are conceptually closer than others

- How to utilize the concept hierarchy?

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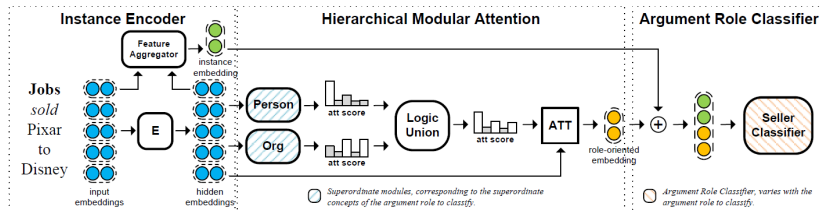
Our Model

- Neural Module Networks
  - Imitating the concept hierarchical structure
  - Provide effective inductive bias for EAE

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Overall architecture

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Superordinate Concept Module (SCM)

- One superordinate concept is corresponding to one module
- Attention module, to highlight related information
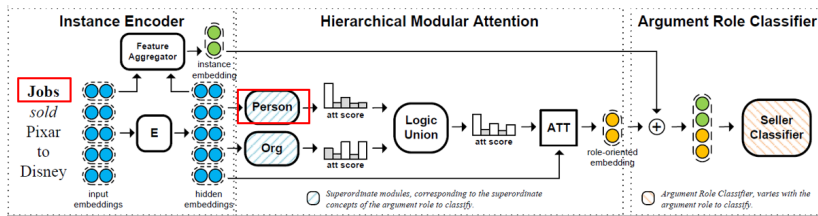
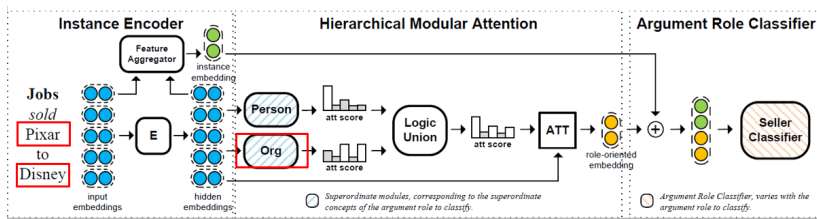Introduction
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Superordinate Concept Module (SCM)

- One superordinate concept is corresponding to one module
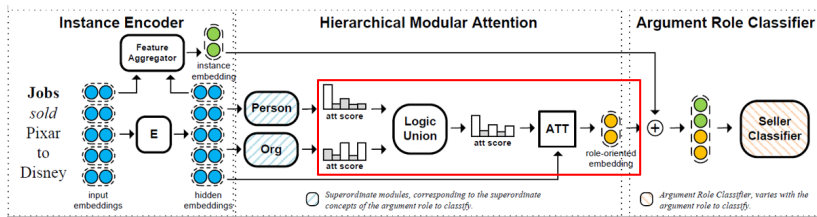- Attention module, to highlight related information

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Logic Union Module

- Compose corresponding SCMs
- Depends on the argument role

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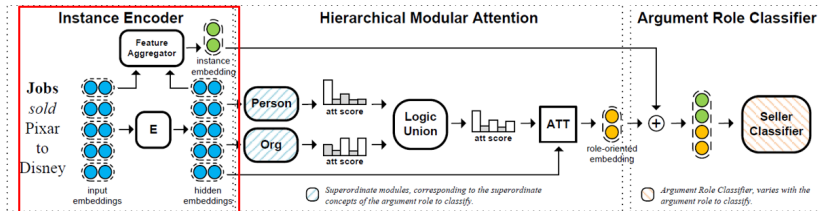## Argument Role Classifier

- Given the embeddings
- Predict whether this instance is of this argument role

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Instance Encoder

- Encode text and the candidate entity into embeddings
- Feature Aggregator: pooling, aggregate into a global instance embedding
- HMEAE is agnostic to the encoder

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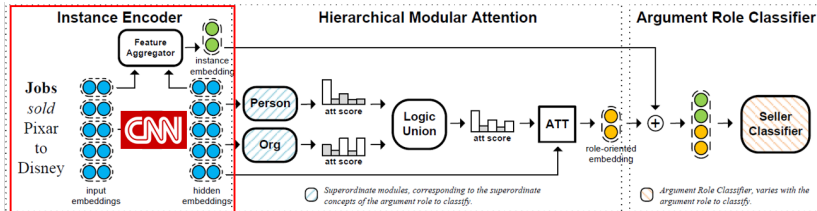Methodology
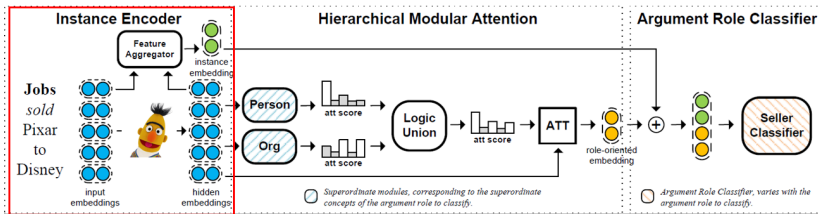ooooooooo●

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Instance Encoder

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Overall Results

Method	Argument Role Classification		
	P	R	F1
Li's Joint	64.7	44.4	52.7
DMCNN	62.2	46.9	53.5
RBPB	54.1	53.5	53.8
JRNN	54.2	**56.7**	55.4
dbRNN	**66.2**	52.8	58.7
HMEAE (CNN)	57.3	54.2	55.7
DMBERT	58.8	55.8	57.2
HMEAE (BERT)	62.2	56.6	**59.3**

Table 1: The overall results (%) on ACE 2005.

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Overall Results

Method	Argument Role Classification		
	P	R	F1
DISCERN-R	7.9	7.4	7.7
Washington4	32.1	5.0	8.7
CMU CS Event1	**31.2**	4.9	8.4
Washington1	26.5	6.8	10.8
DMCNN	17.9	16.0	16.9
HMEAE (CNN)	15.3	22.5	18.2
DMBERT	22.6	24.7	23.6
HMEAE (BERT)	24.8	**25.4**	**25.1**

Table 2: The overall results (%) on TAC KBP 2016.

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Case Study

- Do the SCMs really capture its corresponding concepts?

Figure 1: Heatmap for attention scores of three SCMs on the left sentence.

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Conclusion and Future work

- A modular architecture imitating a prior structure (concept hierarchy) can provide effective inductive bias
- Other tasks? Other priors?
- Automatic design the architecture?

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The End

Thanks for listening.
Questions are welcome.

(a) Code

(b) Paper