




BERT for Joint Intent Classification and Slot Filling

郭成凯

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- ▶ BERT for Joint Intent Classification and Slot Filling.
 - ▶ **NLU** -> Dialog State Tracking -> Policy Learning -> NLG

CV项目

- ▶ 多相机
- ▶ 全场景
- ▶ Re-ID
- ▶ 视频分析
- ▶ 人脸识别



语音识别/合成

- ▶ 语音合成

<https://www.parrottt.com/>

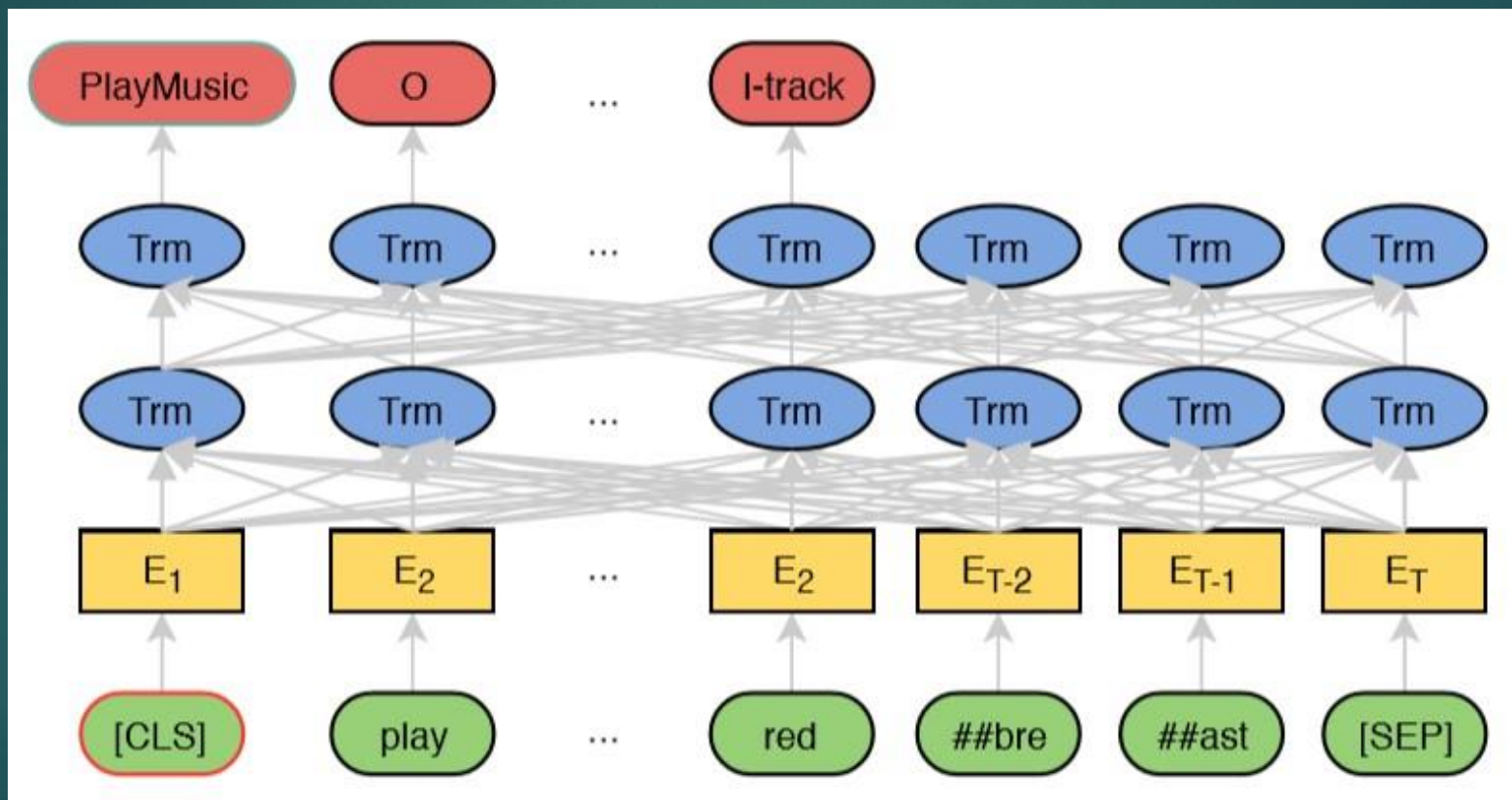
- ▶ 语音识别 LM Bert

- ▶ OCR

Joint Intent cls & slot filling

Query	Find me a movie by Steven Spielberg
Frame	Intent find_movie Slot genre = movie directed_by = Steven Spielberg

Model



实现

```
self.hidden_size = hidden_size
self.num_intents = num_intents
self.num_slots = num_slots
self.dropout = nn.Dropout(dropout)
self.intent_dense = nn.Linear(self.hidden_size, self.hidden_size)
self.intent_classifier = nn.Linear(self.hidden_size, self.num_intents)
self.slot_dense = nn.Linear(self.hidden_size, self.hidden_size)
self.slot_classifier = nn.Linear(self.hidden_size, self.num_slots)
self.apply(
    lambda module: transformer_weights_init(module, xavier=False))
self.to(self._device)

def forward(self, hidden_states):
    hidden_states = self.dropout(hidden_states)

    intent_states = self.intent_dense(hidden_states[:, 0])
    intent_states = torch.relu(intent_states)
    intent_logits = self.intent_classifier(intent_states)

    # slot_states = self.slot_dense(hidden_states[1:, :])
    slot_states = self.slot_dense(hidden_states)
    slot_states = torch.relu(slot_states)
    slot_logits = self.slot_classifier(slot_states)

    return intent_logits, slot_logits
```

Results

Models	Snips			ATIS		
	Intent	Slot	Sent	Intent	Slot	Sent
RNN-LSTM (Hakkani-Tür et al., 2016)	96.9	87.3	73.2	92.6	94.3	80.7
Atten.-BiRNN (Liu and Lane, 2016)	96.7	87.8	74.1	91.1	94.2	78.9
Slot-Gated (Goo et al., 2018)	97.0	88.8	75.5	94.1	95.2	82.6
Joint BERT	98.6	97.0	92.8	97.5	96.1	88.2
Joint BERT + CRF	98.4	96.7	92.6	97.9	96.0	88.6

ATIS Test

```
- Restoring JointIntentSlotClassifier

- Query: show flights tomorrow evening from milwaukee to st. louis
- Predicted intent:      14      flight
- show                  0
- flights              0
- tomorrow             B-depart_date.day_name
- evening              B-depart_time.period_of_day
- from                 0
- milwaukee            B-fromloc.city_name
- to                   0
- st.                  B-toloc.city_name
- louis                I-toloc.city_name
```

SNIPS Test

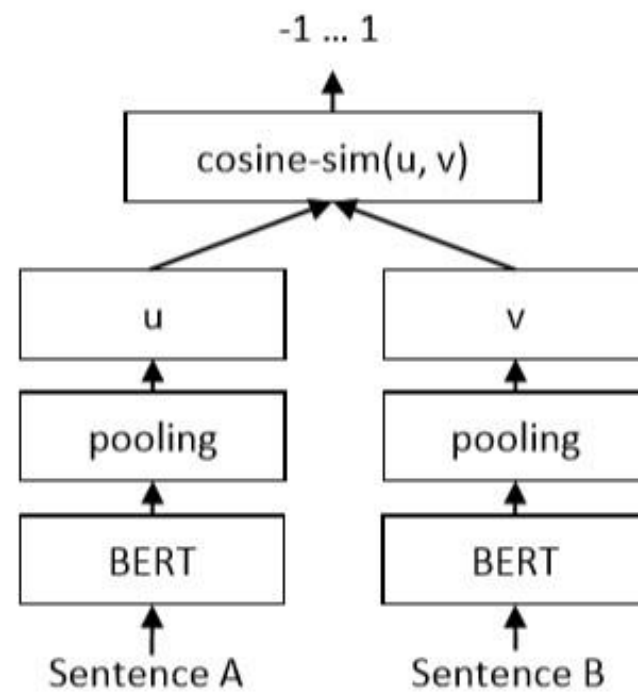
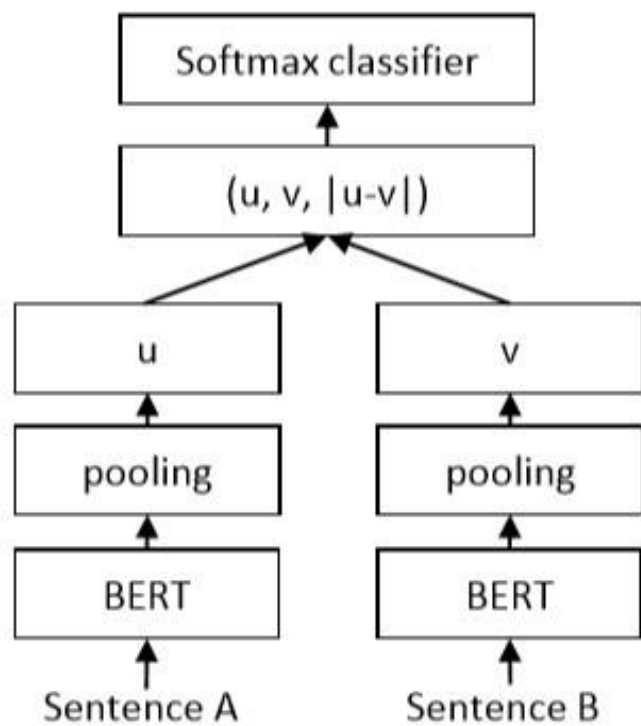
```
Query: i'd like to listen to bingo.  
Predicted intent:      4      PlayMusic  
i'd      0  
like     0  
to       0  
listen  0  
to       0  
bingo.  song_name
```

```
Query: its pretty dark here , why didnt you turn the lights up  
Predicted intent:      2      IncreaseBrightness  
its      0  
pretty  0  
dark    0  
here    0  
,       0  
why     0  
didnt   0  
you     0  
turn    0  
the     0  
lights  0  
up      0
```

Another Method:

- ▶ Sentence-BERT
- ▶ Sentence Embeddings using Siamese BERT-Networks

Model



Objective Function:

- ▶ Classification Objective Function

$$\text{softmax}(W^t(u, v, \|u - v\|))$$

- ▶ Regression Objective Function

- ▶ Triplet Objective Function

$$\max(\|s_a - s_p\| - \|s_a - s_n\| + 1, 0)$$

Test

A man is eating pasta.

```
[0.21805185 0.1520233 1.04767424 0.89392382 0.9602672 0.79048638  
0.84144169 0.8055068 0.90363041]
```

A man is eating a piece of bread.

Someone in a gorilla costume is playing a set of drums.

```
[0.8083395 0.80898171 0.76493328 0.7976688 0.92636555 0.8432147  
0.80365474 0.20152867 0.71403485]
```

A monkey is playing drums.

A cheetah chases prey on across a field.

```
[0.97539466 0.95483547 0.87328054 0.70701568 0.94015299 0.63376351  
0.72819956 0.69392715 0.09933376]
```

A cheetah is running behind its prey.

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感谢您的聆听。