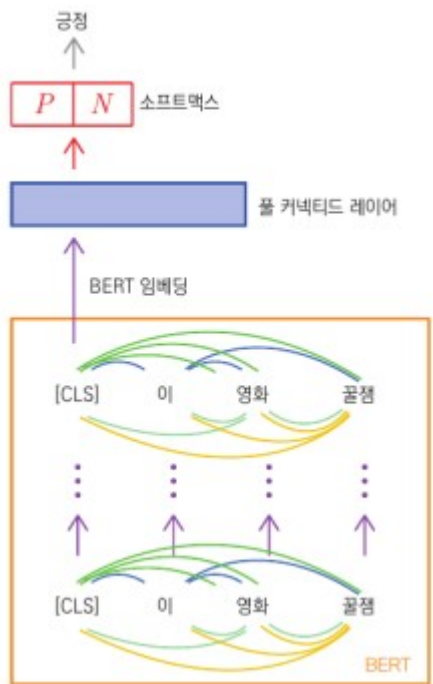


Fine Tuning-bert

전찬웅

Bert 활용



```
model.predict("이 영화 엄청 재미있네요")  
model.predict("이 영화 엄청 재미없네요")
```

```
array([[0.02599655, 0.9740035]], dtype=float32)  
array([[0.98890567, 0.01109429]], dtype=float32)
```

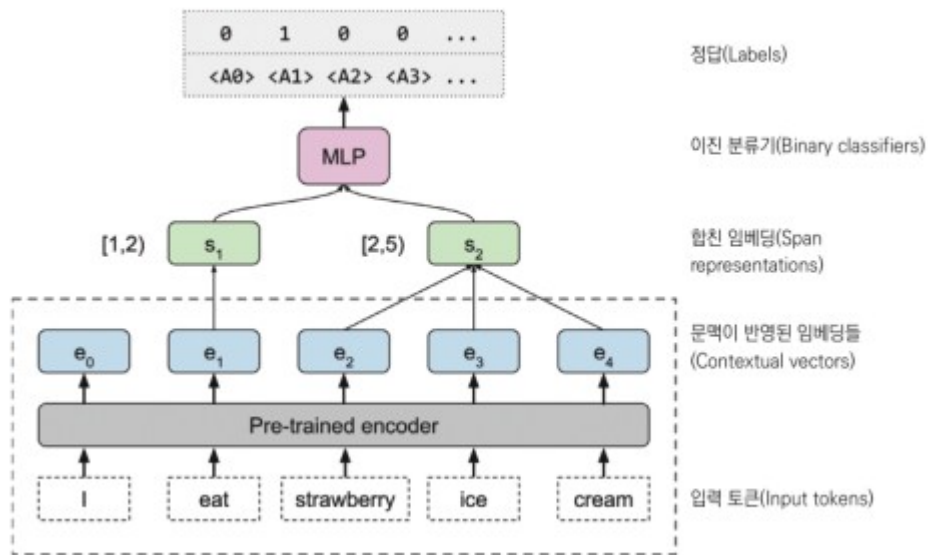
0

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Bert 예제

- Naver 영화 댓글 감정 분석

Probing model



POS	The important thing about Disney is that it is a global [brand] ₁ . → NN (Noun)
Constit.	The important thing about Disney is that it [is a global brand] ₁ . → VP (Verb Phrase)
Depend.	[Atmosphere] ₁ is always [fun] ₂ → nsubj (nominal subject)
Entities	The important thing about [Disney] ₁ is that it is a global brand. → Organization
SRL	[The important thing about Disney] ₂ [is] ₁ that it is a global brand. → ArgI (Agent)
SPR	[It] ₁ [endorsed] ₂ the White House strategy... → {awareness, existed_after, ...}
Coref. ^O	The important thing about [Disney] ₁ is that [it] ₂ is a global brand. → True
Coref. ^W	[Characters] ₂ entertain audiences because [they] ₁ want people to be happy. → True Characters entertain [audiences] ₂ because [they] ₁ want people to be happy. → False
Rel.	The [burst] ₁ has been caused by water hammer [pressure] ₂ . → Cause-Effect(e ₂ , e ₁)

Probing model

	CoVe			ELMo			GPT		
	Lex.	Full	Abs. Δ	Lex.	Full	Abs. Δ	Lex.	cat	mix
Part-of-Speech	85.7	94.0	8.4	90.4	96.7	6.3	88.2	94.9	95.0
Constituents	56.1	81.6	25.4	69.1	84.6	15.4	65.1	81.3	84.6
Dependencies	75.0	83.6	8.6	80.4	93.9	13.6	77.7	92.1	94.1
Entities	88.4	90.3	1.9	92.0	95.6	3.5	88.6	92.9	92.5
SRL (all)	59.7	80.4	20.7	74.1	90.1	16.0	67.7	86.0	89.7
Core roles	56.2	81.0	24.7	73.6	92.6	19.0	65.1	88.0	92.0
Non-core roles	67.7	78.8	11.1	75.4	84.1	8.8	73.9	81.3	84.1
OntoNotes coref.	72.9	79.2	6.3	75.3	84.0	8.7	71.8	83.6	86.3
SPR1	73.7	77.1	3.4	80.1	84.8	4.7	79.2	83.5	83.1
SPR2	76.6	80.2	3.6	82.1	83.1	1.0	82.2	83.8	83.5
Winograd coref.	52.1	54.3	2.2	54.3	53.5	-0.8	51.7	52.6	53.8
Rel. (SemEval)	51.0	60.6	9.6	55.7	77.8	22.1	58.2	81.3	81.0
Macro Average	69.1	78.1	9.0	75.4	84.4	9.1	73.0	83.2	84.4

	BERT-base				BERT-large				
	F1 Score			Abs. Δ ELMo	F1 Score			Abs. Δ	
	Lex.	cat	mix		Lex.	cat	mix	(base)	ELMo
Part-of-Speech	88.4	97.0	96.7	0.0	88.1	96.5	96.9	0.2	0.2
Constituents	68.4	83.7	86.7	2.1	69.0	80.1	87.0	0.4	2.5
Dependencies	80.1	93.0	95.1	1.1	80.2	91.5	95.4	0.3	1.4
Entities	90.9	96.1	96.2	0.6	91.8	96.2	96.5	0.3	0.9
SRL (all)	75.4	89.4	91.3	1.2	76.5	88.2	92.3	1.0	2.2
Core roles	74.9	91.4	93.6	1.0	76.3	89.9	94.6	1.0	2.0
Non-core roles	76.4	84.7	85.9	1.8	76.9	84.1	86.9	1.0	2.8
OntoNotes coref.	74.9	88.7	90.2	6.3	75.7	89.6	91.4	1.2	7.4
SPR1	79.2	84.7	86.1	1.3	79.6	85.1	85.8	-0.3	1.0
SPR2	81.7	83.0	83.8	0.7	81.6	83.2	84.1	0.3	1.0
Winograd coref.	54.3	53.6	54.9	1.4	53.0	53.8	61.4	6.5	7.8
Rel. (SemEval)	57.4	78.3	82.0	4.2	56.2	77.6	82.4	0.5	4.6
Macro Average	75.1	84.8	86.3	1.9	75.2	84.2	87.3	1.0	2.9

Probing model

