Natural Language Inference

- Sentences Involving Compositional Knowledge (Marelli et al, 2014)
- Stanford Natural Language Inference dataset (Bowman et al, 2015)
- Natural Language Inference from Multiple Premises (Lai et al, 2017)

SICK Label: **neutral**

The black woman is wearing glasses over the headdress

A woman is wearing an Egyptian headdress

SNLI Label: **entailment**

A soccer game with multiple males playing

Some men are playing a sport

MPNLI Label: **contradiction**

A group of individuals performed in front of a seated crowd
Woman standing in front of group with black folders in hand
A group of women with black binders stand in front of a group of people
A group of people are standing at the front of the room, preparing to sing

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A group having a meeting

State of the art & Bottleneck

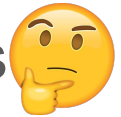
Neural network-based architectures

human performance ~91.2

Radford et al. '18	Fine-Tuned LM-Pretrained Transformer	85m	96.6	89.9
Seonhoon Kim et al. '18	Densely-Connected Recurrent and Co-Attentive Network **Ensemble**	53.3m	95.0	90.1
Zhuosheng Zhang et al. '19a	SJRC (BERT-Large +SRL)	308m	95.7	**91.3**
Zhousheng Zhang et al. '19b	SemBERT	340m	95.3	**91.6**
Xiaodong Liu et al. '19	MT-DNN	330m	97.2	**91.6**

https://nlp.stanford.edu/projects/snli

Not much research done on hybrid models

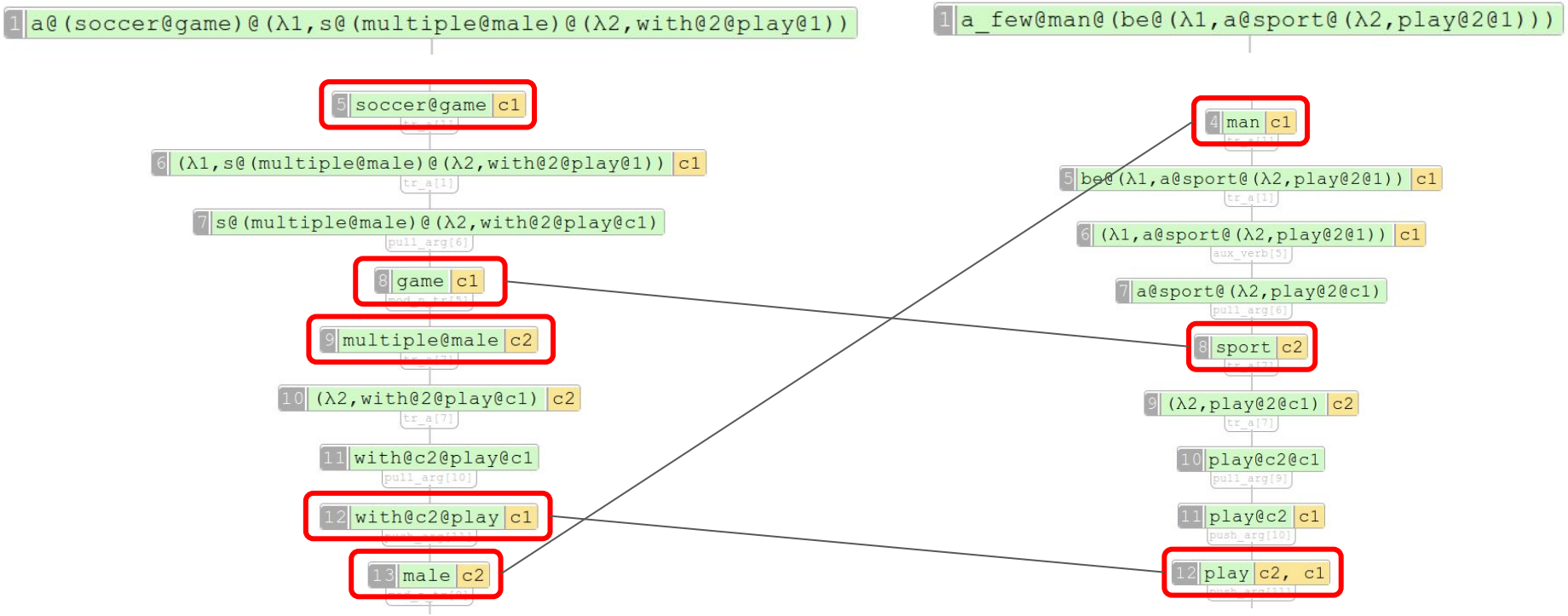


Research proposal: combine NN and logical forms

A soccer game with multiple males playing

https://naturallogic.pro/LangPro/

Some men are playing a sport

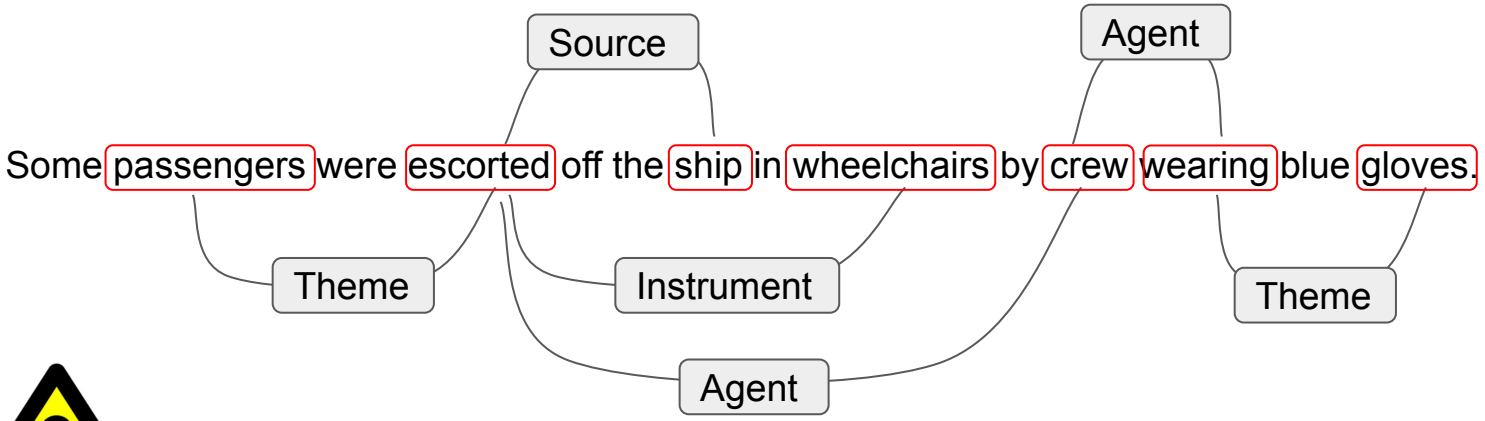


Logical form decomposes sentences

Data-driven method accounts for lexical relations

Semantic role labelling

- Relations between events and their participants
- Many even consider it as semantic parsing



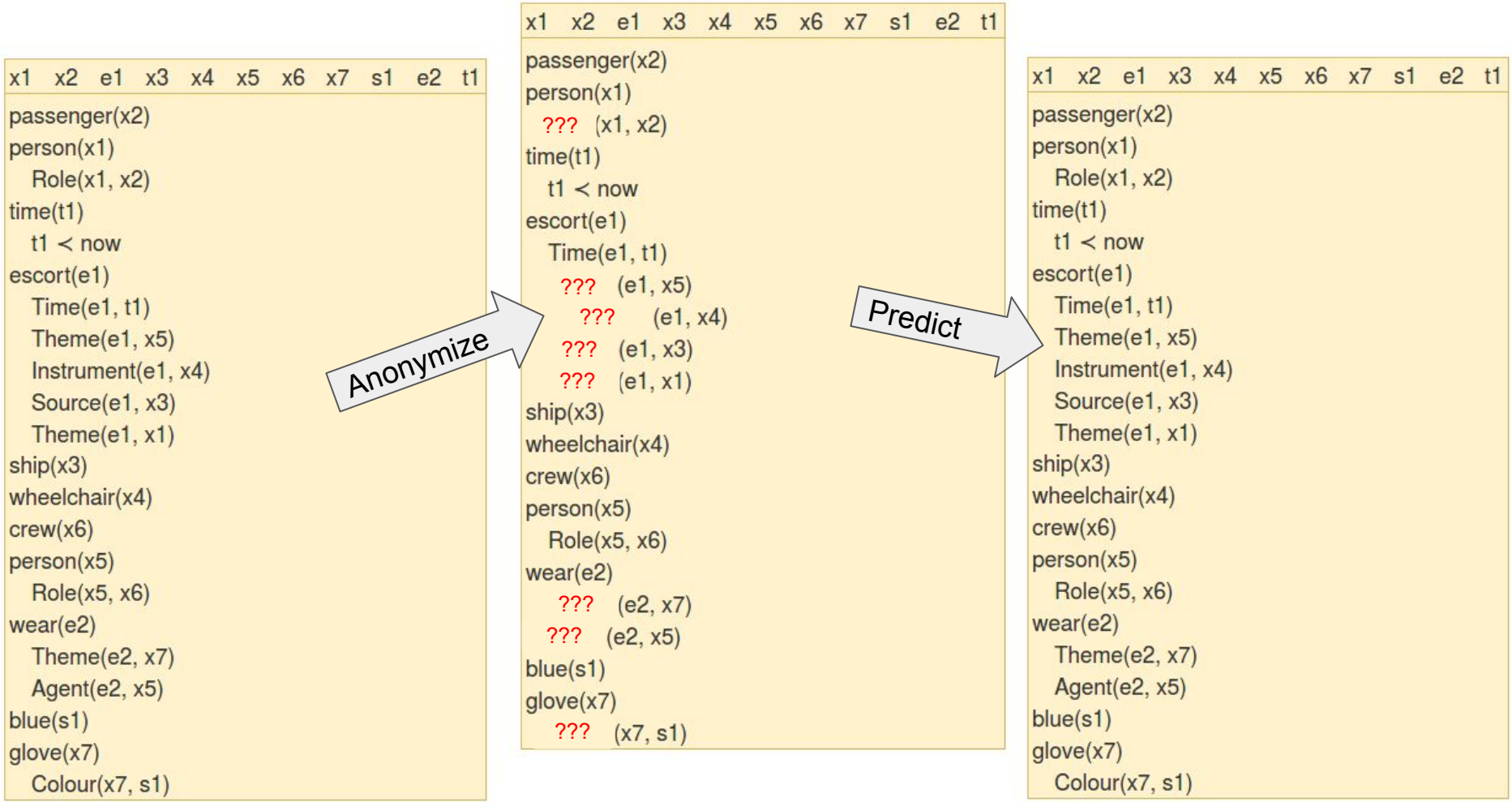
These are not Universal Dependencies!

Semantic role labelling

https://pmb.let.rug.nl/explorer/explore.php?part=93&doc_id=0757

Some passengers were escorted off the ship in wheelchairs by crew wearing blue gloves.

x1	x2	e1	x3	x4	x5	x6	x7	s1	e2	t1
passenger(x2)										
person(x1)										
Role(x1, x2)										
time(t1)										
t1 < now										
escort(e1)										
Time(e1, t1)										
Theme(e1, x5)										
Instrument(e1, x4)										
Source(e1, x3)										
Theme(e1, x1)										
ship(x3)										
wheelchair(x4)										
crew(x6)										
person(x5)										
Role(x5, x6)										
wear(e2)										
Theme(e2, x7)										
Agent(e2, x5)										
blue(s1)										
glove(x7)										
Colour(x7, s1)										


x1 x2 e1 x3 x4 x5 x6 x7 s1 e2 t1
passenger(x2)
person(x1)
Role(x1, x2)
time(t1)
t1 < now
escort(e1)
Time(e1, t1)
Theme(e1, x5)
Instrument(e1, x4)
Source(e1, x3)
Theme(e1, x1)
ship(x3)
wheelchair(x4)
crew(x6)
person(x5)
Role(x5, x6)
wear(e2)
Theme(e2, x7)
Agent(e2, x5)
blue(s1)
glove(x7)
Colour(x7, s1)
Anonymize
x1 x2 e1 x3 x4 x5 x6 x7 s1 e2 t1
passenger(x2)
person(x1)
??? (x1, x2)
time(t1)
t1 < now
escort(e1)
Time(e1, t1)
??? (e1, x5)
??? (e1, x4)
??? (e1, x3)
??? (e1, x1)
ship(x3)
wheelchair(x4)
crew(x6)
person(x5)
Role(x5, x6)
wear(e2)
??? (e2, x7)
??? (e2, x5)
blue(s1)
glove(x7)
??? (x7, s1)
Predict
x1 x2 e1 x3 x4 x5 x6 x7 s1 e2 t1
passenger(x2)
person(x1)
Role(x1, x2)
time(t1)
t1 < now
escort(e1)
Time(e1, t1)
Theme(e1, x5)
Instrument(e1, x4)
Source(e1, x3)
Theme(e1, x1)
ship(x3)
wheelchair(x4)
crew(x6)
person(x5)
Role(x5, x6)
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Theme(e2, x7)
Agent(e2, x5)
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glove(x7)
Colour(x7, s1)