



university of
 groningen

Exploring Neural Methods for Parsing Discourse Representation Structures

Rik van Noord, Lasha Abzianidze, Antonio Toral and Johan Bos

NWO

Parallel
 MEANING
 BANK

Main Goal

Neural model that is able to produce DRSs

Discourse Representation Structures

I am not working for Tom

PMB release 2.1.0

pmb.let.rug.nl

e_1	x_1	t_1
time.n.08(t_1)		
$t_1 = \text{now}$		
work.v.02(e_1)		
Time(e_1, t_1)		
Co – Agent(e_1, x_1)		
Agent($e_1, \text{speaker}$)		
male.n.02(x_1)		
Name(x_1, tom)		

	Data	Docs	Tokens
	Train	3,998	24,917
	Test	557	3,180
	Train	73,778	638,610

Fully manually annotated

Partially manually annotated

Gold standard

System output

Var matching

b1 REF t1
b1 EQU t1 “now”
b1 time “n.08” t1
b2 Time e1 t1
b1 NOT b2
b2 REF e1
b2 Agent e1 “speaker”
b2 work “v.02” e1
b2 Co-Agent e1 x1
b3 REF x1
b3 Name x1 “tom”
b3 male “n.02” x1

b2 REF x1
b2 EQU x1 “now”
b2 time “n.08” x1
b1 Time x2 x1
b2 NOT b1
b1 REF x2
b1 Agent x2 “speaker”
b1 work “v.01” x2
b1 REF x3
b1 Goal x2 x3
b1 Name x1 “tom”

b1 → b2
t1 → x1
b2 → b1
e1 → x2

Scores

P: 5/8

R: 5/9

F: 58.8

Variables

Rewrite variables based on De Bruijn index

\$NEW REF @NEW
\$0 EQU @0 “now”
\$0 time “n.08” @0
\$NEW Time @1 @0
\$-1 NOT \$0
\$0 REF @NEW

\$0 Agent @0 “speaker”
\$0 work “v.02” @0
\$0 Co-Agent @0 @1
\$NEW REF @NEW
\$0 Name @0 “tom”
\$0 male “n.02” @0

Characters or Words?

Characters! But keep:

- DRS operators: NOT, REF, EQU
- DRS roles : Agent, Time, Theme
- DRS variables: \$NEW, @1, \$0, @-1

Outperformed:
Words (Glove)
BPE
Char + words
Next: BERT/XLNet

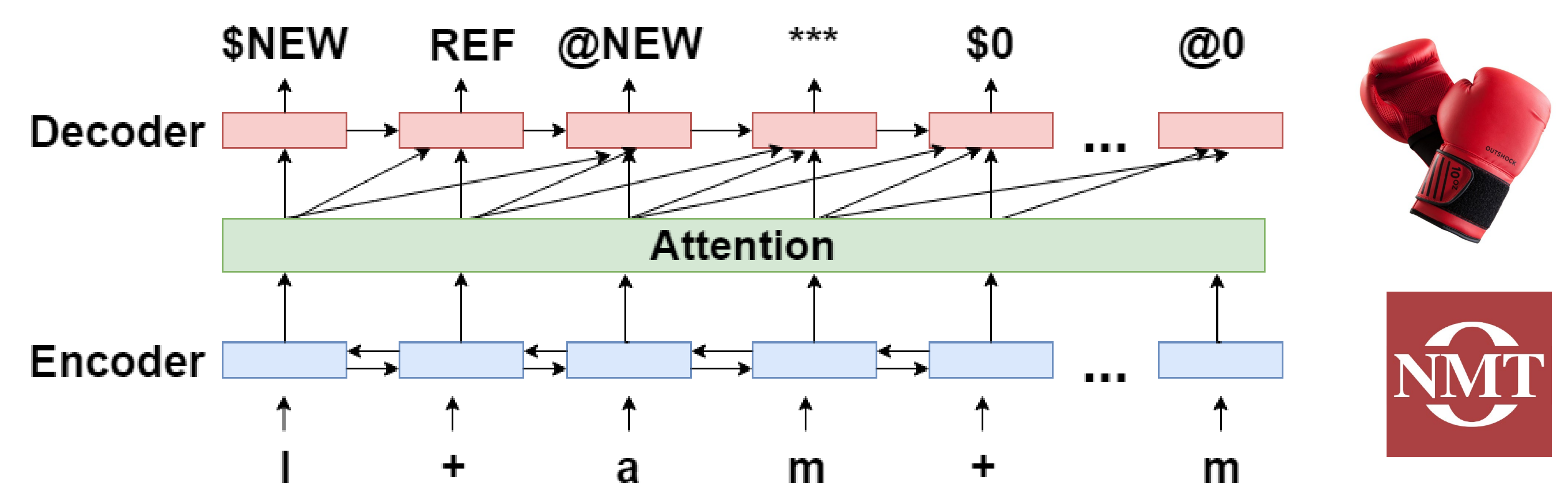
Sentence:

I + a m + n o t + w o r k i n g + f o r + T o m

DRS:

\$NEW REF @NEW *** \$0 EQU @0 “n o w “ *** \$0 time
“ n . 0 8 “ @0 *** \$NEW Time @1 @0 *** \$-1 NOT \$0 [...]

Neural Model



Best model: first train on then finetune on

DRS Referee

A list of clauses is not necessarily a well-formed DRS!

- Well-formed syntax
- No free variables
- No loops in relations
- Single main box



F-score of 0.0 for ill-formed DRSs

Results

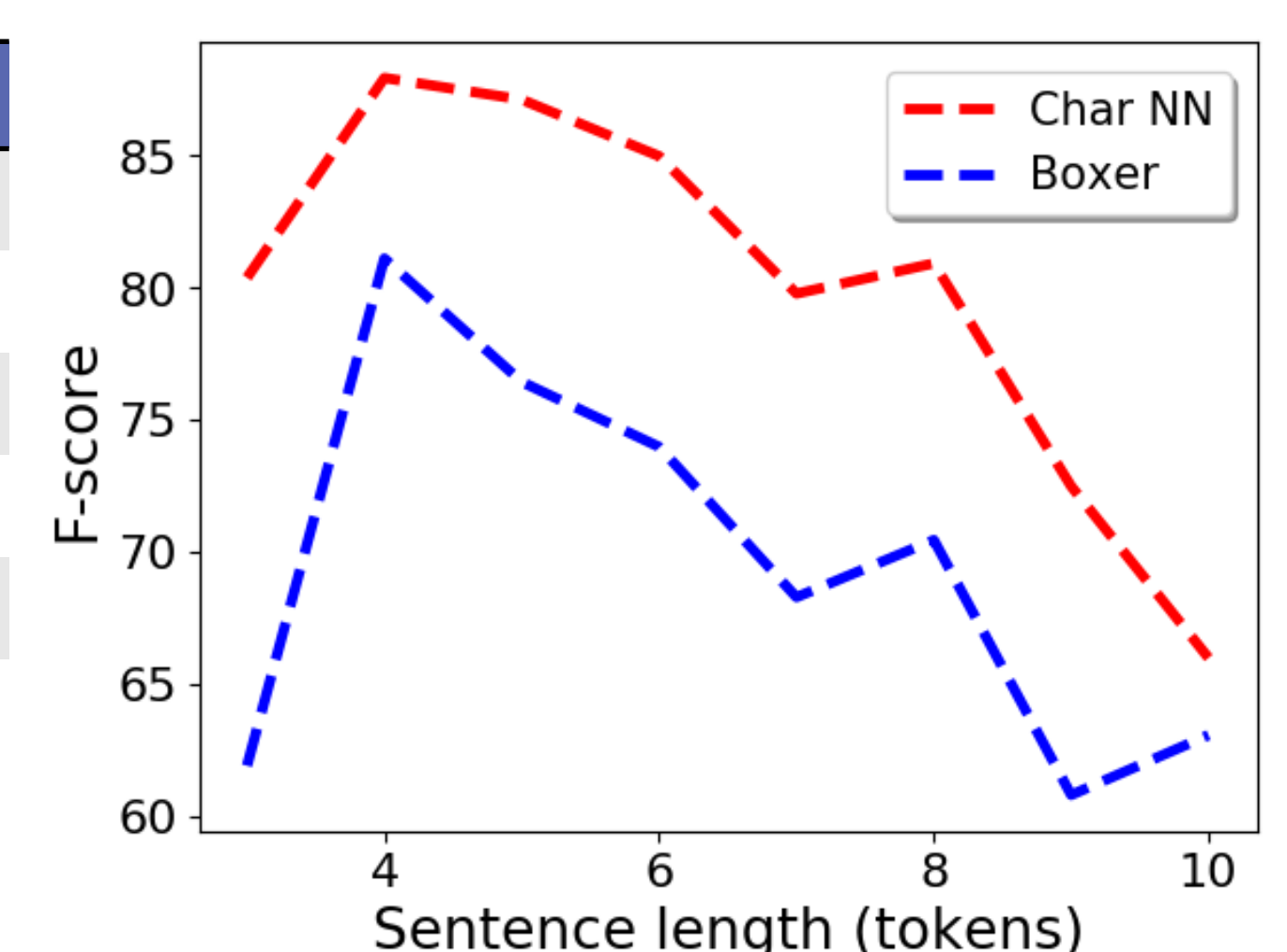
Model	Prec	Rec	F
SPAR	48.0	33.9	39.7
Sim-SPAR	55.6	57.9	56.8
amr2drs	43.3	43.0	43.2
Boxer	75.7	72.9	74.3
This work - gold only	79.7	76.2	77.9
This work – gold + silver	84.7	82.4	83.6

	NN	Boxer
All clauses	83.6	74.3
DRS Operators	93.2	88.0
Roles	84.1	71.4
Concepts	79.7	72.5

But what about semantics?

Or sentence length?

Phenomenon	#	NN	Boxer
Negation & modals	73	90	89
Scope ambiguity	15	73	80
Pronoun resolution	31	84	90
Discourse rel. & imp.	33	64	82
Embedded clauses	30	77	87



A look into the future...

Linguistic features can improve performance

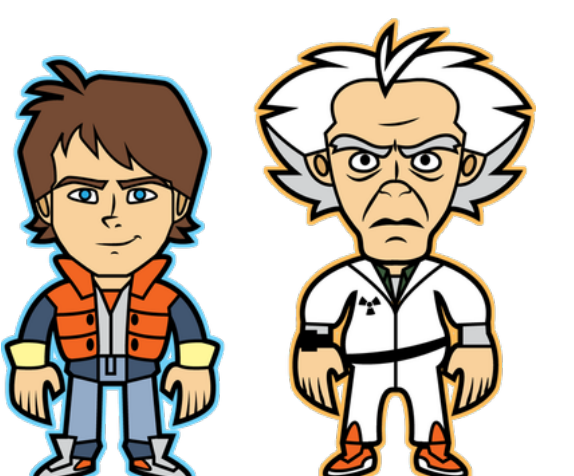
Seperately encode: POS, DEP, SYM, CCG, SEM

Linguistic Information in Neural Semantic Parsing Using Multiple Encoders
Van Noord, Toral and Bos, IWCS 2019

Check out the proceedings of our shared task!

Transformers, stack-LSTMs and much more...

The First Shared Task on Discourse Representation Structure Parsing
Abzianidze, Van Noord, Haagsma and Bos, IWCS 2019 pmb.let.rug.nl/shared_task.php



DRS parsing	
x	y
$\text{parse.v.01}(y)$	
$\text{Result}(y, x)$	
$\text{drs.n.01}(x)$	



rikvannoord@gmail.com



www.rikvannoord.nl



github.com/RikVN/



[@rikvannoord](https://twitter.com/rikvannoord)