Bringing replication and reproduction together with generalisability in NLP: Three reproduction studies for Target Dependent Sentiment Analysis

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Document Sentiment Example

'Rude service, medicore food...there are tons of restaurants in NY...stay away from this one' (Pontiki et al., 2015)

Negative

Aspect Based Sentiment Analysis (ABSA) Example

Text
'Rude service, medicore food...there are tons of restaurants in NY...stay away from this one' (Pontiki et al., 2015)

Aspects

1. SERVICE#GENERAL – Negative
2. FOOD#QUALITY – Neutral
3. RESTAURANT#GENERAL – Negative

Target Dependent Sentiment Analysis (TDSA) Example

Text
'Rude service, medicore food...there are tons of restaurants in NY...stay away from this one' (Pontiki et al., 2015)

Targets

1. service – Negative
2. food – Neutral

Generalisability?

1. Domain – Restaurant, Laptop
2. Type – Social Media, Reviews
3. Medium – Written, Spoken
4. Data Set Size
5. Data Set Characteristics – number of targets in a sentence.

Generalisability within TDSA

	Datasets						
Methods	1	2	3	4	5	6	7
Mitchell et al. (2013)			✓				
Kiritchenko et al. (2014)				✓			
Dong et al. (2014)	✓						
Vo et al. (2015)	✓	✓	✓				
Zhang et al. (2015)			✓				
Zhang et al. (2016)	✓	✓	✓				
Tang et al. (2016b)	✓			✓			
Tang et al. (2016a)				✓			
Wang et al. (2016)				✓			
Chen et al. (2017)	✓			✓	✓		
Liu et al. (2017)	✓	✓	✓				
Wang et al. (2017)	✓					✓	
Marrese-Taylor et al. (2017)				✓			✓

1=Dong et al. (2014), 2=Wilson (2008), 3=Mitchell et al. (2013), 4=Pontiki et al. (2014), 5=Chen et al. (2017), 6=Wang et al. (2017), 7=Marrese-Taylor et al. (2017)

Table 1: Methods and Datasets

■ Not Applicable

Generalisability within TDSA

	Datasets						
Methods	1	2	3	4	5	6	7
Mitchell et al. (2013)			✓				
Kiritchenko et al. (2014)				✓			
Dong et al. (2014)	✓						
Vo et al. (2015)	✓	✓	✓				
Zhang et al. (2015)			✓				
Zhang et al. (2016)	✓	✓	✓				
Tang et al. (2016b)	✓			✓			
Tang et al. (2016a)				✓			
Wang et al. (2016)				✓			
Chen et al. (2017)	✓			✓	✓		
Liu et al. (2017)	✓	✓	✓				
Wang et al. (2017)	✓					✓	
Marrese-Taylor et al. (2017)				✓			✓

1=Dong et al. (2014), 2=Wilson (2008), 3=Mitchell et al. (2013), 4=Pontiki et al. (2014), 5=Chen et al. (2017), 6=Wang et al. (2017), 7=Marrese-Taylor et al. (2017)

Table 2: Methods and Datasets

Social Media Reviews News Not Applicable

Generalisability within TDSA

	Datasets						
Methods	1	2	3	4	5	6	7
Mitchell et al. (2013)			✓				
Kiritchenko et al. (2014)				✓			
Dong et al. (2014)	✓						
Vo et al. (2015)	✓	✓	✓				
Zhang et al. (2015)			✓				
Zhang et al. (2016)	✓	✓	✓				
Tang et al. (2016b)	✓			✓			
Tang et al. (2016a)				✓			
Wang et al. (2016)				✓			
Chen et al. (2017)	✓			✓	✓		
Liu et al. (2017)	✓	✓	✓				
Wang et al. (2017)	✓					✓	
Marrese-Taylor et al. (2017)				✓			✓

1=Dong et al. (2014), 2=Wilson (2008), 3=Mitchell et al. (2013), 4=Pontiki et al. (2014), 5=Chen et al. (2017), 6=Wang et al. (2017), 7=Marrese-Taylor et al. (2017)

Table 3: Methods and Datasets

Social Media Reviews News Not Applicable

Generalisability within TDSA

	Datasets						
Methods	1	2	3	4	5	6	7
Mitchell et al. (2013)			✓				
Kiritchenko et al. (2014)				✓			
Dong et al. (2014)	✓						
Vo et al. (2015)	✓	✓	✓				
Zhang et al. (2015)			✓				
Zhang et al. (2016)	✓	✓	✓				
Tang et al. (2016b)	✓			✓			
Tang et al. (2016a)				✓			
Wang et al. (2016)				✓			
Chen et al. (2017)	✓			✓	✓		
Liu et al. (2017)	✓	✓	✓				
Wang et al. (2017)	✓					✓	
Marrese-Taylor et al. (2017)				✓			✓

1=Dong et al. (2014), 2=Wilson (2008), 3=Mitchell et al. (2013), 4=Pontiki et al. (2014), 5=Chen et al. (2017), 6=Wang et al. (2017), 7=Marrese-Taylor et al. (2017)

Table 4: Methods and Datasets

Social Media Reviews News Not Applicable

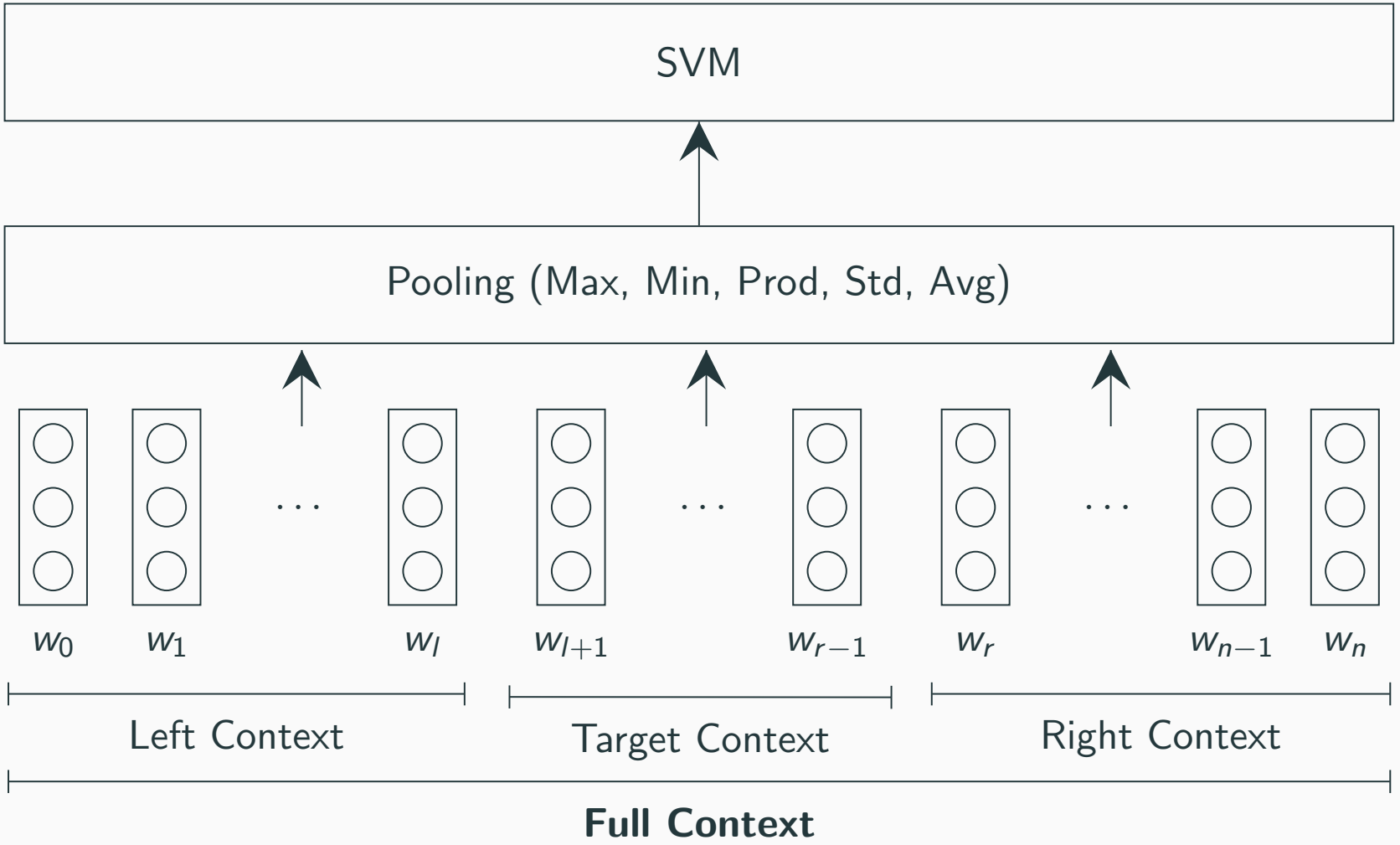
Why Reproduce?

Authors	Code with paper
Wang et al. (2017)	Yes
Tang et al. (2016b)	Unreliable
Vo et al. (2015)	No

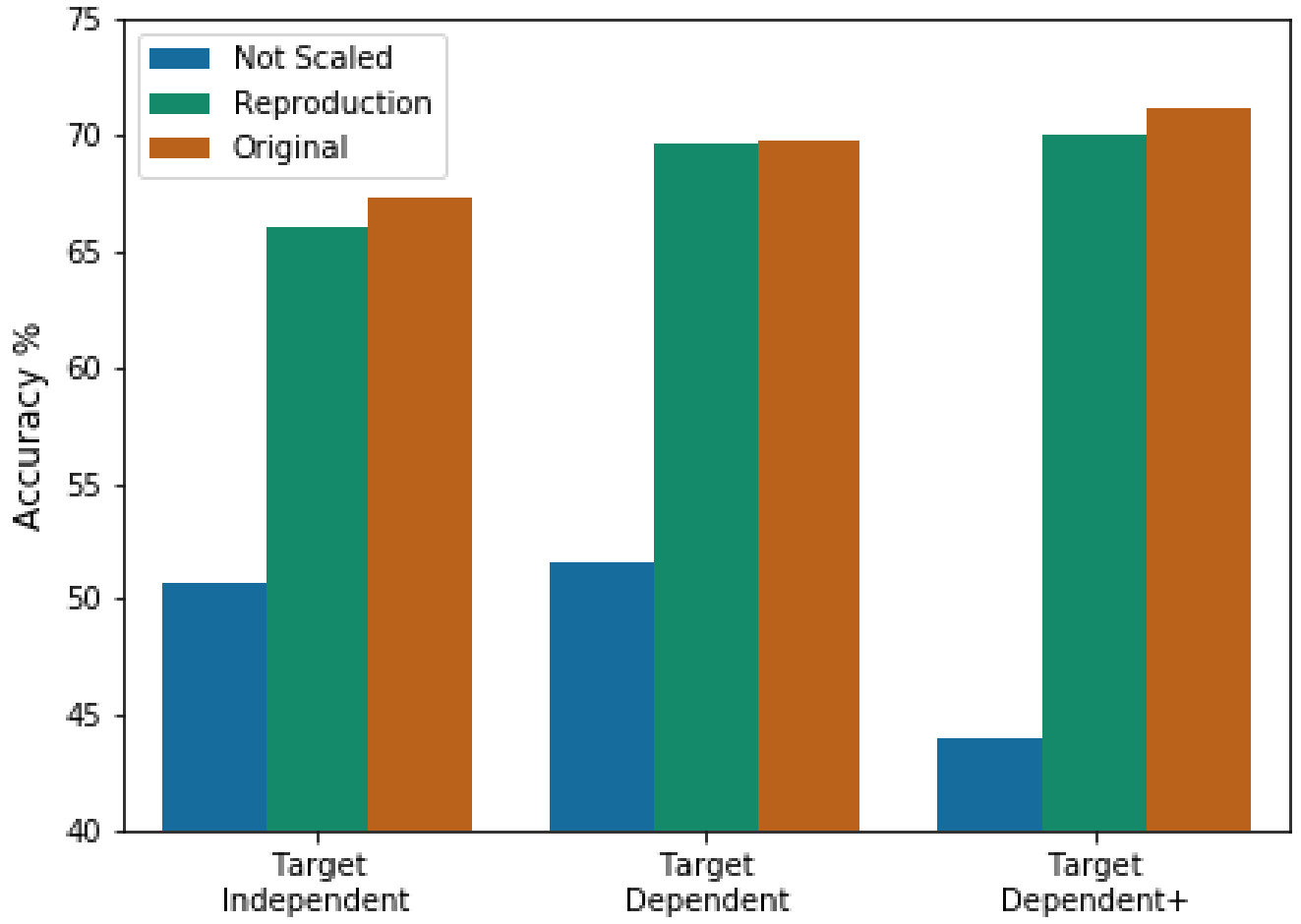
Authors	Restaurant	Laptop
Tang et al. (2016b)	75.63	68.13
Chen et al. (2017)	78.00	71.83
Tay et al. (2017)	69.73	62.38

■ Original ■ Re-used the same code ■ Re-implemented

Vo et al. (2015) Method

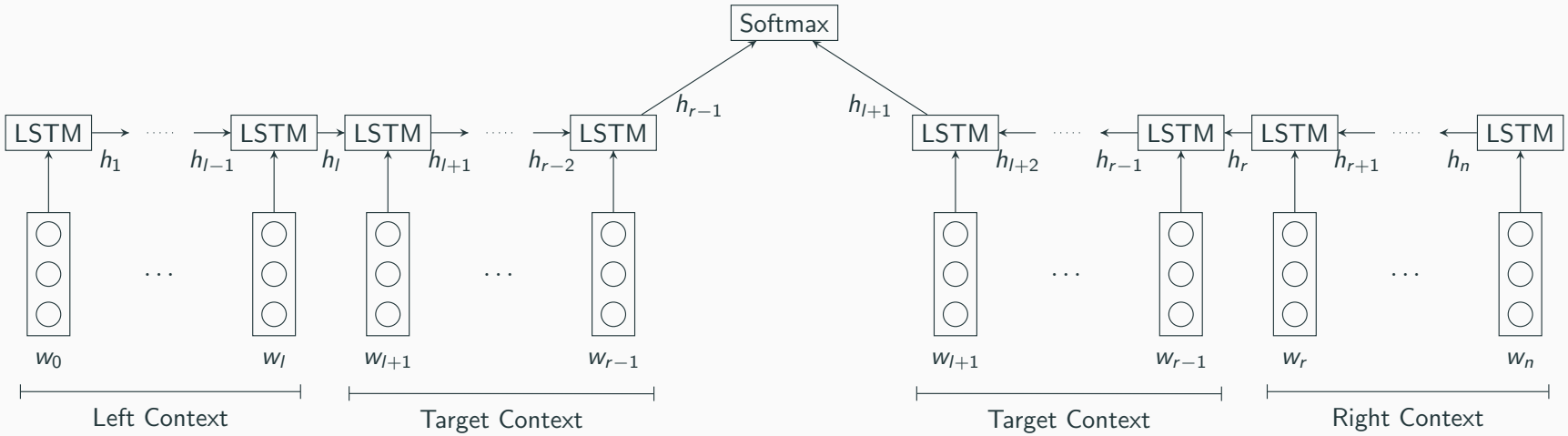


Vo et al. (2015) Reproduction Result

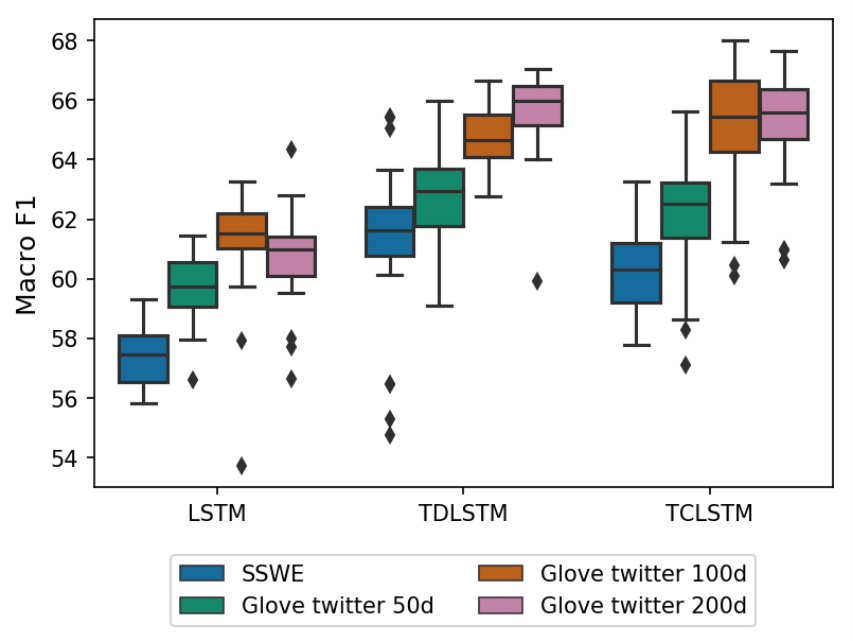


Scaling features is important - 15-25% difference

Tang et al. (2016b) Method



Tang et al. (2016b) Reproduction Result



	Macro F1		
Methods	O	R (Max)	R (Mean)
LSTM	64.70	64.34	60.69
TDLSTM	69.00	67.04	65.63
TCLSTM	69.50	67.66	65.23
O=Original, R=Reproduction			

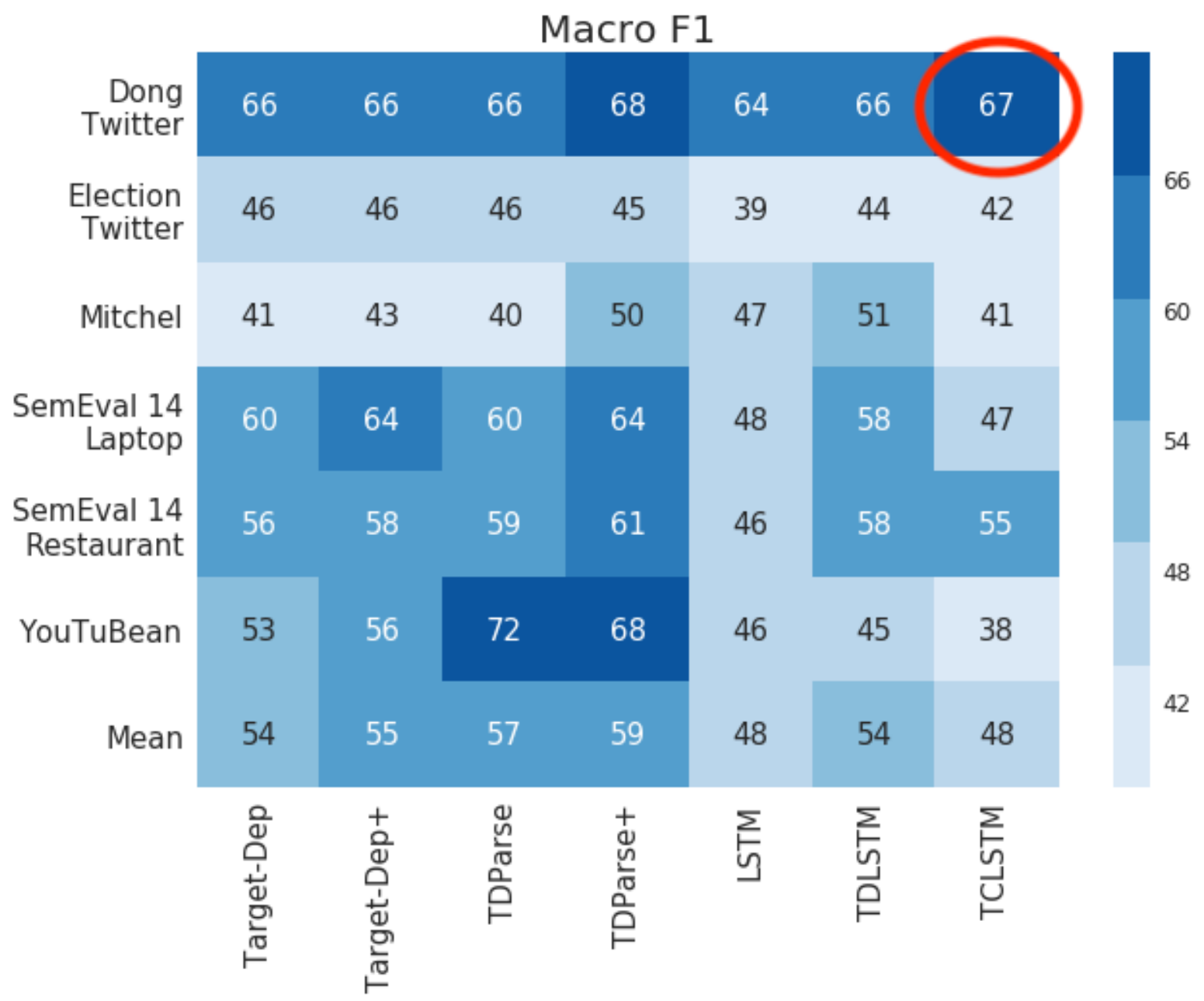
Repeating experiments with different seed values is important. (Reimers et al., 2017)

Mass Evaluation Datasets

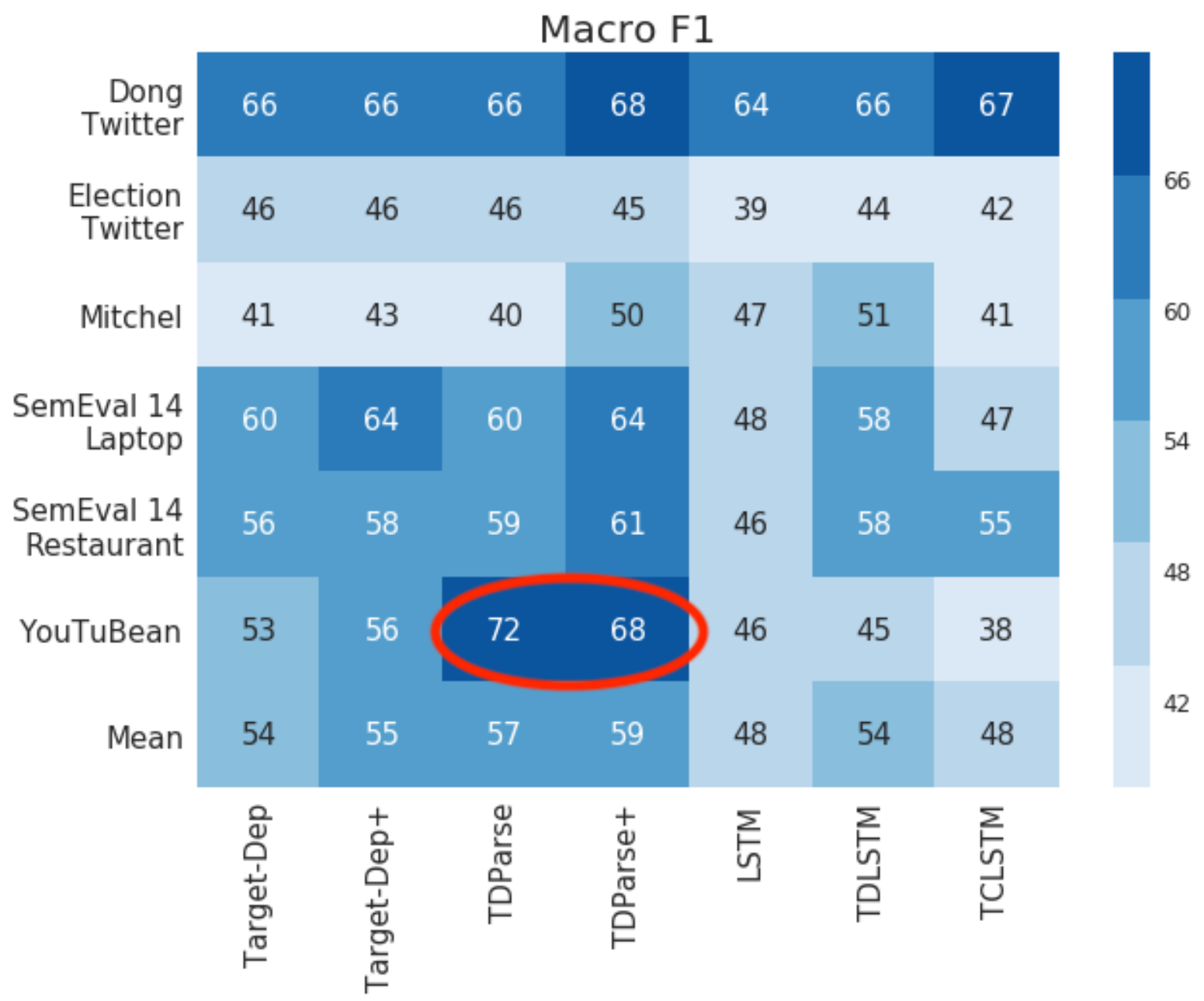
Dataset	Domain	Type	Size	Medium	ATS
SemEval 14 L	L	RE	2951	W	1.58
SemEval 14 R	R	RE	4722	W	1.83
Mitchel	G	S	3288	W	1.22
Dong Twitter	G	S	6940	W	1.00
Election Twitter	P	S	11899	W	2.94
YouTuBean	MP	RE/S	798	SP	2.07

L=Laptop, R=Restaurant, G=General, P=Politics, MP=Mobile Phones, RE=Review, S=Social Media, W=Written, SP=Spoken, ATS=Average Targets per Sentence

Mass Evaluation



Mass Evaluation



Contributions

1. **Generalisability**: First to report results across across three different dataset properties: 1. Domain, 2. Type, 3. Medium.

2. **Reproduction**: Open source TDSA framework with three different models.

Code, documentation, Jupyter notebook examples, and model zoo:
`https://github.com/apmoore1/Bella`

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