



How can world knowledge and in-depth evaluation improve sentiment analysis

Andrew Moore

Supervisor: Paul Rayson

March 2, 2018

School of Computing and Communications, Lancaster University.

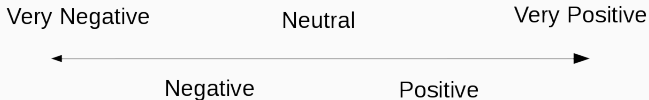
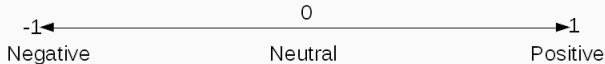
What is sentiment analysis

Generally finding the positive and negative opinion within a text.

Text

1. Document e.g. News article
2. Sentence e.g. Headline

Opinion Scales



How is sentiment predicted

Positive rotten tomato review

tim allen is great in his role but never hogs the scenes from his fellow cast , as there are plenty of laughs and good lines for everyone in this comedy. (Pang et al., 2005)

Finance Example

*Falling **crude** prices, corrections make stocks **attractive**¹*

¹<http://www.mydigitalfc.com/companies-and-markets/stock-market/falling-crude-prices-corrections-make-stocks-attractive>

Finance Example

*Falling crude prices, corrections make stocks **attractive***²

²<http://www.mydigitalfc.com/companies-and-markets/stock-market/falling-crude-prices-corrections-make-stocks-attractive>

Finance Example

Falling crude prices, corrections make stocks attractive³

Shell Example

Niger delta oil spill clean-up launched - but could take quarter of a century⁴

³<http://www.mydigitalfc.com/companies-and-markets/stock-market/falling-crude-prices-corrections-make-stocks-attractive>

⁴<https://www.theguardian.com/global-development/2016/jun/02/niger-delta-oil-spill-clean-up-launched-ogoniland-communities-ibn>

Finance Example

*Falling crude prices, corrections make stocks **attractive***⁵

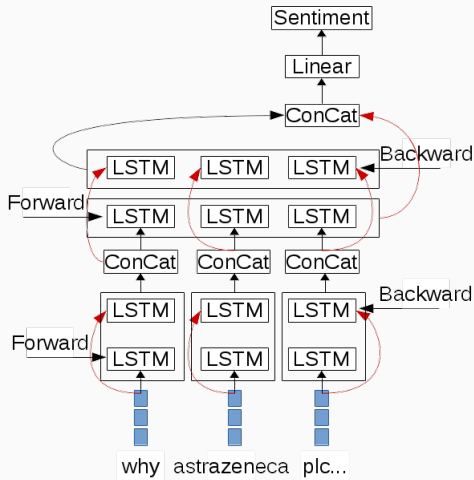
Shell Example

*Niger delta oil **spill** clean-up launched - but could take quarter of a century*⁶

⁵<http://www.mydigitalfc.com/companies-and-markets/stock-market/falling-crude-prices-corrections-make-stocks-attractive>

⁶<https://www.theguardian.com/global-development/2016/jun/02/niger-delta-oil-spill-clean-up-launched-ogoniland-communities-ibn>

Finance specific word embeddings



What is the state of the art?

Methods	Datasets						
	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

Which implementation is correct?

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

What we are doing

	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

1. Transfer learning between related task
2. Transfer learning between languages

Questions?

a.moore@lancaster.ac.uk

@apmoore94

Presentation can be found here ⁷

⁷<https://github.com/apmoore1/semEval/blob/master/presentation/semEval.pdf>

References I



Chen, Peng et al. (2017). “Recurrent Attention Network on Memory for Aspect Sentiment Analysis”. In: *Proceedings of the 2017 Conference on Empirical Methods in Natural Language Processing*. Copenhagen, Denmark: Association for Computational Linguistics, pp. 463–472.
URL: <http://aclweb.org/anthology/D17-1048>.



Dong, Li et al. (2014). “Adaptive Recursive Neural Network for Target-dependent Twitter Sentiment Classification”. In: *Proceedings of the 52nd Annual Meeting of the Association for Computational Linguistics (Volume 2: Short Papers)*. Baltimore, Maryland: Association for Computational Linguistics, pp. 49–54. URL: <http://aclanthology.coli.uni-saarland.de/pdf/P/P14/P14-2009.pdf>.

References II



Kiritchenko, Svetlana et al. (2014). “NRC-Canada-2014: Detecting Aspects and Sentiment in Customer Reviews”. In: *Proceedings of the 8th International Workshop on Semantic Evaluation (SemEval 2014)*. Dublin, Ireland: Association for Computational Linguistics, pp. 437–442. URL: <http://aclanthology.coli.uni-saarland.de/pdf/S/S14/S14-2076.pdf>.



Liu, Jiangming and Yue Zhang (2017). “Attention Modeling for Targeted Sentiment”. In: *Proceedings of the 15th Conference of the European Chapter of the Association for Computational Linguistics: Volume 2, Short Papers*. Valencia, Spain: Association for Computational Linguistics, pp. 572–577. URL: <http://aclanthology.coli.uni-saarland.de/pdf/E/E17/E17-2091.pdf>.

References III



Marrese-Taylor, Edison, Jorge Balazs, and Yutaka Matsuo (2017). *Mining fine-grained opinions on closed captions of YouTube videos with an attention-RNN*. Copenhagen, Denmark. URL: <http://aclweb.org/anthology/W17-5213>.



Mitchell, Margaret et al. (2013). “Open Domain Targeted Sentiment”. In: *Proceedings of the 2013 Conference on Empirical Methods in Natural Language Processing*. Seattle, Washington, USA: Association for Computational Linguistics, pp. 1643–1654. URL: <http://www.aclweb.org/anthology/D13-1171>.



Pang, Bo and Lillian Lee (2005). “Seeing stars: Exploiting class relationships for sentiment categorization with respect to rating scales”. In: *Proceedings of the 43rd annual meeting on association for computational linguistics*. Association for Computational Linguistics, pp. 115–124.

References IV



Pontiki, Maria et al. (2014). “SemEval-2014 Task 4: Aspect Based Sentiment Analysis”. In: *Proceedings of the 8th International Workshop on Semantic Evaluation (SemEval 2014)*. Dublin, Ireland: Association for Computational Linguistics, pp. 27–35. URL: <http://aclanthology.coli.uni-saarland.de/pdf/S/S14/S14-2004.pdf>.



Tang, Duyu, Bing Qin, and Ting Liu (2016a). “Aspect Level Sentiment Classification with Deep Memory Network”. In: *Proceedings of the 2016 Conference on Empirical Methods in Natural Language Processing*. Austin, Texas: Association for Computational Linguistics, pp. 214–224. URL: <http://aclanthology.coli.uni-saarland.de/pdf/D/D16/D16-1021.pdf>.

References V



Tang, Duyu et al. (2016b). “Effective LSTMs for Target-Dependent Sentiment Classification”. In: *Proceedings of COLING 2016, the 26th International Conference on Computational Linguistics: Technical Papers*. Osaka, Japan: The COLING 2016 Organizing Committee, pp. 3298–3307. URL: <http://aclanthology.coli.uni-saarland.de/pdf/C/C16/C16-1311.pdf>.



Tay, Yi, Anh Tuan Luu, and Siu Cheung Hui (2017). “Learning to Attend via Word-Aspect Associative Fusion for Aspect-based Sentiment Analysis”. In: *arXiv preprint arXiv:1712.05403*.



Vo, Duy-Tin and Yue Zhang (2015). “Target-Dependent Twitter Sentiment Classification with Rich Automatic Features.” In: *IJCAI*, pp. 1347–1353.

References VI



Wang, Bo et al. (2017). “TDParse: Multi-target-specific sentiment recognition on Twitter”. In: *Proceedings of the 15th Conference of the European Chapter of the Association for Computational Linguistics: Volume 1, Long Papers*. Valencia, Spain: Association for Computational Linguistics, pp. 483–493. URL: <http://aclanthology.coli.uni-saarland.de/pdf/E/E17/E17-1046.pdf>.



Wang, Yequan et al. (2016). “Attention-based LSTM for Aspect-level Sentiment Classification”. In: *Proceedings of the 2016 Conference on Empirical Methods in Natural Language Processing*. Austin, Texas: Association for Computational Linguistics, pp. 606–615. URL: <http://www.aclweb.org/anthology/D16-1058>.



Wilson, Theresa Ann (2008). *Fine-grained subjectivity and sentiment analysis: recognizing the intensity, polarity, and attitudes of private states*. University of Pittsburgh.

References VII



Zhang, Meishan, Yue Zhang, and Duy Tin Vo (2015). “Neural Networks for Open Domain Targeted Sentiment”. In: *Proceedings of the 2015 Conference on Empirical Methods in Natural Language Processing*. Lisbon, Portugal: Association for Computational Linguistics, pp. 612–621. URL: <http://www.aclweb.org/anthology/D15-1073>.



– (2016). “Gated Neural Networks for Targeted Sentiment Analysis.” In: *AAAI*, pp. 3087–3093.