















































- [60] Zeng L, Li F. A classification-based approach for implicit feature identification. In: Song SM, Min Z, eds. Proc. of the 12th China National Conf. on Computational Linguistics (CCL 2013). Berlin, Heidelberg: Springer-Verlag, 2013. 190–202. [doi: 10.1007/978-3-642-41491-6\_18]
- [61] Sun L, Li S, Li JY, Lv JT. A novel context-based implicit feature extracting method. In: Proc. of the 2014 Int'l Conf. on Data Science and Advanced Analytics (DSAA 2014). Washington: IEEE Computer Society, 2014. 420–424. [doi: 10.1109/DSAA.2014.7058106]
- [62] Ma JM. Research on extraction method of implicit evaluation objects in online user reviews [MS. Thesis]. Beijing: Beijing Jiaotong University, 2017 (in Chinese with English abstract).
- [63] Xu H, Zhang F, Wang W. Implicit feature identification in Chinese reviews using explicit topic mining model. *Knowledge-Based Systems*, 2015,76(1):166–175. [doi: 10.1016/j.knosys.2014.12.012]
- [64] Lau RYK, Li C, Liao SSY. Social analytics: Learning fuzzy product ontologies for aspect-oriented sentiment analysis. *Decision Support Systems*, 2014,65:80–94. [doi: 10.1016/j.dss.2014.05.005]
- [65] Zhang Y, Zhu W. Extracting implicit features in online customer reviews for opinion mining. In: Proc. of the 22nd Int'l Conf. on World Wide Web Companion (WWW 2013). New York: ACM Press, 2013. 103–104. [doi: 10.1145/2487788.2487835]
- [66] Bagheri A, Saraee M, De JF. Care more about customers: Unsupervised domain-independent aspect detection for sentiment analysis of customer reviews. *Knowledge-Based Systems*, 2013,52:201–213. [doi: 10.1016/j.knosys.2013.08.011]
- [67] Fei G, Liu B, Hsu M, Castellanos M, Ghosh R. A dictionary-based approach to identifying aspects implied by adjectives for opinion mining. In: Proc. of the 24th Int'l Conf. on Computational Linguistics (COLING 2012). Stroudsburg: ACL, 2012. 309.
- [68] Xia L, Wang Z, Chen C, Zhai S. Research on feature-based opinion mining using topic maps. *The Electronic Library*, 2016,34(3): 435–456. [doi: 10.1108/EL-11-2014-0197]
- [69] Smrž P. Using WordNet for opinion mining. In: Sojka P, Choi KS, eds. Proc. of the 3rd Int'l WordNet Conf. (GWC 2006). Brno: Masaryk University, 2006. 333–335.
- [70] Zhu YL, Min J, Zhou YQ, Huang XJ, Wu LD. Semantic orientation computing based on HowNet. *Journal of Chinese Information Processing*, 2006,20(1):16–22 (in Chinese with English abstract).
- [71] Li D, Qiao BJ, Cao YD, Wan YL. Word orientation recognition based on semantic analysis. *Pattern Recognition and Artificial Intelligence*, 2008,21(4):482–487 (in Chinese with English abstract).
- [72] Du WF, Tan SB, Yun XC, Cheng XQ. A new method to compute semantic orientation. *Journal of Computer Research and Development*, 2009,46(10):1713–1720 (in Chinese with English abstract).
- [73] Su F, Markert K. Subjectivity recognition on word senses via semi-supervised mincuts. In: Proc. of the Human Language Technologies: The 2009 Annual Conf. of the North American Chapter of the Association for Computational Linguistics (HLT-NAACL 2009). Stroudsburg: ACL, 2009. 1–9.
- [74] Esuli A, Sebastiani F. Determining the semantic orientation of terms through gloss classification. In: Herzog O, Schek HJ, eds. Proc. of the 14th ACM Int'l Conf. on Information and Knowledge Management (CIKM 2005). New York: ACM Press, 2005. 617–624. [doi: 10.1145/1099554.1099713]
- [75] Turney PD, Littman ML. Measuring praise and criticism: Inference of semantic orientation from association. *ACM Trans. on Information Systems (TOIS)*, 2003,21(4):315–346. [doi: 10.1145/944012.944013]
- [76] Kim SM, Hovy E. Automatic detection of opinion bearing words and sentences. In: Dale R, Wong KF, eds. Proc. of the 2nd Int'l Joint Conf. on Natural Language Processing (IJCNLP 2005). Berlin: Springer-Verlag, 2005. 61–66.
- [77] Kim SM, Hovy E. Identifying and analyzing judgment opinions. In: Robert C, Jeff A, Jennifer C, Mark S, eds. Proc. of the Main Conf. on Human Language Technology Conf. of the North American Chapter of the Association of Computational Linguistics (HLT-NAACL 2006). Stroudsburg: ACL, 2006. 200–207.
- [78] Liu H, He J, Wang T, Song W, Du X. Combining user preferences and user opinions for accurate recommendation. *Electronic Commerce Research and Applications*, 2013,12(1):14–23. [doi: 10.1016/j.elerap.2012.05.002]
- [79] Lu H, Niu ZD, Zhang N, Sun XK, Liu WL. A model for sentiment classification of Chinese microblog based on parsing and theme extension. *Trans. of Beijing Institute of Technology*, 2014,34(8):824–830 (in Chinese with English abstract).
- [80] Matsuo Y, Ishizuka M. Keyword extraction from a single document using word co-occurrence statistical information. *Int'l Journal on Artificial Intelligence Tools*, 2004,13(1):157–169. [doi: 10.1142/S0218213004001466]

- [81] Lin C, He Y, Everson R, Ruger S. Weakly supervised joint sentiment-topic detection from text. *IEEE Trans. on Knowledge and Data Engineering*, 2012,24(6):1134–1145. [doi: 10.1109/TKDE.2011.48]
- [82] Pang B, Lee L. A sentimental education: Sentiment analysis using subjectivity summarization based on minimum cuts. In: *Proc. of the 42nd Annual Meeting on Association for Computational Linguistics (ACL 2004)*. Stroudsburg: ACL, 2004. 271–278. [doi: 10.3115/1218955.1218990]
- [83] Blitzer J, Dredze M, Pereira F. Biographies, bollywood, boom-boxes and blenders: Domain adaptation for sentiment classification. In: *Proc. of the 45th Annual Meeting on Association for Computational Linguistics (ACL 2004)*, Vol.7. Stroudsburg: ACL, 2007. 440–447.
- [84] Duric A, Song F. Feature selection for sentiment analysis based on content and syntax models. *Decision Support Systems*, 2012, 53(4):704–711. [doi: 10.1016/j.dss.2012.05.023]
- [85] Zheng YG. Research on extended topic model for fine-grained opinion mining of online reviews [MS. Thesis]. Hangzhou: Zhejiang Gongshang University, 2017 (in Chinese with English abstract).
- [86] Li CX, Xie LD. Text classification and opinion mining based on LDA. *Electronic Technology & Software Engineering*, 2017,4: 209–210 (in Chinese with English abstract).
- [87] Sterckx L, Caragea C, Demeester T, Develder C. Supervised keyphrase extraction as positive unlabeled learning. In: *Proc. of the 2016 Conf. on Empirical Methods in Natural Language Processing (EMNLP 2016)*. Stroudsburg: ACL, 2016. 1924–1929.
- [88] Du J, Gui L, Xu R. Extracting opinion expression with neural attention. In: Li YM, Xiang GX, eds. *Proc. of the 5th of Chinese National Conf. on Social Media Processing (SMP 2016)*. Singapore: Springer-Verlag, 2016. 151–161. [doi: 10.1007/978-981-10-2993-6\_13]
- [89] Lafferty J, McCallum A, Pereira F. Conditional random fields: Probabilistic models for segmenting and labeling sequence data. In: Brodley C, Danyluk AP, eds. *Proc. of the 8th Int'l Conf. on Machine Learning (ICML 2001)*, Vol.1. New York: ACM Press, 2001. 282–289.
- [90] Pontiki M, Galanis D, Papageorgiou H, Manandhar S, Androutsopoulos I. Semeval-2015 task 12: Aspect based sentiment analysis. In: Nakov P, Zesch T, eds. *Proc. of the 9th Int'l Workshop on Semantic Evaluation (SemEval 2015)*. Stroudsburg: ACL, 2015. 486–495.
- [91] Lu B. Identifying opinion holders and targets with dependency parser in Chinese news texts. In: *Proc. of the Human Language Technologies: The 11th Annual Conf. of the North American Chapter of the Association for Computational Linguistics (HLT-NAACL 2010)*. Stroudsburg: ACL, 2010. 46–51.
- [92] Zhang C. Automatic keyword extraction from documents using conditional random fields. *Journal of Computational Information Systems*, 2008,4(3):1169–1180.
- [93] Laddha A, Mukherjee A. Extracting aspect specific opinion expressions. In: *Proc. of the 2016 Conf. on Empirical Methods in Natural Language Processing (EMNLP 2016)*. Stroudsburg: ACL, 2016. 627–637.
- [94] Breck E, Choi Y, Cardie C. Identifying expressions of opinion in context. In: Veloso M, ed. *Proc. of the 20th Int'l Joint Conf. on Artificial Intelligence (IJCAI 2007)*. Menlo Park: AAAI Press, 2007. 2683–2688.
- [95] Yang B, Cardie C. Extracting opinion expressions with semi-Markov conditional random fields. In: *Proc. of the 2012 Joint Conf. on Empirical Methods in Natural Language Processing and Computational Natural Language Learning (EMNLP-CoNLL 2012)*. Stroudsburg: ACL, 2012. 1335–1345.
- [96] Lecun Y, Bengio Y, Hinton G. Deep learning. *Nature*, 2015,521(7553):436–444. [doi: 10.1038/nature14539]
- [97] Li Q, Jin Z, Wang C, Zeng DD. Mining opinion summarizations using convolutional neural networks in Chinese microblogging systems. *Knowledge-Based Systems*, 2016,107(C):289–300. [doi: 10.1016/j.knosys.2016.06.017]
- [98] Pang L, Lan YY, Xu J, Guo JF, Wan SX, Cheng XQ. A survey on deep text matching. *Chinese Journal Computers*, 2016,40(4): 1–19 (in Chinese with English abstract).
- [99] Socher R, Perelygin A, Wu JY, Chuang J, Manning CD, Ng AY, Potts C. Recursive deep models for semantic compositionality over a sentiment treebank. In: *Proc. of the 2013 Conf. on Empirical Methods in Natural Language Processing (EMNLP 2013)*. Stroudsburg: ACL, 2013. 1631–1642.
- [100] Yao K, Zweig G, Hwang MY, Shi Y, Yu D. Recurrent neural networks for language understanding. In: *Proc. of the 14th Annual Conf. of the Int'l Speech Communication Association (INTERSPEECH 2013)*. Portland: INTERSPEECH, 2013. 2524–2528.

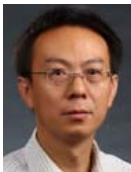
- [101] Kalchbrenner N, Grefenstette E, Blunsom P. A convolutional neural network for modelling sentences. In: Proc. of the 52nd Annual Meeting of the Association for Computational Linguistics (ACL 2014). Stroudsburg: ACL, 2014. 655–665.
- [102] Huang Z, Xu W, Yu K. Bidirectional LSTM-CRF models for sequence tagging. *Computer Science*, 2015,20(2):508–517.
- [103] Ma X, Hovy E. End-to-End sequence labeling via bi-directional LSTM-CNNs-CRF. In: Proc. of the 54th Annual Meeting of the Association for Computational Linguistics: Long Papers-Volume (ACL 2016). Stroudsburg: ACL, 2016. [doi: 10.13140/RG.2.1.2182.5685]
- [104] Wiebe J, Wilson T, Cardie C. Annotating expressions of opinions and emotions in language. *Language Resources and Evaluation*, 2005,39(2-3):165–210. [doi: 10.1007/s10579-005-7880-9]
- [105] Johansson R, Moschitti A. Syntactic and semantic structure for opinion expression detection. In: Proc. of the 14th Conf. on Computational Natural Language Learning (CoNLL 2010). Stroudsburg: ACL, 2010. 67–76.
- [106] Ye Q, Zhang ZQ, Luo ZX. Automatically measuring subjectivity of Chinese sentences for sentiment analysis to reviews on the Internet. *China Journal of Information Systems*, 2007,1(1):79–91 (in Chinese with English abstract).
- [107] Dave K, Lawrence S, Pennock DM. Mining the peanut gallery: Opinion extraction and semantic classification of product reviews. In: Proc. of the 12th Int'l Conf. on World Wide Web (WWW 2003). New York: ACM Press, 2003. 519–528. [doi: 10.1145/775152.775226]
- [108] Gamon M, Aue A, Corston-Oliver S, Ringger E. Pulse: Mining customer opinions from free text. In: Famili A, Joost N, eds. Proc. of the 6th Int'l Conf. on Intelligent Data Analysis (IDA 2005). Berlin, Heidelberg: Springer-Verlag, 2005. 121–132. [doi: 10.1007/11552253\_12]
- [109] Liu B, Hu M, Cheng J. Opinion observer: Analyzing and comparing opinions on the Web. In: Proc. of the 14th Int'l Conf. on World Wide Web (WWW 2005). New York: ACM Press, 2005. 342–351. [doi: 10.1145/1060745.1060797]
- [110] Yi J, Niblack W. Sentiment mining in WebFountain. In: Proc. of the 21st IEEE Int'l Conf. on Data Engineering (ICDE 2005). Washington: IEEE Computer Society, 2005. 1073–1083. [doi: 10.1109/ICDE.2005.132]
- [111] Wilson T, Hoffmann P, Undaran SS, Kessler K, Wiebe J, Choi Y, Cardie C, Riloff E, Patwardhan S. OpinionFinder: A system for subjectivity analysis. In: Proc. of the Human Language Technology Conf. on Empirical Methods in Natural Language Processing (HLT-EMNLP 2005). Stroudsburg: ACL, 2005. 34–35.
- [112] Mukherjee A. Extracting aspect specific sentiment expressions implying negative opinions. In: Proc. of the 17th Int'l Conf. on Intelligent Text Processing and Computational Linguistics (CICLING 2016). 2016. 1–20.
- [113] Pontiki M, Galanis D, Papageorgiou J, Manandhar S, Androutsopoulos I. Semeval-2015 task 12: Aspect based sentiment analysis. In: Proc. of the 9th Int'l Workshop on Semantic Evaluation (SemEval 2015). Stroudsburg: Association for Computational Linguistics, 2015. 486–495.
- [114] Snyder B, Barzilay R. Multiple aspect ranking using the good grief algorithm. In: Proc. of the Human Language Technologies: The 2007 Annual Conf. of the North American Chapter of the Association for Computational Linguistics (HLT-NAACL 2007). Stroudsburg: ACL, 2007. 300–307.
- [115] Wilson T, Wiebe J, Hoffmann P. Recognizing contextual polarity in phrase-level sentiment analysis. In: Proc. of the Conf. on Human Language Technology and Empirical Methods in Natural Language Processing. 2005. 347–354.
- [116] Baccianella S, Esuli A, Sebastiani F. Sentiwordnet 3.0: An enhanced lexical resource for sentiment analysis and opinion mining. In: Proc. of the 7th Int'l Conf. on Language Resources and Evaluation. 2010. 2200–2204.
- [117] Stone PJ, Dunphy DC, Smith MS, Ogilvie DM. *The General Inquirer: A Computer Approach to Content Analysis*. Oxford: The M.I.T. Press, 1968. 375–376.
- [118] Chen WT, Lin SC, Huang SL, Chung YS, Chen KJ. E-HowNet and automatic construction of a lexical ontology. In: Proc. of the Int'l Conf. on Computational Linguistics: Demonstrations (ICCL 2010). Stroudsburg: ACL, 2010. 45–48.
- [119] Ku LW, Chen HH. Mining opinions from the Web: Beyond relevance retrieval. *Journal of the Association for Information Science and Technology*, 2007,58(12):1838–1850. [doi: 10.1002/asi.20630]
- [120] Pennebaker JW, Chung CK, Ireland M, Gonzales A, Booth RJ. The development and psychometric properties of LIWC 2007. *LIWC 2007 Manual*, 2015,29(11):1020–1025.
- [121] Wang K, Xia R. A survey on automatic construction methods of sentiment lexicons. *Acta Automatica Sinica*, 2016,42(4): 495–511 (in Chinese with English abstract).



- [122] Chen H, Zimbra D. AI and opinion mining. *IEEE Intelligent Systems*, 2010,25(3):74–80. [doi: 10.1109/MIS.2010.75]
- [123] Huang XJ, Zhang Q, Wu YB. A survey on sentiment analysis. *Journal of Chinese Information Processing*, 2011,25(6):118–126 (in Chinese with English abstract).

#### 附中文参考文献:

- [2] 姚天昉,程希文,徐飞玉,汉思·乌思克尔特,王睿.文本意见挖掘综述. *中文信息学报*,2008,22(3):71–80.
- [3] 王辉,王晖昱,左万利.观点挖掘综述. *计算机应用研究*,2009,26(1):25–29.
- [4] 陈旻,朱凡微,吴明晖,应晶.观点挖掘综述. *浙江大学学报:工学版*,2014,48(8):1461–1472.
- [13] 李建华,刘功申,林祥.情感倾向性分析及应用研究综述. *信息安全学报*,2017,2(2):48–62.
- [14] 陈巧红,孙超红,贾宇波.文本数据观点挖掘技术综述. *工业控制计算机*,2017,30(2):94–95,102.
- [15] 陈晓美,王付国,吴宏伟,孙中秋.社会化网络评论观点挖掘的研究热点与应用进展. *情报科学*,2013,31(11):119–124.
- [29] 徐冰,赵铁军,王山雨,郑德权.基于浅层句法特征的评价对象抽取研究. *自动化学报*,2011,37(10):1241–1247.
- [43] 刘鸿宇,赵妍妍,秦兵,刘挺.评价对象抽取及其倾向性分析. *中文信息学报*,2010,24(1):84–88.
- [54] 刘倩.观点挖掘中评价对象抽取方法的研究[博士学位论文].南京:东南大学,2016.
- [58] 郎君,忻舟,秦兵,刘挺,李生.集成多种背景语义知识的共指消解. *中文信息学报*,2009,23(3):3–9.
- [62] 马京苗.网购用户评论中隐式评价对象的提取方法研究[硕士学位论文].北京:北京交通大学,2017.
- [70] 朱嫣岚,闵锦,周雅倩,黄萱菁,吴立德.基于 HowNet 的词汇语义倾向计算. *中文信息学报*,2006,20(1):16–22.
- [71] 李钝,乔保军,曹元大,万月亮.基于语义分析的词汇倾向识别研究. *模式识别与人工智能*,2008,21(4):482–487.
- [72] 杜伟夫,谭松波,云晓春,程学旗.一种新的情感词汇语义倾向计算方法. *计算机研究与发展*,2009,46(10):1713–1720.
- [79] 陆浩,牛振东,张楠,孙星恺,刘文礼.基于句法与主题扩展的中文微博情感倾向性分析模型. *北京理工大学学报*,2014,34(8):824–830.
- [85] 郑玉桂.面向电商评论细粒度观点挖掘的拓展主题模型研究[硕士学位论文].杭州:浙江工商大学,2017.
- [86] 李晨曦,谢罗迪.基于 LDA 模型的文本分类与观点挖掘. *电子技术与软件工程*,2017,4:209–210.
- [98] 庞亮,兰艳艳,徐君,郭嘉丰,万圣贤,程学旗.深度文本匹配综述. *计算机学报*,2016,40(4):1–19.
- [106] 叶强,张紫琼,罗振雄.面向互联网评论情感分析的中文主观性自动判别方法研究. *信息系统学报*,2007,1(1):79–91.
- [121] 王科,夏睿.情感词典自动构建方法综述. *自动化学报*,2016,42(4):495–511.
- [123] 黄萱菁,张奇,吴苑斌.文本情感倾向分析. *中文信息学报*,2011,25(6):118–126.
- [123] 黄萱菁,张奇,吴苑斌.文本情感倾向分析. *中文信息学报*,2011,25(6):118–126.



韩忠明(1972—),男,山西文水人,博士,副教授,CCF 专业会员,主要研究领域为社会网络,数据挖掘,大数据处理.



李梦琪(1993—),女,硕士生,主要研究领域为自然语言处理.



刘莹(1992—),男,硕士生,主要研究领域为社交网络挖掘.



张梦玟(1995—),女,硕士生,主要研究领域为自然语言处理.



段大高(1976—),男,博士,副教授,CCF 专业会员,主要研究领域为数据挖掘,人工智能.



于重重(1971—),女,博士,教授,CCF 高级会员,主要研究领域为模式识别,机器学习.