

School/Department:	Econometric Institute Erasmus School of Economics
Project Title:	Ontology-Driven Aspect-Based Sentiment Analysis in Product Reviews
Abstract:	<p>Given the large amount of user-generated data on the Web (e.g., product reviews, discussion forums, personal blogs, etc.), there is an increasing interest for companies to tap into this data in order to improve products or services, marketing campaigns, customer relations, or reputation. During the last decade, a lot of attention has been given to sentiment analysis, i.e., the extraction of sentiment (positive, neutral, or negative) from textual data. While in the early stages sentiment analysis was done at coarse-grained level (document, paragraph, or sentence), in the last years research has shifted to sentiment analysis for fine-grained level (aspects per sentence), also known as aspect-based sentiment analysis.</p> <p>In this project, we aim to further advance aspect-based sentiment analysis by considering the use of domain ontologies that capture the relationships that exist between the various aspects that pertain to a certain domain. In the past, aspect-based sentiment analysis was done based on given aspects represented as a set of words, which restricts aspect detection in textual documents by, for example, not accounting for synonyms (e.g., 'display' for 'screen' aspect). Also, the natural relationships that exist between these aspects are not exploited limiting the sentiment computations by not propagating the sentiment between aspects (e.g., liking 'tandoori chicken' implies liking 'Indian food'). In this work, we hypothesize that such deficiencies can be addressed by exploiting a lexicalized domain ontology where aspects have multiple lexical representations associated and aspect relationships are explicitly given.</p> <p>In the past, we have surveyed various approaches for aspect-based sentiment analysis [1], and proposed several solutions for (i) detecting implicit aspects in product reviews [2], and (ii) computing the aspect-based sentiment using rule-based solutions [3]. We have developed a Java framework for aspect-based sentiment analysis (https://github.com/KSchouten/Heracles) and evaluated our various solutions using standard metrics (e.g., precision, recall, and F1-measure) on standard data sets from the business domain [4]. These previously developed artifacts will form the starting point of the work proposed in this project. Some preliminary work has already been done in [5, 6].</p>

	<p>[1] <i>Survey on Aspect-Level Sentiment Analysis</i> Kim Schouten and Flavius Frasincar, IEEE Transactions on Knowledge and Data Engineering (TKDE), IEEE Computer Society, Volume 28, Number 3, pages 813-830, 2016</p> <p>[2] <i>Finding Implicit Features in Consumer Reviews for Sentiment Analysis</i> Kim Schouten and Flavius Frasincar 14th International Conference on Web Engineering (ICWE 2014), Lecture Notes in Computer Science, Volume 8541, pages 130-144, Springer, 2014</p> <p>[3] <i>Aspect-Based Sentiment Analysis on the Web Using Rhetorical Structure Theory</i> Rowan Hoogervorst, Erik Essink, Wouter Jansen, Max van den Helder, Kim Schouten, Flavius Frasincar, and Maite Taboada, 16th International Conference on Web Engineering (ICWE 2016), Lecture Notes in Computer Science, Volume 9671, pages 317-334, Springer, 2016</p> <p>[4] <i>Semeval-2015 Task 12: Aspect Based Sentiment Analysis</i> Maria Pontiki, Dimitrios Galanis, Haris Papageorgiou, Suresh Manandhar, and Ion Androutsopoulos, Ninth International Workshop on Semantic Evaluation (SemEval 2015), pages 486-495, Association for Computational Linguistics, 2015</p> <p>[5] <i>Ontology-Driven Sentiment Analysis of Product and Service Aspects</i> Kim Schouten and Flavius Frasincar 15th Extended Semantic Web Conference (ESWC 2018), Lecture Notes in Computer Science, Volume 10843, pages 608-623, Springer, 2018</p> <p>[6] <i>Ontology-Enhanced Aspect-Based Sentiment Analysis</i> Kim Schouten, Flavius Frasincar, and Franciska de Jong 17th International Conference on Web Engineering (ICWE 2017), Lecture Notes in Computer Science, Volume 10360, pages 302-320, Springer, 2017</p>
Requirements of candidate:	<p>Background: The candidate needs to be proficient with <i>Java programming</i>, and have a good knowledge of <i>machine learning techniques</i>. In addition, the candidate should possess knowledge of <i>natural language processing techniques</i>, <i>Semantic Web technologies</i>, and <i>managerial economics</i>, or be willing to learn the necessary topics in these fields in a relatively short amount of time. Excellent communication skills for both writing and speaking in English are expected, as well as willingness to collaborate with the various parties related to this project. Candidates are expected to be in the top segment of their class with respect to their grades and must show interest in an academic career, including both research and teaching/supervision activities.</p> <p>Master's degree: Yes</p> <p>English requirement: IELTS: 7.5 (min. 6.0 for all subs.) or TOEFL: 100 (internet) or 600 (paper) and GMAT-test or GRE-test: 85%</p>

<p>Supervisor information:</p>	<p>Dr. Flavius Frasincar frasincar@ese.eur.nl http://people.few.eur.nl/frasincar/</p> <p>Promotor Prof. dr. ir. Rommert Dekker, rdekker@ese.eur.nl, http://people.few.eur.nl/rdekker/</p> <p>A selection of recent publications is:</p> <p><i>Supervised and Unsupervised Aspect Category Detection for Sentiment Analysis With Co-Occurrence Data</i> Kim Schouten, Onne van der Weijde, Flavius Frasincar, and Rommert Dekker</p> <p>IEEE Transactions on Cybernetics (TCyb), Volume 48, Number 4, pages 1263-1275, IEEE Computer Society, 2018</p> <p><i>Ontology-Driven Sentiment Analysis of Product and Service Aspects</i> Kim Schouten and Flavius Frasincar 15th Extended Semantic Web Conference (ESWC 2018), Lecture Notes in Computer Science, Volume 10843, pages 608-623, Springer, 2018</p> <p><i>Ontology-Enhanced Aspect-Based Sentiment Analysis</i> Kim Schouten, Flavius Frasincar, and Franciska de Jong 17th International Conference on Web Engineering (ICWE 2017), Lecture Notes in Computer Science, Volume 10360, pages 302-320, Springer, 2017</p> <p><i>An Ontology-Enhanced Hybrid Approach to Aspect-Based Sentiment Analysis</i> Daan de Heij, Artiom Troyanovsky, Cynthia Yang, Milena Zychlinsky Scharff, Kim Schouten, and Flavius Frasincar 18th International Conference on Web Information Systems Engineering (WISE 2017), Lecture Notes in Computer Science, Volume 10570, pages 338-345, Springer, 2017</p> <p><i>Survey on Aspect-Level Sentiment Analysis</i> Kim Schouten and Flavius Frasincar IEEE Transactions on Knowledge and Data Engineering (TKDE), IEEE Compute Society, Volume 28, Number 3, pages 813-830, 2016</p> <p><i>A Survey of Event Extraction Methods from Text for Decision Support Systems</i> Frederik Hogenboom, Flavius Frasincar, Uzay Kaymak, Franciska de Jong, and Emiel Caron. Decision Support Systems (DSS), Volume 85, pages 12-22, 2016</p> <p><i>Using Rhetorical Structure in Sentiment Analysis</i> Alexander Hogenboom, Flavius Frasincar, Franciska de Jong, and Uzay Kaymak. Communications of the ACM (CACM), Volume 58, Number 7, pages 69-77, 2015</p>
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	<p><i>Polarity Classification using Structure-Based Vector Representations of Text</i> Alexander Hogenboom, Flavius Frasincar, Franciska de Jong, and Uzay Kaymak. Decision Support Systems (DSS), Volume 74, pages 46-56, 2015</p> <p><i>Exploiting Emoticons in Polarity Classification of Text</i> Alexander Hogenboom, Daniella Bal, Flavius Frasincar, Malissa Bal, Franciska de Jong, and Uzay Kaymak. Journal of Web Engineering (JWE), Volume 14, Numbers 1-2, pages 22-40, Rinton Press, 2015</p> <p><i>Lexicon-Based Sentiment Analysis by Mapping Conveyed Sentiment to Intended Sentiment</i> Alexander Hogenboom, Malissa Bal, Flavius Frasincar, and Daniella Bal International Journal of Web Engineering and Technology (IJWET), Volume 9, Number 2, pages 125-147, Inderscience Publishers, 2014</p> <p><i>Multi-lingual Support for Lexicon-Based Sentiment Analysis Guided by Semantics</i> Alexander Hogenboom, Bas Heerschop, Flavius Frasincar, Uzay Kaymak, Franciska de Jong. Decision Support Systems (DSS), Volume 62, pages 43-53, Elsevier, 2014</p> <p><i>FLOPPIES: A Framework for Large-Scale Ontology Population of Product Information from Tabular Data in E-commerce Stores</i> Lennart Nederstigt, Steven Aanen, Damir Vandic, and Flavius Frasincar Decision Support Systems (DSS), Volume 59, pages 296-311, Elsevier, 2014</p> <p><i>An Automated Framework for Incorporating News into Stock Trading Strategies</i> Wijnand Nuij, Viorel Milea, Frederik Hogenboom, Flavius Frasincar, and Uzay Kaymak. IEEE Transactions on Knowledge and Data Engineering (TKDE), IEEE Computer Society, Volume 26, Number 4, pages 823-835, 2014</p>
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