

Appraisal of Opinion Expressions in Discourse

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Introduction

Opinions are the common stock of conversation; and yet, like many facets of every day life, they are difficult to analyze precisely. Roughly, research in sentiment analysis comes in two flavors: a psychological one and a computational one. Psychologists propose cognitive theories of emotions and affect of various sorts. We distinguish three main approaches: the discrete approach where emotions are a small set of basic, innate and universal concepts (P. Ekman 1970) (C. Izard 1971), the dimensional approach which proposes dimensions underlying emotional concepts (Osgood *et al.* 1957) (J. Russell 1983) and finally, the appraisal approach where emotions are defined as the evaluation of the interaction between someone's goals, beliefs, etc., and his environment (A. Ortony *et al.* 1988) (J. Martin and P. White 2005).

Computational approaches to sentiment analysis eschew a general theory of emotions and focus on extracting the affective content of a text from the detection of expressions of sentiment. These expressions are assigned a positive or a negative scalar value, representing a positive, negative or neutral sentiment towards some topic. Using information retrieval, text mining and computational linguistic techniques (P. Turney 2002) (H. Yu and V. Hatzivassiloglou 2003) together with a set of dedicated linguistic resources, such as SentiWordNet (A. Esuli and F. Sebastiani 2006) one can calculate opinions exploiting the detected "bag of sentiment words". Related works include the detection of the opinion holder and the opinion topic (S. Kim and E. Hovy 2006) (S. Bethard *et al.* 2004). Recently, new methods for sentiment analysis aim to assign fine-grained affect labels based on various psychological theories—e.g., the WordNet Affect project (C. Strapparava and A. Valitutti 2004) based on Ortony's salience imbalance theory (*ibid.*), the MPQA project (J. Wiebe *et al.* 2005) based on the notion of private state of (R. Quirk *et al.* 1985), and finally work by (C. Whitelaw *et al.* 2005) and (J. Read *et al.* 2007) based

on Martin's Appraisal theory (*ibid.*). We think there is still room for improvement in the field of sentiment analysis. To get an accurate appraisal of opinion in texts, it is important for NLP systems to go beyond positive and negative sentiment expressions and identify a wide range of opinion expressions, including motivations, recommendations, and speculations, as well as how they are discursively related in the text.

In this paper, we propose an analysis of opinion in texts based on a lexical semantic analysis of a wide class of expressions coupled together with an analysis of how clauses involving these expressions are related to each other within a discourse. We do not provide a definition of opinion or a psycholinguistic theory of the triggering of opinions/emotions. Rather, we study how affective content is explicitly and lexically expressed and how these expressions are related to each other within a discourse in written texts. Our aim is to establish the feasibility and stability of an annotation scheme for opinion expressions at the sub-sentential level and propose a way to use this scheme to calculate the overall opinion expressed in a text on a given topic.

Our approach is novel in three ways. First, we categorize opinion expressions using a typology of four top-level categories: *Reporting expressions*, which provide an evaluation of the degree of commitment of both the holder and the subject of the reporting verb, *Judgment expressions*, which express normative evaluations of objects and actions and within which we distinguish judgements related to social norms and judgments related to personal norms, *Advise expressions*, which express an opinion on a course of action for the reader, and *Sentiment expressions*, which express feelings. Our typology is described in Section 1.

Second, while research in the field has focussed on determining the orientation of opinion words in various lexical categories, almost no work to date has investigated rhetorical relations between clauses containing opinion expressions. However, the following simple examples drawn from our French corpus (translated in English) show that discourse relations affect the strength of a given sentiment.

- (S1) [I agree with you]_a even if I was shocked
 (S2) Buy the DVD, [you will not regret it]_b
 (S3) [I am deeply outraged]_c, [because we are lucky to have in Lourdes a quality maternity hospital]_d

Opinions in S1 and S2 are positive but the contrast introduced by *even* in S1 decreases the strength of the opinion expressed in (a) whereas the explanation provided by (b) in S2 increases the strength of the recommendation. The opinion provided by (c) in S3 is negative, and the explanation (d) introduced by *because* makes the opinion stronger. We describe in Section 2 how to identify elementary

discourse segments containing opinion expressions and how these segments are connected to each other using a set of rhetorical relations.

In order to represent and evaluate the overall opinion of a document (which is composed of several opinion segments), we characterize discourse segments using a shallow representation that associates with each segment a feature structure that contains the semantic category it belongs to, the associated modality, the opinion holder, the opinion topic, the opinion word and the content of the opinion. This semantic representation is used to evaluate the overall opinion of a document using a set of dedicated rules associated for each discourse relation. The semantic representation and the evaluation of the overall opinion are respectively presented in Section 3 and 4.

Finally, previous work has focussed on annotating a single corpus genre (book reviews, newspapers) in English. To our knowledge, no one has compared how the expression of opinion differs across different genres and other languages. We have analyzed the distribution of our categories in three different types of digital corpora : movie reviews, Letters to the Editor and news reports, in English and in French. The annotation methodology and our results are reported in Section 5.

We end this paper by a related work section and give a general conclusion and main perspectives.

1. Categorizing Opinions

In this section, we do not provide a definition of opinion or a psycholinguistic theory of the triggering of opinions/emotions. Rather, we study how affective content is *explicitly* and lexically expressed in written texts.

Our approach to categorize opinions uses the lexical semantic research of A. Wierzbicka (1987) and B. Levin (1993). A. Wierzbicka classifies approximately 270 English verbs referring to speech into 37 classes according to their meaning (ORDER class, ASK class, ARGUE class, etc.). B. Levin classifies over 3,000 English verbs according to shared meaning and syntactic behavior. She identifies semantically coherent verb classes, and examines verb comportment with respect to a wide range of syntactic alternations that reflect verb meaning (verbs of contact, verbs of communication, etc.). Our description of the SENTIMENT category is based on Mathieu's (Y. Mathieu 2000, 2005) linguistic study on feeling, emotion and psychological states in French. Y. Mathieu offers a semantic classification in which verbs and nouns are split into 38 semantic classes, according to their meaning (LOVE class, FASCINATE class, FEAR class, ASTONISH class, etc.). Semantic classes are linked by meaning and intensity relationships. She associates a set of

linguistic properties with words and classes, and builds semantic representations, described by means of feature structures.

From these three classifications, we have selected opinion verb classes (such as “Love”, “Suggest”) and verbs that take opinion expressions within their scope and that reflect the holder’s commitment on the opinion expressed (such as “Say”, “Wonder”, “Insist”). We have removed some verbs classes, modified some existing classes and merged related classes into new categories. Subjective verbs were split into these new categories which were then extended by adding nouns and adjectives. Our classification is the same for French and English languages but for a better presentation, category labels and examples are given only in English.

An opinion expression belongs to one of four top-level categories: REPORTING, JUDGEMENT, ADVISE and SENTIMENT (see Table 1). In the REPORTING group, opinions are often expressed as the objects of verbs used to report the speech and opinions of others. These verbs convey the degree of the holder’s commitment to the opinion being presented, and some provide at least indirectly a judgement by the author on the opinion expressed. The opinion polarity (positive, negative or neutral) is given by the verbs’ complements. We decompose this category into three main subgroups according to the degree of commitment and the degree of veracity concerning the information in their complements.

In the first subgroup, we find verbs that introduce information that (a) the author takes as established (the **Inform** group) or that (b) the holder is strongly committed to (the **Assert** group). **Assert** verbs typically imply strong commitment by the agent of the speech act in the content of the claim that is the object of the verb. **Inform** verbs communicate information by means of their presuppositions that the author takes to be established. Verbs in this group typically presuppose the truth of their complements. Thus, it would be inconsistent for the author to say “*Paul revealed that he was sick, but he was not sick*”, whereas it is not inconsistent to use an **Assert** verb in this way: it is consistent to say “*Paul claimed that he was sick, but he was not sick*”. The veracity of the information introduced by verbs from (a) is thus typically stronger than the information introduced by verbs from (b). On the other hand, the **Inform** verbs, unlike the **Assert** verbs do not necessarily imply a strong commitment.

The second group of REPORTING verbs also divides into two classes: (c) the **Tell** group, and (d) the **Remark** group. Unlike **Assert** verbs, **Tell** and **Remark** verbs do not convey strong commitments of the subject to the embedded content; unlike **Inform** verbs, they do not convey anything about the author’s view of the embedded content. The distinction between these **Remark** and **Tell** classes has to do with what they convey about the status of the information in the complement.

Finally, the last group in REPORTING introduces an opinion with a certain degree of subjectivity. We consider here two subcategories: (e) the **Think** group

verbs express the fact that the subject has a strong commitment to the complement of the verb; (f) the **Guess** group verbs express a weaker commitment on the part of the agent. The veracity of the information introduced by verbs from (e) is stronger than the information introduced by verbs from (f); for example, the reader should have more confidence concerning X in "He thinks that X" than in "He wonders if X".

The second major category, the **JUDGEMENT** group, involves words that express a positive or negative assessment of something or someone. It includes verbs, nouns and adjectives. Judgment expressions convey a binary polarity to the opinion (positive or negative). We consider two subgroups: judgments referring to a system of social norms and judgments referring to personal norms. The first group includes the (g) **Blame** class that assigns to someone the responsibility for "bad situations" and the (h) **Praise** class which is the exact opposite of the **Blame** class. The second sub-group (i) **appreciation** involves positive or negative appreciation of someone or something.

Table 1. Opinion Categories

CATEGORIES	GROUPS	EXAMPLES
REPORTING	a) Inform	<i>inform, notify, explain</i>
	b) Assert	<i>assert, claim, insist</i>
	c) Tell	<i>say, announce, report</i>
	d) Remark	<i>comment, observe, remark</i>
	e) Think	<i>think, reckon, consider</i>
	f) Guess	<i>presume, suspect, wonder</i>
JUDGMENT	g) Blame	<i>blame, criticize, condemn</i>
	h) Praise	<i>praise, agree, approve</i>
	i) Appreciation	<i>good, shameful, brilliant</i>
	j) Recommend	<i>advise, argue for</i>
ADVISE	k) Suggest	<i>suggest, propose</i>
	l) Hope	<i>wish, hope</i>
	m) Anger/CalmDown	<i>irritation, anger</i>
SENTIMENT	n) Astonishment	<i>astound, daze</i>
	o) Love, Fascinate	<i>fascinate, captivate</i>
	p) Hate, Disappoint	<i>demoralize, disgust</i>
	q) Fear	<i>fear, frighten, alarm</i>
	r) Offense	<i>hurt, chock</i>
	s) Sadness/Joy	<i>happy, sad</i>
	t) Bore/Entertain	<i>bore, distraction</i>

The third category is the **ADVISE** group. **ADVISE** expressions urge the reader to adopt a certain course of action or opinion. The writer places himself in a position of authority with respect to the reader and typically backs up his advice with other material to help convince the reader. We consider three subgroups: (j) the **Recommend** group expresses a good/bad opinion and a stronger push for some course of action; (k) the **Suggest** group is used to say what the writer suggests or speculates on without being absolutely certain; finally, (l) the **HOPE** group expresses the general feeling that some desire will be fulfilled. Opinion expressions in (j) are stronger than in (k) and (l) whereas expressions in (l) are weaker.

The last category is the **SENTIMENT** group. Words in this category express an attitude toward something usually based on feeling or emotion rather than reasoning. They have a polarity as well as strength. We distinguish here between positive sentiments (**Calm down**, **Entertain**, **Joy**, and **Love/Fascinate** classes) and negative sentiments (**Anger**, **Bore**, **Offense**, **Sadness**, **Fear** and **Hate/Disappoint** classes). Some classes, such as **Astonishment** and **Touch** generally express a neutral polarity, although the polarity and the strength are given by the context.

2. Rhetorical relations between containing opinion expressions

The rhetorical structure is an important element in understanding opinions conveyed by a text. Our four opinion categories are used to label opinion expressions within a discourse segment. Using the discourse theory SDRT (N. Asher and A. Lascarides 2003) as our formal framework, we define a basic segment as a clause containing an opinion expression or a sequence of clauses that together bear a rhetorical relation to a segment expressing an opinion. We have segmented conjoined NPs or APs into separate clauses — for instance, *the film is beautiful and powerful* is taken to express two segments: *the film is beautiful* and *the film is powerful*. Segments are then connected to each other using a small subset of “veridical” discourse relations. For example, there are three opinion segments in the following sentence: [*Even if the product is excellent*]_a, [*the design is very basic*]_b, [*which is disappointing in this brand*]_c. There is a **CONTRAST** relation between **a** and **b**. This contrast makes up the segment **c**. A rhetorical relation between segments **a** and **b** is noted as: **RelationName(a, b)**. We use five types of rhetorical relations:

- **CONTRAST** and **CORRECTION** indicate a difference of opinion. **CONTRAST(a, b)** implies that **a** and **b** are both true but there is some de-feasible implication of one that is contradicted by the other, whereas **CORRECTION(a, b)** involves a stronger opposition and implies that **b** is true while **a** is false. To find these relations in text, we use specific discourse mark-

ers, such as: *although, but*, etc. for CONTRAST, and *contradict, protest, deny*, etc. for CORRECTION.

- EXPLANATION(a, b), marked for example by *because*, indicates that **b** offers a (typically sufficient) reason for **a**. ELABORATION(a, b), marked by *for example, in particular* implies that **b** gives more details on what was expressed within **a**. We have merged EXPLANATION and ELABORATION within a single relation called SUPPORT, as both of these relations are used to support opinions.
- RESULT(a, b), indicated by markers like *so, as a result*, indicates that **b** is a consequence or result of **a**.
- Finally, CONTINUATION(a, b) means that **a** and **b** form part of a larger thematic whole. For example, the rhetorical structure of S is RESULT(CONTRAST(a, b), c).

Within a discourse segment, negations were treated as reversing the polarities of the opinion expressions within their scope. Conditionals are hard to interpret because they affect the opinion expressed within the consequent of a conditional in different ways. For example, conditionals expressions of ADVISE can block the advice or reverse it. Thus *if you want to waste you money, buy this movie* will be annotated as a recommendation not to buy it. On the other hand, conditionals can also strengthen the recommendation as in *if you want to have good time, go and see this movie*. We have left the treatment of conditionals as well as disjunctions for future work.

3. A Semantic Representation

We represent each opinion word that belongs to a category with a shallow semantic feature structure. It involves a feature structure which associates with a segment: the category it belongs to, the associated modality, the opinion holder, the opinion topic and the opinion expression that enable us to identify the segment. A modality is defined as a combination of a degree of commitment (C) and a strength for expressions in the REPORTING category, or a combination of a polarity (positive, negative, neutral) and a strength for expressions from the JUDGMENT, ADVICE and the SENTIMENT categories. For REPORTING verbs, the groups **Inform** and **Assert** are associated to the modality C1, the groups **Tell** and **Remark** to C2 and the groups **Think** and **Guess** to C3 such that $C1 > C2 > C3$. Simple scalar dimensions are used to represent strength. The values 2, 1 and 0 mean respectively that the expression has a strong, a medium or a low strength.

When verb arguments contain an opinion expression, there is an additional attribute in the feature structure which describes the content of opinion expressions introduced by the verb. For example, the segment *[The French presidency confirmed congratulations sent to Vladimir Putin]* is represented Figure 1.

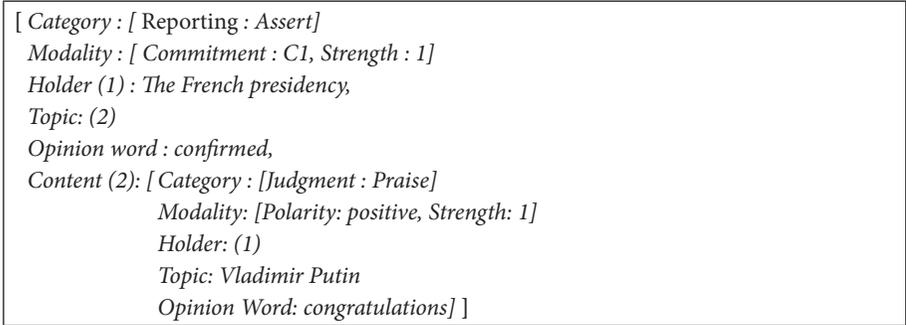


Figure 1. Semantic representation of a discourse segment

4. Computing the overall opinion in a document

The Figure 2 shows the rhetorical relations between segments of the following movie review S:

- (S) *[This film is amazing.]_a*. *[One leaves not completely convinced]_b.1*, *[but one is overcome]_b.2*. *[It's poignant]_c.1*, *[sad]_c.2* *[and at the same time horrible]_c.3*. *[Buy it]_d*, *[you won't regret it]_e*

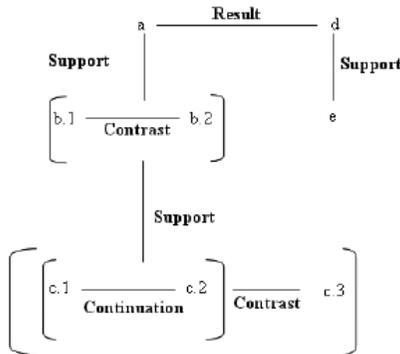


Figure 2. Rhetorical relations between opinion segments in S.

Once we have constructed the discursive representation of a text, we have to combine the different feature structures (FS) in order to get a general representation

that goes beyond standard positive/negative representation of opinion texts. The combination of low-level FS is performed in two steps:

1. combine the structures related by coordinating relations (such as CONTRAST and CONTINUATION). In Figure 2, this allows to build from the segments **b.1** and **b.2** a new FS;
2. combine the structures related via subordinating relations (such as SUPPORT and RESULT) in a bottom-up way. In Figure 2, the FS of the segment **a** is combined with the structure deduced from step 1.

During this process, a set of dedicated rules is used. For example, SUPPORTS strengthen the opinion in the first constituent as in: [*Buy the DVD*] [*you will not regret it*]. CONTINUATIONS strengthen the polarity of the common opinion. RESULTS strengthen the polarity or opinion in the second argument. For CONTRASTS, we distinguish two cases. If one of the arguments bears a rhetorical relation with the other argument, then the contrast strengthens the polarity of the opinion as in: [*I am an atheist*], [*but I totally agree with the priest*]. If the two arguments are opinion segments with an opposite polarity, then the contrast weakens the polarity of the first argument like in: [*I agree with you*], [*even if I was shocked*]; otherwise it strengthens the polarity of the opinion expression. We have formalized some of these rules and proposed a way to represent an opinion text using a graphical representation. For more details, see N. Asher *et al.* (2008).

5. Annotation and Experiments

We annotated three different types of on-line corpora, each with a distinctive style and audience: movie reviews, Letters to the Editor and news reports, written in French and English. Movie reviews were taken from *Télérama*, *AlloCiné.fr* and *movies.com*, Letters to Editors from *La Dépêche du Midi* and *The San Francisco Chronicle*, news articles from *Le Monde*, *20 Minutes* and the MUC6 news corpus. We randomly selected 150 articles for French corpora (around 50 articles for each genre). Two native French speakers annotated respectively around 546 and 589 segments. To check the cross linguistic feasibility of generalisations made about the French data, we also annotated around 30 articles from movie reviews and Letters in English and we use the MUC6 corpus (186 articles), which were annotated independently with discourse structures by three annotators in the University of Texas's DISCOR¹ project. Our lexicon, described in Section 1, is then extended during the annotation process. Actually, we have categorized 200 verbs, 160 nouns

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and 195 adjectives for French and 190 verbs, 150 nouns and 170 adjectives for English. For each corpus, annotators annotate elementary discourse segments, define its shallow semantic representation and then connect discourse segments using the set of rhetorical relations we have identified.

The average distribution of opinion expressions in our corpus across our categories for each language is shown in Table 2. The annotation of movie reviews was very easy. The style of writing is brief and opinion expressions are mainly adjectives and nouns. Reviewers often summarize their overall opinion, give an opinion on each different point such as actors, screenplay, etc. and conclude their review with expressions of recommendations and sometimes expressions of suggestions. We found an average of 5 segments per review. Opinions in movie reviews are mainly judgment appreciations and sentiments. The distribution of each category is similar for the French and the English corpus.

Table 2. Average distribution of categories in French and English

Groups	Movie (%)		Letters (%)		News (%)	
	French	English	French	English	French	English
REPORTING	2.67	2.12	14.80	13.34	43.91	42.85
JUDGMENT	60.53	53.21	52.50	70.65	37.47	33.34
ADVISE	9.5	10.63	10.05	13.34	7.27	9.52
SENTIMENT	27.30	34.04	22.65	2.67	11.35	14.29

Letters to the Editor contain a title introducing the letter and then a mixture of facts and opinion expressions (more than one paragraph). As with the movie reviews, opinion words are adjectives and nouns but also verbs. For French letters, opinions are mainly judgment appreciations and sentiment. However, letters in English contain more expressions of praise and blame than in French and less sentiment expressions. The distribution of appreciations, hopes and reporting expressions is similar for the French and the English corpus. Finally, opinions in news documents involve principally reported speech. As we only annotated segments that clearly expressed opinions or were related via one of our rhetorical relations to a segment expressing an opinion, our annotations typically only covered a fraction of the whole document. The Press articles were the hardest to annotate and generally contained lots of embedded structure introduced by REPORTING type verbs, as well as negations. In addition to reporting, this corpus contains many expressions of judgment and a small number of sentiments comparing to movies and letters. Here again, we note similar distribution of categories in both French and English corpus.

To compute the inter-annotator agreements we chose to focus, at a first step, only on agreements on opinion categorization, segment identification and rhetorical structure detection. We computed the agreements only on the French corpus. Using the Kappa measure² (J. Cohen 1960), the inter-annotators agreement on opinion categorization is 95% for movie reviews, 86% for Letters to the Editors and 73% for news documents. Annotators had good agreement concerning what the basic segments were (82%), which shows that the discourse approach in sentiment analysis is easier compared to the lexical task where annotators have low agreements on the identification of opinion tokens. The principal sources of disagreement in the annotation process came from annotators' putting opinion expressions in different categories (mainly between **Praise/Blame** group and **Appreciation** group) and the choice of rhetorical relations.

6. Related Works

While research in the field has focused on determining the orientation of opinion words in various lexical categories, almost no work to date has investigated rhetorical relations between clauses containing opinion expressions. Our classification differs from psychologically based classifications like Martin's Appraisal system (J. Martin and P. White 2005): the REPORTING and the ADVISE categories do not appear in Martin's classification and the contents of JUDGMENT and SENTIMENT categories are quite different, and more detailed for sentiment descriptions with 14 sub-classes. In addition, our analysis of opinion expressions includes verbs, adjectives and nouns, which go beyond analyses limited to adjectives (J. Read *et al.* 2007, C. Whitelaw *et al.* 2005).

Within the MPQA corpus, J. Wiebe *et al.* (2005) identify a low-level annotation schema. We chose not to build our discourse based opinion categorization on the top of MPQA for two reasons. Firstly, MPQA was originally developed for English and (A. Esuli *et al.* 2008) showed that MPQA is not adequate for dealing with many features characterizing Romance languages. Secondly, text anchors which correspond to opinion in MPQA are not well defined since each annotator is free to identify expression boundaries. This is problematic if we want to integrate rhetorical structures into opinion identification task. MPQA often groups discourse indicators (*but*, *because*, etc.) with opinion expressions leading to no guarantee that text anchors will correspond to a well formed discourse unit. Finally, previous work has focused on annotating a single corpus genre (book reviews, newspapers)

2. Cohen's kappa coefficient is a statistical measure of inter-rater agreement for qualitative items.

in English. To our knowledge, no one has compared how the expression of opinion differs across different genres and languages.

Finally, (S. Somasundaran *et al.* 2008) propose to model the discourse-level associations that rise between related opinion topics using opinion frames. In this model, a frame is a structure composed of two opinions and their respective targets connected via two types of relation: the same and the alternative relation. These relations are close to the discourse relations CONTRAST and SUPPORT used in our graphical representation (N. Asher *et al.* 2008). However, there is no definitive mapping between opinion frames and rhetorical relations. In our case, discourse relations are directly used to link opinion/non opinion segments since we argue that discourse relations defined within the SDRT framework are important elements for computing the overall opinion of a document.

Conclusion and Future Works

The preliminary evaluations of our annotations have shown the validity of the categorization of opinions we proposed. We are able to calculate an overall global opinion on a topic in a principled way, by taking account of logical and discourse structure, in particular relations like CONTRAST and SUPPORT. By including REPORTING expressions, we are easily able to distinguish between opinions of agents mentioned in the text and the opinions of the text's author. In future research, we plan to:

1. extend our annotation scheme to other types of corpora and to deepen our opinion typology, specifically to include modals and moods like the conditional and the subjunctive;
2. compute inter-annotator agreements on the opinion holder, topics, modality as well as polarity;
3. characterize each discourse segment with a deep semantic representation which associates for each category of opinion expression a lambda term involving the proffered content and a lambda term for the presuppositional content of the expression, if it has one. The logical form of a clause is then calculated by combining these terms with their arguments. The use of a non monotonic, propositional modal logic such as that in (Asher and Lascarides 2003) allows us to calculate overall judgements from sentiment expressions and to combine them via the rhetorical structure to get an overall judgement about a particular topic.
4. In terms of automatization, we plan to exploit a syntactic parser to get the argument structure of verbs and then the use of a discourse segmenter like

that developed in the DISCOR project, followed by the detection of discourse relations using cue words. This will enable us to use the deep semantic analysis to provide a classification of texts according to their opinions on various topics and to compare this approach to its competitor, the bag of words approach.

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Summary

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We present an analysis of opinion in texts based on a detailed semantic analysis of a wide class of expressions. We propose a new annotation schema for a deep contextual opinion analysis using discourse relations. We analyze the distribution of our categories in three different types of online corpora, movie reviews, Letters to the Editor and news reports, in English and French.

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