Identification And Examination Of Bipolar Phrases And Polarity Contradictions

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Abstract:
When conducting fine-grained sentiment analysis, one must cope with the construction of bipolar terms like "just punishment," for example. Furthermore, the bottom up created phrase polarity (e.g., "to approve war") occasionally violates the top down prediction of phrase polarity imposed by specific verbs on their direct objects. We examine the construction of bi-polar phrases from both a phrase internal and a verb-centered point of view, and we introduce a fine-grained polarity lexicon based on the Appraisal Theory. We have created a system pipeline that does sentiment synthesis for these languages as well as a multilingual polarity resource (French, English, and German). We address instances in relation to every one of these languages.

1. Introduction:

The title provided discusses the challenges and complexities of sentiment analysis, particularly in dealing with sophisticated language beyond typical product reviews. It argues for a more nuanced approach to analyzing the polar load of texts, moving beyond simple distinctions of 'positive' and 'negative.'

The discussion introduces the Appraisal Theory (Martin and White, 2005), which proposes a finer distinction between judgment, emotion, and attitude. According to this theory, words or phrases can have positive connotations at different levels, such as moral, emotional, or factual bases. The example of "just punishment" is presented, highlighting the potential for conflicting polarities at different levels, suggesting the need for more sophisticated analysis.
It is also addresses issues related to phrases formed by combining words with different polarities. In such cases, it suggests considering various levels of polarity, like moral and factual, to better capture the overall sentiment. The discussion extends to verbs like 'admire' and 'prefer,' which impose polarity expectations on their arguments. The example of "He admires his sick friend" versus "He admires his deceitful friend" is used to illustrate how different types of negativity may affect the overall sentiment.

It concludes by proposing hypotheses for resolving polarity conflicts, suggesting that distinctions between morally negative and factually negative, as well as the active/passive nature of the negativity, may play a role in determining the overall sentiment. Overall, the text emphasizes the need for a more nuanced and context-aware approach to sentiment analysis, considering multiple dimensions of polarity to accurately capture the complexity of language.

2. Fine-grained Polarity Lexicon.

This approach taken to achieve a compositional solution for determining the polarity of phrases and sentences at various levels. The emphasis is on ensuring high quality through the use of a manually crafted polarity lexicon that specifies the polarities of individual words (not phrase senses).

It highlights recent advancements in sentiment analysis that propose fine-grained distinctions, particularly distinguishing between various types of positive and negative polarities. The example provided references the Appraisal Theory (Martin and White, 2005), which categorizes polarities into appreciation (e.g., a sick friend), judgment (e.g., a deceptive friend), and emotion (e.g., an angry friend). This nuanced classification aims to capture the multifaceted nature of sentiment.

The lexicon also includes additional elements such as shifters, which invert the polarity (e.g., "a good idea" - positive vs. "not a good idea" - negative), as well as intensifiers and diminishers. It suggests that these components contribute to a comprehensive understanding of sentiment. Figure 1 is mentioned as a representation of the details of the French lexicon, which is the focus of the paper.

In summary, the approach involves a meticulous manual crafting of a polarity lexicon, incorporating fine-grained distinctions and various elements to achieve a nuanced and compositional solution for determining sentiment at both phrase and sentence levels.

word class	NEG	POS	DIM	INT	SHI	Total
Adjectives	1550	858	3	34	5	2450
Nouns	1332	508	1	10	5	1856
ALL	2917	1411	5	79	26	4438

Fig. 1. French polarity lexicon

English version the following statistics holds: shifters 23, intensifiers 94, diminishes 21, positive nouns 583, negative nouns 1355, positive adjectives 1096, negative adjectives 1474. Figure 2 gives an overview of our labels together with same examples: The prefixes A, F and J denote appreciation (factual), affect and judgment, respectively.

Tag	Meaning	Examples
A POS	Appreciation Positive	optimisation, beautiful, productive
F POS	Affect Positive	sensitive, happiness, love
J POS	Judgment Positive	charity, fidelity, charming
A NEG	Appreciation Negative	illness, unstable, loss
F NEG	Affect Negative	hatred, mourn, afraid
J NEG	Judgment Negative	corrupted, dictator, torture
DIM	Diminisher	less, decreasing
INT	Intensifier	more, vast
SHI	Shifter	not, absence of

Fig. 2. Complete list of polarity labels with examples

3. Phrasal Level Sentiment Composition

The approach describes the process of mapping polarity from a lexicon to the text and then calculating the polarity of nominal and prepositional phrases. This involves considering both lexical marking and syntactic analysis using a dependency parser. The composition of polarity for these phrases follows the principle of compositionality, aligning with the approach taken by other scholars such as Moilanen and Pulman (2007).

The polarity calculation involves propagating polarities from the bottom up to the heads of noun phrases (NPs) and prepositional phrases (PPs), considering the syntactic structure and relationships with other subordinates. The composition is carried out by translating the output of the dependency parser into a constraint grammar format. The vislcg3-tools VISL-group (2013) is then utilized to create compositional rules in a straightforward manner.It tries to explain that the composition on the NP degree is straightforward when the polarity labels match, including the prefix. For instance, when combining a positive adjective with a positive noun, the result is a positive noun phrase. The prefix remains unchanged, and no shifters are present in this scenario. The example given is that a lucky (A POS) donator (A POS) results in a wonderful NP, which is a lucky donator (A POS). The same logic applies to other prefixed polarities, ensuring consistency in the composition of polarities.

In summary, the approach involves mapping and calculating polarities for phrases based on lexical and syntactic analyses, adhering to the principle of compositionality. The composition is facilitated by translating dependency parser output into a constraint grammar format and applying compositional rules. The approach highlights the straightforward nature of the composition process when polarity labels match, emphasizing the importance of considering prefixes and maintaining consistency in the resulting polarities.

The most intriguing instances involve adjectives with a polarity opposite to that of the accompanying noun. For instance, within the (English) Gutenberg corpus, there are noun phrases where a negatively polarized adjective (F NEG) is paired with a positively polarized noun (F POS). While the prefix is retained, a decision must be made to categorize the overall polarity as either positive or negative. Notably, the negative polarity seems to prevail in numerous cases; for instance, "disappointed hope" is deemed negative. The situations involving J prefix variants and the F POS-F NEG combination yield identical results, consistently favoring the negative polarity. Consequently, an empirical examination is warranted to validate these hypotheses.

adjective	noun	adjective	noun
nervous	emotion	disappointed	affection
angry	passion	grief	joys
furious	passions	anxious	hopes
nervous	gratitude	angry	pleasure
disappointed	hopes	disappointed	love
angry	joy	sad	astonishment
unhappy	passions	sad	pleasure

Fig. 3. Examples of bi-polar phrases: F NEG-F POS combinations

But what if prefixes differ, e.g. a J POS adjective collides with a F NEG noun? Which prefix, which polarity should we keep? In order to make the problem behind them clear, we call these cases bi-polar noun phrases, although we believe

that in most cases a decision can be taken: whether it is positive or negative. Even the prefix might be clear. See Figure 4 for some examples.

adjective	noun	adjective	noun
earnest	regret	sincerely	anxious
kindly	regret	wisest	sorrow
honest	concern	heroic	angers
noble	rage	honest	shame
lively	despair	decent	sorrow

Fig. 4. Examples of bi-polar phrases: J POS-F NEG combinations

Instead of merely stating a composition rule, we deemed it more fitting to ground this decision in an empirical study, as detailed in section 5. Before delving into the alternative conflict scenario, where verbs deviate from their expected polarities, we first introduce the verb resource itself.

4. Polar Verbs: Effects and Expectations

To consolidate the polarity data of NPs/PPs at the sentence level, one needs to incorporate their aggregation through their governor, typically the verb. Neviarouskaya et al. (2009) advocate for a system where distinct rules for verb classes, based on their semantics, are employed for sentiment analysis at the phrase/clause level.
Reschke and Anand (2011) demonstrate the feasibility of establishing evaluativity features for verb classes to derive contextual evaluativity based on the polarity of their arguments. Other scholars engaged in sentiment analysis on texts with multiple evaluations towards the same target argue for a more intricate lexicon model, particularly a set of rules for verbs outlining the impact on the arguments of the sub-categorization frame, especially concerning the relationships between them, as discussed by Maks and Vossen (2012).

In addition to supporting evidence from the cited literature and corresponding promising results, sentiment calculation error analysis strongly suggests treating verbs similarly to the polar adjectives and nouns mentioned earlier. This becomes particularly evident in target-specific (sentence-level) sentiment analysis. For instance, in the sentence "Attorney X accuses Bank Y of investor fraud," deducing that 'accuse' is a negative polarity verb is straightforward. However, nuances arise when considering that Bank Y is accused, which should have a negative "impact," while Attorney X, as the verb's subject, remains unaffected. The prepositional phrase "of investor fraud" serves as a modifier, intuitively suggesting a negative polarity for this PP; otherwise, the accusation might be perceived as unjust. The grammatical function must be determined first (via a parser) to accurately calculate results and expectations associated with the lexical-semantic meaning of the verb.

Moreover, the meaning of the verb (and hence the polarity) is context-dependent, as exemplified by phrases like "report a profit" (positive) versus "report a loss" (negative) versus "report an expected outcome" (neutral). This necessitates a conditional identification of the resulting verb polarity, where the polarity calculated for the object head triggers the polarity of the verb. In German, there are verbs that not only change polarity concerning syntactic frames (e.g., in reflexive form) but also in relation to the polarity of connected arguments (see Fig. 5).

German	English	Polarity
fu¨r die Kinder sorgen	to take care of the kids	positive
fu¨r Probleme[neg.] sorgen	to cause problems	negative
fu¨r Frieden[pos.] sorgen	to bring peace	positive
sich sorgen	to worry	negative

Fig. 5. Several examples for the use of the German verb “sorgen”.

Consequently, the impact on verb polarity is encoded in three dimensions: effect, expectation, and the inherent polarity of the verb. The effect is understood as the outcome instantiated by the verb, while the expectation represents the anticipated polarity evoked by the verb. The polarity of a verb itself serves as an evaluation of the entire verb phrase. In summary, alongside the verb's polarity, we introduce the effects and expectations of the verb on the frame. This determination is guided by the identified syntax pattern (including negation), the lexical meaning of the polarity, and/or the conditional polarity associated with the foundation—augmenting the calculated main polarity.
This process yields over 120 verb pattern classes, considering various syntax patterns and providing the polarity of the grammatical function, resultant effects and expectations, and the verb's inherent polarity. Take, for example, the verb

class "fclass subj neg obja eff verb neg," describing the grammatical pattern (subject and direct object) and specifying activated effects and/or expectations (in this case, a negative effect for the direct object). We apply this rule by assigning the effects to relevant occurrences based on the identified verb lemma and the met syntactic pattern during linguistic analysis.

While maintaining a distinction between syntax and lexical information, we occasionally integrate lexical details when necessary. For instance, in expressing the lemma of the involved preposition in the prepositional phrase as "fclass neg subj effreflobja prepobj[um] verb neg" (e.g., "um" (for)), we depart from the pure syntax level, noting the encoded reflexive direct object.

As mentioned earlier, our goal is to integrate resources, combining the polarity lexicon and verb annotation. This integration allows for new, target-specific sentiment calculations that extend beyond the capabilities of compositional sentiment analysis relying solely on lexical resources. Such nuanced assessments, unattainable through fuzzy criteria like proximity to other polar words, were explored in our empirical study. We sought to determine if verb expectations are genuinely violated in actual texts and to what extent these instances can be reliably identified. Our verb resources encompass 305 verbs for German, 210 for English, and 320 for French.

5. Empirical Investigation

We conducted two distinct experiments: one focused on the compositional polarity at the bi-polar noun phrase level, and the other centered on predicting polarity based on verbs. These experiments utilized texts sourced from LeSoir (500 articles) and articles available on the news platform AgoraVox (300 articles), totaling approximately 6 million words.

5.1 NP-level

Our theory was that clashing polarities in a noun phrase always result in a negative NP, and we claimed that this was especially true in this case. A negative adjective reverses or negates the word it modifier's positive polarity. A positive adjective serves as an intensifier of the noun it modifier's negative polarity. Figure 6 gives an overview on the most frequent combinations. To test this hypothesis, we randomly selected 20 case samples from the results for each of the six most common combination types. We evaluated whether the noun phrases overall negative, positive or ambiguous. We attributed the value "yes", "no" or "ambiguous" to each noun phrase. The results are listed in Figure 7 below. According to our manual evaluation, 96 out of 123 selected conflict cases (which corresponds to 81%) validate our hypothesis. Adj-Noun Combination yes (negative) no (positive) ambiguous Indeed, we can easily identify positive adjectives as Intensifiers of their negative head nouns:

Adj-Noun Combination	Frequency	Adj-Noun Combination	Frequency
1. A POS , A NEG	1041	4. A POS , J NEG	242
2. A NEG , A POS	691	5. A NEG , J POS	234
3. J POS , A NEG	349	6. J NEG , A POS	155

Fig. 6. Most frequent combinations

-c´el`ebre catastrophe "famous catastrophe"
(A POS adjective + A NEG noun)
-glorieuse incertitude "glorious uncertainty" (J POS adjective + A NEG noun)
-violation d´elib´er´ee "deliberated violation" (A POS adjective + J NEG noun).

We evaluated 19% of the selected cases as either ambiguous or as contradicting our hypothesis. A contradiction of the hypothesis means that the overall polarity of a noun phrase should have been computed as
Overall positive instead of overall negative, such as in the following cases:
sourire ravageur "charming smile"(A NEG adjective + A POS noun) bouleversante sinc´erit´e "overwhelming sincerity"(A
NEG adjective + J POS noun) lutte antiterroriste "antiterrorist fight"(J POS adjective + A NEG noun),Based on our empirical findings, we propose one aggregation rule for each of the six combination types investigated:

When an A POS adjective is used to modify an A NEG noun, it operates as an intensifier. The NP's overall polarity is A NEG.When an A NEG adjective is used to modify an A POS noun, the A NEG adjective alters the noun's positive polarity. The NP's overall polarity is A NEG. When a J POS adjective modifies an A NEG noun, the J POS adjective qualifies the noun further. The NP's overall polarity is A NEG. When an A POS adjective modifies a J NEG noun, the adjective functions as the noun's intensifier. The NP's overall polarity is J NEG.-When an A NEG adjective modifies a J POS noun, the noun is shifted. The NP's overall polarity is changed to J.A NEG.-When a J NEG adjective modifies an A POS noun, the adjective's meaning and polarity type take precedence over the noun's. The NP's overall polarity is J NEG. Additional knowledge is needed in order to cope with the exceptions discussed above. These rules provide the best solution given our current resources.

5.2 Verb Level:

We searched for verb expectation violations, since we believe that they form an interesting phenomenon. They might help identify parts of a text that represent controversial opinions or offending passages. Expectation violations are rare in our French corpus, given 5000 sentences, only about 500 conflicts were found:

-410 (91.18% A NEG or A POS conflict
-82 (14.25% J NEG or J POS conflict
-26 -26 (4.55% F NEG or F POS conflict
For example, A-F or J-NEG can cause confli verb has positive expectations. Our data do not allow us to draw clear conclusions about the general rules of these cases. However, we have identified four different verb specific conflict classes. Fine-grained polarity tags determine whether polarity conflicts occur, but the behavior depends on the verb. The categories and rules that we identified are the following:
A -F - or J NEG, for example, can generate a conflict if the verb has a positive expectancy. Our data does not allow us to draw any strong conclusions about a general norm for these situations. The fine-grained polarity tags do determine whether or not a polarity conflict occurs, however they behave differently depending on the verbs. Verbs: accepter, accueillir, accorder, adorer, aider,aimer,appr´ecier,encourager, d´efendre, permettre, privil´egier,prˆoner, soutenir, sugg´erer.

a) Nor A NEG, F NEG or J NEG can cause conflicts. The verbs have a positive impact on the negative polarity: they diminish the negative polarity.

Verbs: corriger, soulager.

b) A NEG, F NEG and J NEG always generate conflicts because the verb intensifies negative expressions.

Verbs: assurer, conforter, cultiver, favoriser .
The proposition establishes a negative polarity effect or relation with regard to somebody or something.Verbs: m´eriter, d´esirer, offrir, profiter, promettre.
As an example, the fourth category addresses verbs that consistently result in conflicts, irrespective of the specific type of negative polarity they modify. These verbs have been subdivided into two distinct subcategories, labeled (a) and (b). The verbs falling under subcategory (a) such as "assurer" (assure), "conforter" (strengthen), "cultiver" (cultivate), "favoriser" (favour), and "have" exhibit, based on our data, an intensifying effect when modifying negative expressions.We have initiated a more in-depth exploration of verb expectation conflicts in other languages. Particularly in German, where our corpus is more extensive compared to French, utilizing the DeWaC corpus (refer to Baroni et al. (2009)), which comprises 90 million sentences. With a larger dataset, we aim to gain a clearer understanding of verb expectation conflicts.

6. Related Work

Bipolar phrases have not received extensive attention in the existing literature, often relying on simple configuration rules that treat positive and negative elements equally as negative (e.g., Choi and Cardie, 2008). In this article, I critically examined these specialized noun phrases and endeavored to propose a more coordinated rule.
The role of verbs in sentiment analysis is not as widely recognized as that of adjectives and nouns. Nevertheless, a few approaches seek to elucidate the impact of verbs, as demonstrated by Chesley et al. (2006), Neviarouskaya et al. (2009), and Reschke and Anand (2011). Chesley et al. (2006) employ verb classes and assign a prior polarity to each class, demonstrating how these classes contribute as features to enhance the accuracy of their approach. However, no attention is given to the verb's arguments in their work. This aspect, on the other hand, is the primary focus of Neviarouskaya et al.'s work (2009).
Once again, verb classes are utilized, such as verbs of having, withholding, disliking, and linking. The frame polarity hinges on the polarity of both the subject and the direct object. For instance, an instantiated verb frame for the verb "lack" is positive if the subject is negative and the direct object is positive (e.g., "your enemy lacks good luck" is considered positive). Notably, the existing approaches do not provide insights into the polarity preferences of these verbs, such as the positive polarity preference for the direct object in the case of "lack." This is a revelation brought forth by our approach, making these two methodologies complementary.

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