

The Detection and Analysis of Bi-polar Phrases and Polarity Conflicts: a Study

Manfred Klenner, Susanna Tron,
Michael Amsler and Nora Hollenstein

Computational Linguistics
University of Zurich
Switzerland

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- Sentiment Analysis: a quick recap
- Appraisal theory and fine-grained polarity labels
- Phrase-level bi-polarity: composition
- Verb polarity frames: a novel resource for SA
- Related work on verbs and their role in sentiment analysis
- Polarity conflicts
- Conclusions

Sentiment Analysis: a recap

"I believe that Antonio Tabucchi was a great Italian writer"

- The opinion holder (I)
- ... produces a subjective expression (I believe ...)
- in order to evaluate (best Italian writer)
- a target (Antonio Tabucchi)
- positively or negatively.

Subjectivity - (negative or positive) objectivity (facts)

Can we strictly distinguish between these two?

Fact or opinion?

- 'He lost all his money' .. negative fact
- 'He lied' .. fact or opinion?
- if proved, then it is a negative fact
- and: it implies misbehaviour - so it's a relevant dimension

We propose to consider both, polar facts and opinions.

Word-level polarity lexicons

Some words do have a prior positive or negative polarity

→ perfect⁺, impertinent⁻, love⁺, hope⁺, to enjoy⁺, to detest⁻, ..

Most words do not have a prior polarity, i.e. they are neutral

→ tree, mouth, green, to read, to go, picture, building, ..

Other words intensify, diminish or shift

→ diminisher: little, minor, hardly

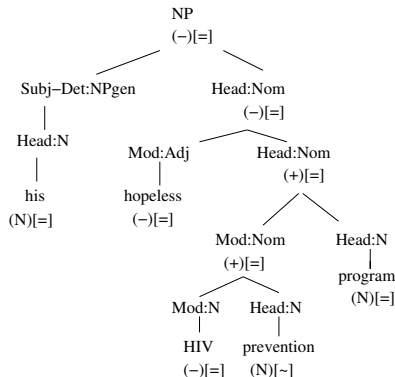
→ intensifier: very

→ shifter: fail to, not, never

Sentiment Composition

Moilanen & Pulman, 2007

- The global polarity of a sentence is a function of the polarities of its parts.
- 'The senators supporting the leader failed to praise his hopeless HIV prevention program'



- (N) = neutral
- (+) = positive
- (-) = negative
- (~) = shifter
- (=) = default behaviour

The need for fine-grained distinctions

- ① She admires her brave colleague
- ② She admires her sick colleague
- ③ ?She admires the remorseful thief
- ④ *She admires her cheating colleague

Fine-grained word-level polarity lexicons

Appraisal Theory: Martin & White (2005)

- opinion related grammatical subsystems: Engagement, Attitude, Graduation
- The ATTITUDE system deals with direct evaluations of people, objects, and facts.
- Attitude has 3 types:
 - affect: refers to an emotional state, e.g. 'to hope'
 - judgment: evaluates a person's behavior in a social context(moral), e.g. 'to lie'
 - appreciation: evaluates the intrinsic qualities of an object, e.g. 'beautiful'
- appreciation/polar factuality: evaluates the qualities of an object and (!) a person (not related to moral), e.g. interesting, vivid, but also ill, tired person

Examples of lexicon entries

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, blame, guilt
DIM/INT	Diminisher/Intensifier	less, decreasing/ more, vast
SHI	Shifter	not, failing to, absence of, lack of

Statistics

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

Figure: French polarity lexicon

word class	FR	EN	DE	IT
Adjectives	2450	2566	2343	1549
Nouns	1856	1928	3352	1626
ALL	4438	4494	5695	3271

Figure: Overview polarity lexicons

Bi-polar phrase composition

- bi-polar: both, a positive and a negative word-level polarity combine to a polar noun phrase
- 'justified doubt' (J_POS+A_NEG)
 - positive, negative, both (bi-polar)?
 - both: negative on the factual side (to doubt), but positive on the moral side (seems to be good reason)
- 'just punishment':
- sometimes bi-polar, sometimes NEG, sometimes even POS
- NEG: 'arrogant certainty', 'unsympathetic ability', 'perverse creativity', 'shabby truth'
- how do prefixes combine: $J_POS + A_NEG = J_NEG?$

Bi-polar NP composition: same prefix

adjective	noun	adjective	noun
angry	passions	anxious	hopes
nervous	gratitude	angry	pleasure
disappointed	hopes	disappointed	love
angry	joy	sad	astonishment
unhappy	passions	sad	pleasure

Figure: F_NEG-F_POS combinations

Literature (e.g. Choi and Cardie, 2008) tells us: NEG wins
An empirical study could help evaluating this ...

Bi-polar NP composition: different prefixes

adjective	noun	adjective	noun
earnest	regret	decent	sorrow
kind	regret	wisest	sorrow
honest	concern	heroic	anger
noble	rage	honest	shame

Figure: J_POS-F_NEG combinations

- Is the NEG-hypothesis valid? NEG: 'earnest regret'?
- Which prefix should we take? J_NEG, F_NEG or just NEG?
- Should we stick with the label 'bi-polar'?
- Can we decide it at all?

Bi-polar NP composition

Hypothesis: inverse polarities (adjective noun) give a negative NP

Hypothesis specializes to a) and b)

- a) negative adjectives negate the positive noun polarity
- b) positive adjectives act as an intensifier on negative noun polarity

Adj-Noun Combination	Example
1. A POS , A NEG	perfect disaster
2. A NEG , A POS	tired friend
3. J POS , A NEG	justified doubt
4. A POS , J NEG	perfect murder
5. A NEG , J POS	sick human rights activist
6. J NEG , A POS	immoral friend

Figure: Most frequent combinations (LeSoir, 6 Million words)

Annotation

- 20 examples of the most frequent combinations
- manual classification: positive, negative or ambiguous
- classification of the polarity type if prefix differences

Adj-Noun Combination	yes (negative)	no (positive)	ambiguous
A POS , A NEG	14/20 (70%)	4/20 (20%)	2/20 (10%)
A NEG , A POS	17/20 (85%)	2/20 (10%)	1/20 (5%)
J POS , A NEG	12/20 (60%)	4/20 (20%)	4/20 (20%)
A POS , J NEG	18/20 (90%)	0/20 (0%)	2/20 (10%)
A NEG , J POS	17/20 (85%)	2/20 (10%)	1/20 (5%)
J NEG , A POS	19/20 (95%)	0/20 (0%)	1/20 (5%)
Total	97/120 (81%)	12/120 (10%)	11/120 (9%)

Figure: Composition results

Proved hypotheses a) and b): examples

pos	+ neg = neg!	neg	+ pos = neg
innocent	victim	lost	confidence
just	punishment	sad	winner
justified	doubt	doubtful	pleasure
true	desaster	naive	faith

- 'justified doubt' is a stronger claim than just 'doubt'
- a negative adjective can't increase the strength of the positive noun, since it reverts it

False predictions: counterexamples

- joie contagieuse (F_POS noun + A_NEG adjective): contagious joy (POS) (sense of carrying along)
- admiration éperdue (F_POS noun + A_NEG adjective): bewildered admiration (POS) (sense of amazed)
- louable souci (J_POS adjective + A_NEG noun): souci = worry, louable = commendable (POS?)
- honneur tardif (J_POS noun + A_NEG adjective): late honor (POS)
- vertueuse victime (J_POS adjective + A_NEG noun): virtuous victim (bi-polar?)

Hart to deal with, hence, we stick with NEG-hypothesis (precision 81%)

Prefix determination

- different prefixes: which one propagates to the phrase level
- ongoing work, some heuristic rules derived from our empirical study
 - $J_NEG + A_POS = J_NEG$
e.g. arrogant certainty, unsympathetic ability, perverse creativity, shabby truth
 - $A_NEG + J_POS = J_NEG$
unrealistic peacefulness, strange justice, useless humanity, pointless audacity
 - $J_POS + A_NEG = A_NEG$ (sometimes even POS?)
deserved death, merciful death, legitimate war, justified pain
 -

A novel resource for polarity determination

'Ebola: Hospital blamed for US transmission'

Verb polarity frames

- verbs seems to have polar connotations wrt. their roles
- we expect the PPObj of 'blame' to be something negative
- the SUBJ of 'blame' receives a negative perspectivation
- NOTE: both are neutral, no prior polarity
- thus: we can derive contextual target polarity
- we distinguish *effects* from *expectations*

'Medved: Blamed for Success?'

The distinction between effects and expectations is heuristic

- expectation: a polar connotation that could be violated by the prior (or contextual) polarity of the constituent
- effect: a polar connotation a constituent receives because it occupies a particular role (could not be violated)

Verb Polarity Frame

- for each subcategorized role:
 - the polar load of the connotation: positive, negative (or none)
 - the kind the polar connotation : effect, expectation (or none)

Polarity conflicts

- Don't we feel uncomfortable about it, if
 - someone approves a murder
 - someone supports a terrorist
 - someone loves/adores/admires brutal scenes
 - we seem to expect a positive direct object
 - we seem to project a negative perspective on the subject filler
-
- polarity conflicts occur, if a polar expectation of a verbs role filler gets violated by the polarity of the actual filler object

Why should we care for polarity conflicts?

Polarity conflicts indicate interesting statements

- i.e. real conflicts announce controversial topics
- i.e. real conflicts imply a strong negative evaluation of the agent

Application: show texts where the target is part of a controversy

Not every expectation violation creates a conflict

- *She admires her cheating colleague
- She admires her sick colleague
- She admires the brave hostage
- She admires the remorseful thief
- She admires the unfriendly human rights activist
- ?She admires the sentenced human rights activist
- *She admires the lying human rights activist

- 'cheating colleague' is morally negative
- 'sick colleague' is factually negative
- 'brave hostage' is bi-polar (J_POS+A_NEG)
- 'remorseful thief' is bi-polar (J_POS+J_NEG)
- 'unfriendly human rights activist' is bi-polar (A_NEG+J_POS)
- 'sentenced human rights activist' is bi-polar (J_NEG+J_POS): passive
- 'lying human rights activist' is bi-polar (J_NEG+J_POS): active

Verb polarity frames

- DE, FR, IT, EN (about 300 verbs per language)
- currently: restrictions apply to grammatical roles
- syntax driven, including even particular prepositions
- e.g. blame DObj, blame DObj for .., blame DObj (not) to
- problem: role filler restrictions sometimes make the difference

Nevirouskaja et al., 2012

- Appraisal categories in the lexicon
- semantic classification of verbs
- composition rules per class
- exterior and interior perspective on instantiated verb frames
- interior: $S \ \& \ V+(\text{'admires'}) \ \& \ O-(\text{'mafia leader'}) \Rightarrow (\text{verb valence dominance, V-score}) \Rightarrow \text{pos.affect}$
- exterior: $S \ \& \ V+(\text{'admires'}) \ \& \ O-(\text{'mafia leader'}) \Rightarrow (\text{verb valence reversal, max(V-score,O-score)}) \Rightarrow \text{neg.judgment}$
- us: posExp(dobj) , polarity conflict if negPol(dobj)
- expectation/effect does not coincide with either perspective
- not every negative dobj leads to a neg.judgment (cf. admire sick colleague)

Reschke and Anand, 2009

- evaluativity functions of verbs
- verb frame polarity is a function of the polarity combination of the arguments
- example: it is positive, if my enemy (negative) loses something positive
- problem: nothing is said about evaluativity in the case of neutral arguments
- us: $\text{posEff}(\text{subj})$ if $\text{negPol}(\text{dobj})$: if a child loses his fear = positive

Deng, Wiebe et al., 2014

- Resource called: +/- EffectWordnet
- rule-based opinion inference: focus on private states of writer

'The bill would curb skyrocketing health care costs'

- writer has positive sentiment towards 'curb costs'
- 'curb costs' is negative for 'costs' (curb = reduce) thus
- writer has negative sentiment towards 'costs'
- writer has positive sentiment towards 'bill'

Deng, Wiebe et al., 2014

- us: curb (German: eindämmen) has negExp(dobj), 'costs' thus are negative
- seems to be similar, but there are differences (and, of course, their approach is more ambitious)
- +/- EffectWordnet: 'commit a crime' is positive for 'crime' (borrowed from Reschke and Anand)
- us: commit (German: begehen) negExp(dobj)

In sum

- our approach and the other approaches focus on complementary aspects of verb-related sentiment inferences
- our focus: what polar circumstances do we - in a kind of default reasoning - expect as a reader
- only in our approach, thus, violations (polarity conflicts) can be directly identified
- only in our approach, the contextual polarity of otherwise neutral entities can be directly derived from their co-occurrence with verbs
- these approaches and our approach are (more or less) complementary

Conclusion

- fine-grained polarity lexicon and
- customized composition rules for
- bi-polar NP composition and
- verb polarity conflict detection
- new resources for 4 language
- a little empirical study as a first evaluation