

FrameNet and sentiment analysis

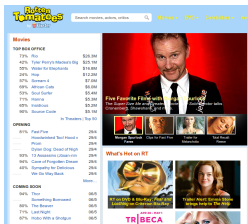
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Applications



The sentiment analysis task

- There is no widely agreed definition of what the scope of sentiment analysis is.
- Along with this goes a terminological diversity that reflects different interests and backgrounds.
- Usually, examples are given of what one would like to handle.

In particular, we propose a detailed annotation scheme that identifies key components and properties of opinions, emotions, sentiments, speculations, evaluations, and other private states (Quirk et al., 1985), i.e., internal states that cannot be directly observed by others. (Wiebe et al. 2005)

- For particular applications, only subsets may be relevant.

Sub-tasks in analyzing opinions

- A more or less complete analysis of *individual* opinion-bearing expressions has to deal at least with the following:
 - Whose opinion? (**Source**/Opinion Holder)
 - What is it about? (**Target**/Topic)
 - What is its valence (positive/negative/mixed/neutral)? (**Polarity**)
 - How strongly positive/negative? (**Intensity**)
- Examples
 - ... Mr. Obama plans to renew [his ^{Source}] **pledge**⁺ [to reduce the world's nuclear arsenal ^{Target}] ...
 - [in my mind ^{Source}], one of the [most utterly ^{Intensity}] **disgusting**⁻ [books ^{Target}] I have ever read
- In certain contexts some of these aspects are easier to identify than others.
- IwiSt is part of a group that prepares a Shared Task on Source+Target extraction for 2014 (Julia Maria Struß, Josef Ruppenhofer).

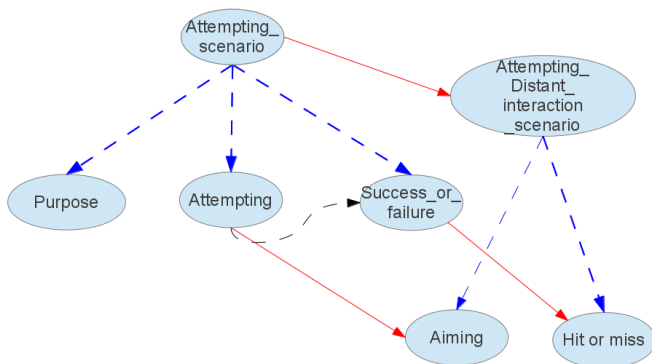
Goal

- Provide a linguistically grounded analysis of expressions of sentiment and subjectivity in natural language which goes beyond the state-of-the-art in the area of sentiment analysis.
- In particular, distinguish lexically inherent (*I like ice-cream*) from pragmatically inferred sentiment (*Ted Cruz is the next Palin*).
- Enable a finer analysis based on frame semantics implemented in an extension/add-on to FrameNet.

FrameNet

- A lexicon+corpus based on theory of **Frame Semantics** (Fillmore 1982, 1985; Baker et al. 1998)
- Organizes the English lexicon into a complex **hierarchy** of predicate sets (=frames)
- Frames capture the background knowledge that competent speakers use when producing and understanding utterances.
- Unlike WordNet synsets, frames include lexical units from **all parts of speech** (e.g. similarity.n, like.prep, similar.a, resemble.v).
- The possible syntactic realizations of the **semantic roles** associated with frames are documented through **corpus annotations**.
- [I *Experiencer*] **like** *Experiencer focus* [ice-cream *Content*]

FrameNet hierarchy



Methods

- define extended representation of FrameNet
- two ways to add information
 - propagate sentiment information on seed data
(semi)-automatically along the relations in the network
 - add word-specific information derived from corpora
- perform cycles of evaluation / refinement / manual correction
- evaluate usefulness of frame-based approach

Overview

- Set up for formally diverse entries (Adj, N, V, Adv, Prep, MWEs, constructions, . . .)
- We can associate sentiment-related properties to particular word senses rather than just lemmas
- Connect the entity-extraction tasks in sentiment analysis with the role labeling task
- Able to represent
 - participant-level and reporter-level opinions
 - event structure and presuppositions
- Offers different perspective on question of composition
- Supports more detailed evaluation
- Re-use and *extend* prior work on lexicon, annotation, tools

Connecting source and target to semantic roles

Semantic roles	Opinion roles
Speaker	Source
Topic	Target
Message	Target
Addressee	-
Time	-
...	-

Table: Role mappings for the Complaining frame

- LUs: belly-ache.v, bitch.v, complaint.n, complain.v, grievance.n, gripe.n, gripe.v, grouse.v, grouching.n, grumble.v, lament.v, moan.v, piss and moan.v, whine.v, whinge.v
- Example: I always thought the guys [who Speaker/Source] **complained** [about the CD remastering of Dylan 's albums Topic/Target] were full of themselves .

Key semantic features

- Intensity (moronic.a < idiotic.a < dumb.a)
- Polarity (moron.n-, brainiac.n+)
- Affectedness
- (Event structure)

Intensity

- Evaluation is inherently a scalar notion: it presupposes a position on a scale, and in the prototypical case deviation from some normal point / region on that scale.
- Semantic scalarity does not line up 100% with morpho-syntactic exponents of grading such as the formation of comparative and superlative forms.
 - end-of-scale adjectives are rarely graded (*?more, most superlative*)
 - multi-word expressions may also have an end-of-scale semantics (*beyond compare, without equal, beneath contempt*)
 - nouns may lexicalize different points on the same scale (*dummy, dunderhead, idiot, moron, imbecile*)
- In a first pass, we do, however, concentrate on the ordering of adjectives.

Polarity

- The polarity (alternatively: orientation or valence) feature captures the positive, negative or neutral attitude of the Source participant towards the Target.
- Many automatic methods exist for assignment of polarity to *lemmas* (e.g. Turney & Littman 2003).
- We can simply use these in a first step and deal with the errors that we introduce on the *word-sense* level subsequently.
- We can also make use of the structure of the database itself to detect cases where the propagation of lemma-level polarity to particular word senses may seem inappropriate.

Affectedness

- Changes of state that leave an event participant in a (notably) changed state.
 - Affectee: Beneficiary (help, repair)
 - Affectee: Maleficiary (prevent, break)
- Potentially, there is an Affector who brings about the change of state.

Event evaluation (∼ inferred judgments)

- “Evaluative stance towards an event is a product of the evaluative stances an assessor bears towards the predicate’s participants” (Anand & Reschke 2010)
- In other words, the stance of the event-reporter towards the event depends on what they think about the participants.
 - My {ally, enemy} was **deprived** of shelter.
 - My {ally, enemy} was **spared** a dangerous mission.
- For particular verb classes with entailments related to *Possession*, *Existence*, and **Affectedness*, A&R develop a mapping from judgments about participants to judgments about the event.

Event evaluation II

Verb class	Result state	Functor
creation	existence	$E_{existing}$
destruction	existence	$E_{non-existent}$
gain	possession	E_{have}
loss	possession	E_{lack}
benefit	affectedness	$E_{positive}$
injury	affectedness	$E_{negative}$

Table: A&R's functors for 6 change of state verb classes

	x	x	E_{have}	E_{lack}	$E_{withhold}$	$E_{deprive}$	E_{spare}
1	+	+	+	-	-	-	-
2	+	-	-	+	+	#	+
3	-	+	-	+	+	+	#
4	-	-	+	-	-	#	-

Table: A&R's analysis for events of possession and withholding

Event evaluation III

- a My friend was given a promotion. Yay!
- b My friend has cancer. It's so sad.
- c That bastard has a lot of support among voters. Crap!
- d That idiot got the worst assignment I can imagine. Serves him right!
- e My neighbor didn't win the prize. ??

Event evaluation IV

- FrameNet was used to define the verb classes that were used in an annotation study to confirm whether the calculus worked on actual text tokens.
- FrameNet itself could add and make some of that information explicit, e.g. about affectedness.

FE	Affectedness
Assailant	Affector
Victim	Affectee

Table: Affectedness for Attack.assault.v

Summary

- To show that frame-semantics based sentiment analysis works, we first have to cover the basics
 - polarity
 - intensity
- Beyond that, we want to show that a more complete and deeper representation actually clarifies things conceptually and allows for more detailed analyses:
 - source and target extraction
 - support for multiple opinions
 - support for inferences
 - ...
- The usefulness of the deeper representation and additional information is not limited to sentiment analysis.