Annotating Expressions of Opinions and Emotions in Language

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Introduction

- The goal is to investigate the use of opinion and emotion in language through a corpus annotation study
- Propose a relatively fine-grained annotation scheme: word- and phrase-level
- Focus of this work is identifying private state expressions in context, rather than judging words and phrases themselves, out of context
- Known as the MPQA Opinion Corpus (10,000-sentence corpus)

Private State

- The goals of the annotation scheme are to represent internal mental and emotional states
- The notion of private state covers opinions, beliefs, thoughts, feelings, emotions, goals, evaluations, and judgments

Private State [Quirk et al. 1985]

A private state is a state that is not open to objective observation or verification: "a person may be observed to assert that God exists, but not to believe that God exists"

Private State Frame

- Private state frame includes the source of private state, the target, and various properties (intensity, significance, and type of attitude)
- Create private state frames for three types of private state expressions
  a. explicit mentions of private states
  b. speech events expressing private states
  c. expressive subjective elements
- Multiple private state frames can be created for a sentence
- Two types of private state frames
  i. expressive subjective elements frames (c)
  ii. direct subjective frames (a, b)

Two Types of Private State Frame

- Direct subjective frame
  - text anchor
  - source
  - target
  - insubstantial: a flag for applications to choose what they want
  - intensity, expression intensity
  - attitude type: negative, positive, both, neither
  - *Private state actions are represented using direct subjective frame
- Expressive subjective element frame
  - text anchor
  - source
  - properties: intensity, attitude type

Objective Speech Event Frame

- Used to represent material that is attributed to some source, but is presented as objective facts
- Attributes
  - text anchor
  - source
  - target
  - implicit

Agent Frame and Nested Sources

- Annotation scheme includes an agent frame for noun phrases that refer to sources of private states and speech events
- Agent frame attributes
  - text anchor
  - source
- Writer may write about other people's private states and speech events, leading to multiple sources in a single sentence
- The shallowest (left-most) agent of all nested sources is the writer e.g. $< writer, X_2, X_3 >$
- Nested source annotations are composed of the IDs associated with each source

Text Anchors in Direct Subjective and Objective Speech Event Frames

A sentence that implicitly presents private state/speech event

`"It is heresay" said Cao, "the 'Shouters' claim they are biffer than Jesus"`

- The source and speech event phrases are implicit; thus, the entire sentence is subordinated to the speech event phrase
- Cao's speech event:
  - **source:** $< writer, Cao >$
  - **speech event:** "said"
  - **subordinated constituents:** "It is heresy"; "the 'Shouters' claim they are bigger than Jesus"
- the Shouters' claim
  - **source:** $< writer, Cao, Shouters >$
  - **speech event:** "claim"
  - **subordinated constituents:** "they are bigger than Jesus"
- If a phrase is implicit, make the entire sentence or quoted string the text anchor for the frame

Objective vs. Subjective Speech Events

- Speech event term dictates subjectivity (e.g. said vs. criticized)
- When speech event term is neutral, or if there isn't an explicit speech event term, it depends on the context and the presence or absence of expressive subjective elements

The distinction between subjective and objective speech events

Suppose there is a speech event S with nested source $< X_1, X_2, X_3 >$, according to X_1, according to X_2, does S express X_3's private state?

- If yes, subjective
- Otherwise, objective

Intensity Ratings

- Intensity ratings are included in the annotation scheme to indicate the intensities of the private states expressed in subjective sentences
- Values are *low, medium, high* and *extreme*
- For direct subjective frames, there is an additional intensity rating, expression intensity, which represents the contribution to intensity made specifically by the private state or speech event phrase

Observations

- A large variety of words that appear in subjective expressions (consider only content words and exclude list of stop words)
  - Direct subjective expressions: 638 distinct words (44%)
  - Expressive subject expressions: 1463 distinct words (51%)
- Different usages of words, in context, need to be distinguished to understand subjectivity
- Many sentences are mixtures of subjectivity and objectivity
- Out of 1689 direct subjective frames, 69% were not assigned one of $\{positive, negative, both\}$
- From the study, annotators are more comfortable marking *negative* (73%)

Annotator Training

- Three general guidelines
  - No fixed rules about how words should be annotated
  - Sentences should be interpreted with respect to the contexts in which they appear
  - Be consistent
- Basic Training: 40 hours
- At the time of the agreement study, each annotator had been annotating part-time (8-12 hours per week) for 3-6 months

Agreement Study

- Editorials are hard to annotate and articles about objective topics are the easiest to annotate
- Need to measure agreement for various aspects of the annotation scheme
- To measure agreement, consider how much intersection there is between the sets of expressions identified by annotators $\Rightarrow$ Use the agr metric

Measuring Agreement

agr metric

Let A and B be the sets of anchors annotated by annotators a and b, respectively. agr is a directional measure of agreement that measures what proportion of A was also marked by b. The agreement of b to a is:

$$agr(a||b) = \frac{|A \text{ matching } B|}{|A|}$$

Agreement for Various Text Anchors

- Expressive subjective element text anchors: avg. 72%
- Direct subjective and objective speech event text anchors (explicit): avg. 82%
- An expression is borderline subjective if
  - i at least one annotator marked the expression with a direct subjective frame
  - ii neither annotator characterized its intensity as being greater than low

Agreement for Sentences

- Use low-level frame annotations to derive sentence-level judgments
- Allow the study to be compared with previously published results
- Sentence-level judgment are defined in terms of low-level frame annotations as follows
  - Exclude insubstantial frames
  - For each sentence, an annotator's judgment is subjective if created one or more direct subjective frames in the sentence. Objective otherwise.
- Avg. pairwise $\kappa = 0.77$
- New results suggest that adding detail to the annotation task can help annotators perform more reliably
- If borderline subjective sentences are removed, avg. $\kappa = 0.87$