Computing with Affective Lexicons

Affective, Sentimental, and Connotative Meaning in the Lexicon
Affective meaning

• Drawing on literatures in
  • affective computing (Picard 95)
  • linguistic subjectivity (Wiebe and colleagues)
  • social psychology (Pennebaker and colleagues)

• Can we model the lexical semantics relevant to:
  • sentiment
  • emotion
  • personality
  • mood
  • attitudes
**Why compute affective meaning?**

- **Detecting:**
  - sentiment towards politicians, products, countries, ideas
  - frustration of callers to a help line
  - stress in drivers or pilots
  - depression and other medical conditions
  - confusion in students talking to e-tutors
  - emotions in novels (e.g., for studying groups that are feared over time)

- **Could we generate:**
  - emotions or moods for literacy tutors in the children’s storybook domain
  - emotions or moods for computer games
  - personalities for dialogue systems to match the user
Connotation in the lexicon

- Words have connotation as well as sense
- Can we build lexical resources that represent these connotations?
- And use them in these computational tasks?
Scherer’s typology of affective states

**Emotion:** relatively brief episode of synchronized response of all or most organismic subsystems in response to the evaluation of an event as being of major significance

- angry, sad, joyful, fearful, ashamed, proud, desperate

**Mood:** diffuse affect state ...change in subjective feeling, of low intensity but relatively long duration, often without apparent cause

- cheerful, gloomy, irritable, listless, depressed, buoyant

**Interpersonal stance:** affective stance taken toward another person in a specific interaction, coloring the interpersonal exchange

- distant, cold, warm, supportive, contemptuous

**Attitudes:** relatively enduring, affectively colored beliefs, preferences predispositions towards objects or persons

- liking, loving, hating, valuing, desiring

**Personality traits:** emotionally laden, stable personality dispositions and behavior tendencies, typical for a person

- nervous, anxious, reckless, morose, hostile, envious, jealous
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Sentiment Lexicons
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The General Inquirer


• Home page: http://www.wjh.harvard.edu/~inquirer
• List of Categories: http://www.wjh.harvard.edu/~inquirer/homecat.htm
• Spreadsheet: http://www.wjh.harvard.edu/~inquirer/inquirerbasic.xls
• Categories:
  • Positiv (1915 words) and Negativ (2291 words)
  • Strong vs Weak, Active vs Passive, Overstated versus Understated
  • Pleasure, Pain, Virtue, Vice, Motivation, Cognitive Orientation, etc
• Free for Research Use
LIWC (Linguistic Inquiry and Word Count)


- 2300 words, >70 classes
- **Affective Processes**
  - negative emotion (*bad, weird, hate, problem, tough*)
  - positive emotion (*love, nice, sweet*)
- **Cognitive Processes**
  - Tentative (*maybe, perhaps, guess*), Inhibition (*block, constraint*)
- **Pronouns, Negation** (*no, never*), **Quantifiers** (*few, many*)
- $30$ or $90$ fee
MPQA Subjectivity Cues Lexicon


• 6885 words from 8221 lemmas
  • 2718 positive
  • 4912 negative

• Each word annotated for intensity (strong, weak)

• GNU GPL
Bing Liu Opinion Lexicon


• Bing Liu's Page on Opinion Mining
• http://www.cs.uic.edu/~liub/FBS/opinion-lexicon-English.rar

• 6786 words
  • 2006 positive
  • 4783 negative
SentiWordNet

Stefano Baccianella, Andrea Esuli, and Fabrizio Sebastiani. 2010 SENTIWORDNET 3.0: An Enhanced Lexical Resource for Sentiment Analysis and Opinion Mining. LREC-2010

- Home page: [http://sentiwordnet.isti.cnr.it/](http://sentiwordnet.isti.cnr.it/)
- All WordNet synsets automatically annotated for degrees of positivity, negativity, and neutrality/objectiveness
- \([\text{estimable}(J,3)]\) “may be computed or estimated”
  - Pos 0    Neg 0    Obj 1
- \([\text{estimable}(J,1)]\) “deserving of respect or high regard”
  - Pos 0.75  Neg 0    Obj 0.25
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Sentiment Lexicons
Computing with Affective Lexicons

Other Affective Lexicons
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Two families of theories of emotion

• Atomic basic emotions
  • A finite list of 6 or 8, from which others are generated

• Dimensions of emotion
  • Valence (positive negative)
  • Arousal (strong, weak)
  • Control
Ekman’s 6 basic emotions:
Surprise, happiness, anger, fear, disgust, sadness
Valence/Arousal Dimensions

- High arousal, low pleasure: 
  - *anger*

- Low arousal, low pleasure: 
  - *sadness*

- High arousal, high pleasure: 
  - *excitement*

- Low arousal, high pleasure: 
  - *relaxation*
Atomic units vs. Dimensions

Distinctive
• Emotions are units.
• Limited number of basic emotions.
• Basic emotions are innate and universal

Dimensional
• Emotions are dimensions.
• Limited # of labels but unlimited number of emotions.
• Emotions are culturally learned.

Adapted from Julia Braverman
One emotion lexicon from each paradigm!

1. 8 basic emotions:
   • NRC Word-Emotion Association Lexicon (Mohammad and Turney 2011)

2. Dimensions of valence/arousal/dominance
   • Warriner, A. B., Kuperman, V., and Brysbaert, M. (2013)
   • Both built using Amazon Mechanical Turk
Plutchick’s wheel of emotion

• 8 basic emotions
• in four opposing pairs:
  • joy–sadness
  • anger–fear
  • trust–disgust
  • anticipation–surprise
NRC Word-Emotion Association Lexicon

Mohammad and Turney 2011

- 10,000 words chosen mainly from earlier lexicons
- Labeled by Amazon Mechanical Turk
- 5 Turkers per hit
- Give Turkers an idea of the relevant sense of the word
- Result:

<table>
<thead>
<tr>
<th>Word</th>
<th>Emotion</th>
<th>Value</th>
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<td>joy</td>
<td>1</td>
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<td>amazingly</td>
<td>sadness</td>
<td>0</td>
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<tr>
<td>amazingly</td>
<td>surprise</td>
<td>1</td>
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<tr>
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<td>sadness terms</td>
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<td>surprise terms</td>
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<td>Union</td>
<td>10170</td>
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The AMT Hit

Prompt word: startle

Q1. Which word is closest in meaning (most related) to startle?
- automobile
- shake
- honesty
- entertain

Q2. How positive (good, praising) is the word startle?
- startle is not positive
- startle is weakly positive
- startle is moderately positive
- startle is strongly positive

Q3. How negative (bad, criticizing) is the word startle?
- startle is not negative
- startle is weakly negative
- startle is moderately negative
- startle is strongly negative

Q4. How much is startle associated with the emotion joy? (For example, happy and fun are strongly associated with joy.)
- startle is not associated with joy
- startle is weakly associated with joy
- startle is moderately associated with joy
- startle is strongly associated with joy

Q5. How much is startle associated with the emotion sadness? (For example, failure and heartbreak are strongly associated with sadness.)
- startle is not associated with sadness
- startle is weakly associated with sadness
- startle is moderately associated with sadness
- startle is strongly associated with sadness

Q6. How much is startle associated with the emotion fear? (For example, horror and scary are strongly associated with fear.)

Q7. How much is startle associated with the emotion anger? (For example, rage and shouting are strongly associated with anger.)

Q8. How much is startle associated with the emotion trust? (For example, faith and integrity are strongly associated with trust.)

Q9. How much is startle associated with the emotion disgust? (For example, gross and cruelty are strongly associated with disgust.)

...
Lexicon of valence, arousal, and dominance

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Ratings for 14,000 words for emotional dimensions:
- **valence** (the pleasantness of the stimulus)
- **arousal** (the intensity of emotion provoked by the stimulus)
- **dominance** (the degree of control exerted by the stimulus)
Lexicon of valence, arousal, and dominance

- **valence** (the pleasantness of the stimulus)
  - 9: happy, pleased, satisfied, contented, hopeful
  - 1: unhappy, annoyed, unsatisfied, melancholic, despaired, or bored
- **arousal** (the intensity of emotion provoked by the stimulus)
  - 9: stimulated, excited, frenzied, jittery, wide-awake, or aroused
  - 1: relaxed, calm, sluggish, dull, sleepy, or unaroused;
- **dominance** (the degree of control exerted by the stimulus)
  - 9: in control, influential, important, dominant, autonomous, or controlling
  - 1: controlled, influenced, cared-for, awed, submissive, or guided
- Again produced by AMT
Lexicon of valence, arousal, and dominance: Examples

<table>
<thead>
<tr>
<th>Valence</th>
<th>Arousal</th>
<th>Dominance</th>
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<tbody>
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<td>7.56</td>
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<tr>
<td>happy</td>
<td>8.47</td>
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<tr>
<td>whistle</td>
<td>5.7</td>
<td>4.18</td>
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<tr>
<td>conscious</td>
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<td>4.15</td>
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<tr>
<td>torture</td>
<td>1.4</td>
<td>1.67</td>
</tr>
</tbody>
</table>
Concreteness versus abstractness

• The degree to which the concept denoted by a word refers to a perceptible entity.
  • Do concrete and abstract words differ in connotation?
  • Storage and retrieval?
  • Bilingual processing?
  • Relevant for embodied view of cognition (Barsalou 1999 inter alia)
    • Do concrete words activate brain regions involved in relevant perception

• Brysbaert, M., Warriner, A. B., and Kuperman, V. (2014) Concreteness ratings for 40 thousand generally known English word lemmas Behavior Research Methods 46, 904-911.
  • Supplementary data: This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License.
  • 37,058 English words and 2,896 two-word expressions (“zebra crossing” and “zoom in”),
  • Rating from 1 (abstract) to 5 (concrete)
  • Calibrator words:
    • shirt, infinity, gas, grasshopper, marriage, kick, polite, whistle, theory, and sugar
Concreteness versus abstractness

- Supplementary data: This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License.
- Some example ratings from the final dataset of 40,000 words and phrases
  
  banana 5
  bathrobe 5
  bagel 5
  brisk 2.5
  badass 2.5
  basically 1.32
  belief 1.19
  although 1.07
Perceptual Strength Norms

Connell and Lynott norms

<table>
<thead>
<tr>
<th>Word</th>
<th>Auditory</th>
<th>Gustatory</th>
<th>Haptic</th>
<th>Olfactory</th>
<th>Visual</th>
<th>Concreteness</th>
<th>Imageability</th>
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</table>

Microsoft Excel Worksheet
Computing with Affective Lexicons

Using the lexicons to detect affect
Lexicons for detecting document affect: Simplest unsupervised method

- **Sentiment:**
  - Sum the weights of each positive word in the document
  - Sum the weights of each negative word in the document
  - Choose whichever value (positive or negative) has higher sum

- **Emotion:**
  - Do the same for each emotion lexicon