Applied Natural Language Processing

Info 256

Lecture 4: Dictionaries (Jan 31, 2019)

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Dictionaries

- Lists of words that evoke some category (optionally paired with a rating on some scale)

- Used frequently in measures of sentiment, affect and tone, but really applicable to any categorical measure.

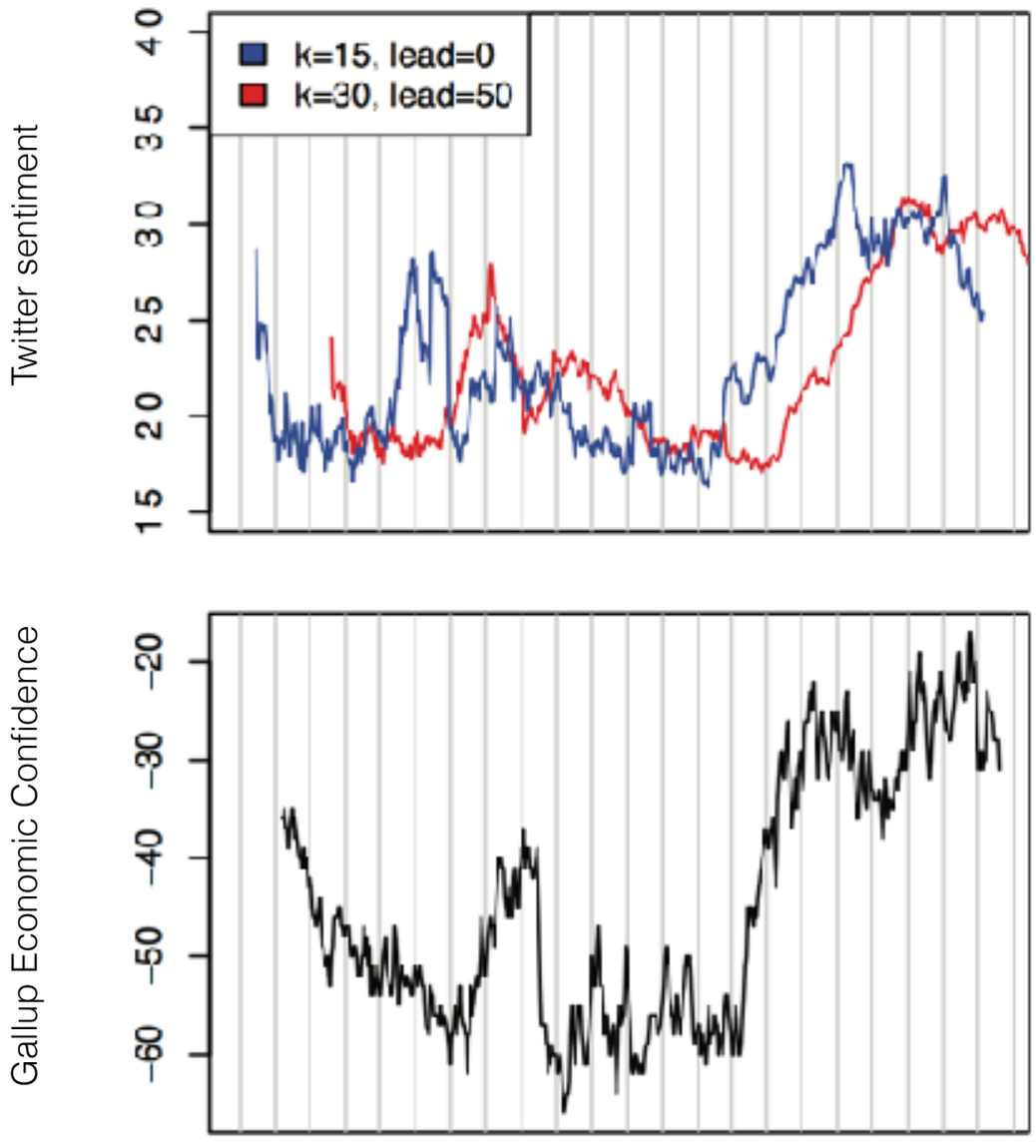
- “Easy and cheap to apply to a variety of problems” [Grimmer and Stewart 2010]

Dictionaries

Input: tweets

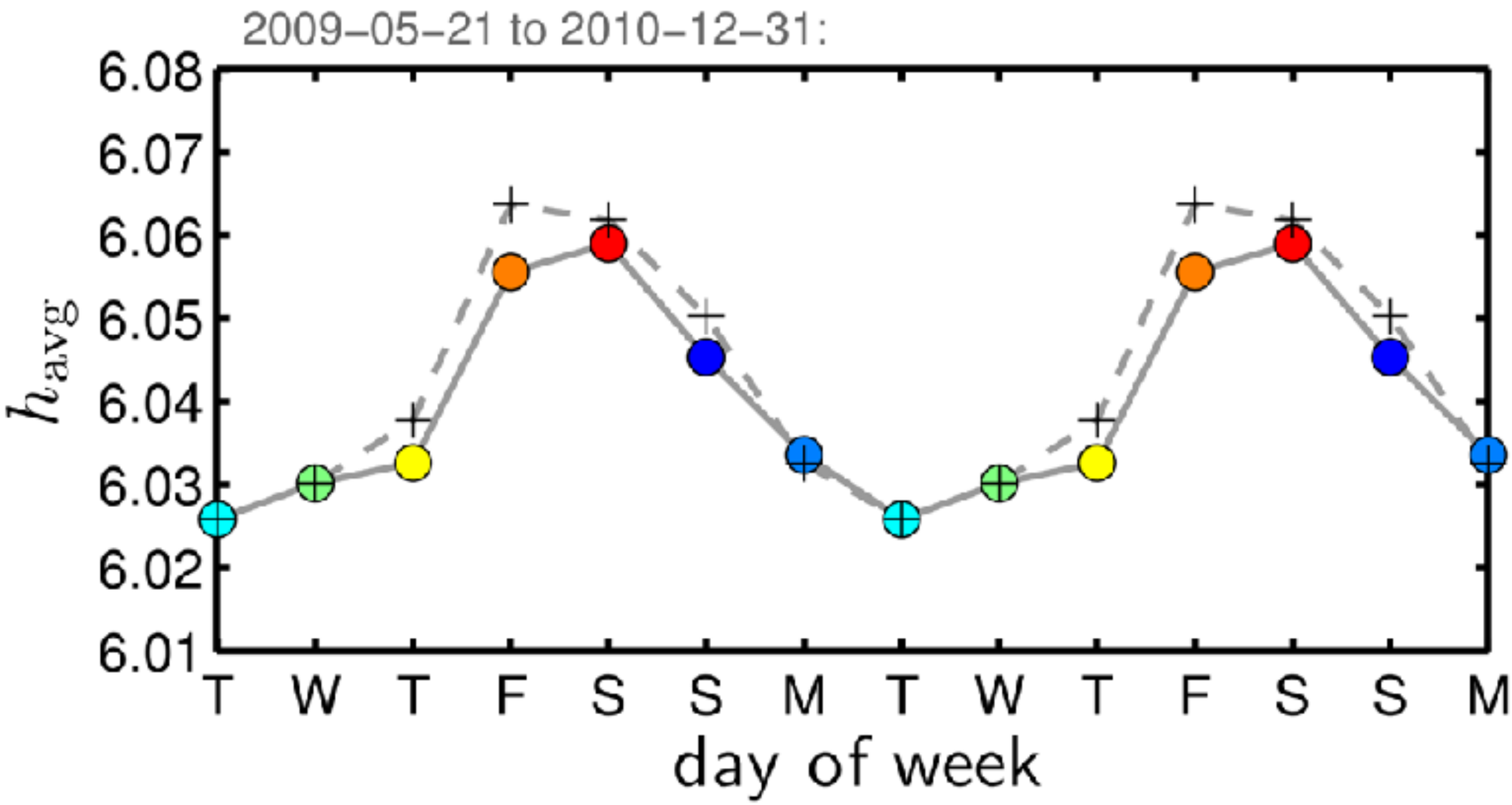
Output: Gallup economic confidence score

Dictionary = {economy, job, jobs}



O'Connor et al. (2010), "From Tweets to Polls: Linking Text Sentiment to Public Opinion Time Series" (ICWSM)

Dictionaries



Dodds et al. (2011), "Temporal patterns of happiness and information in a global social network: Hedonometrics and Twitter" (PLoS One)

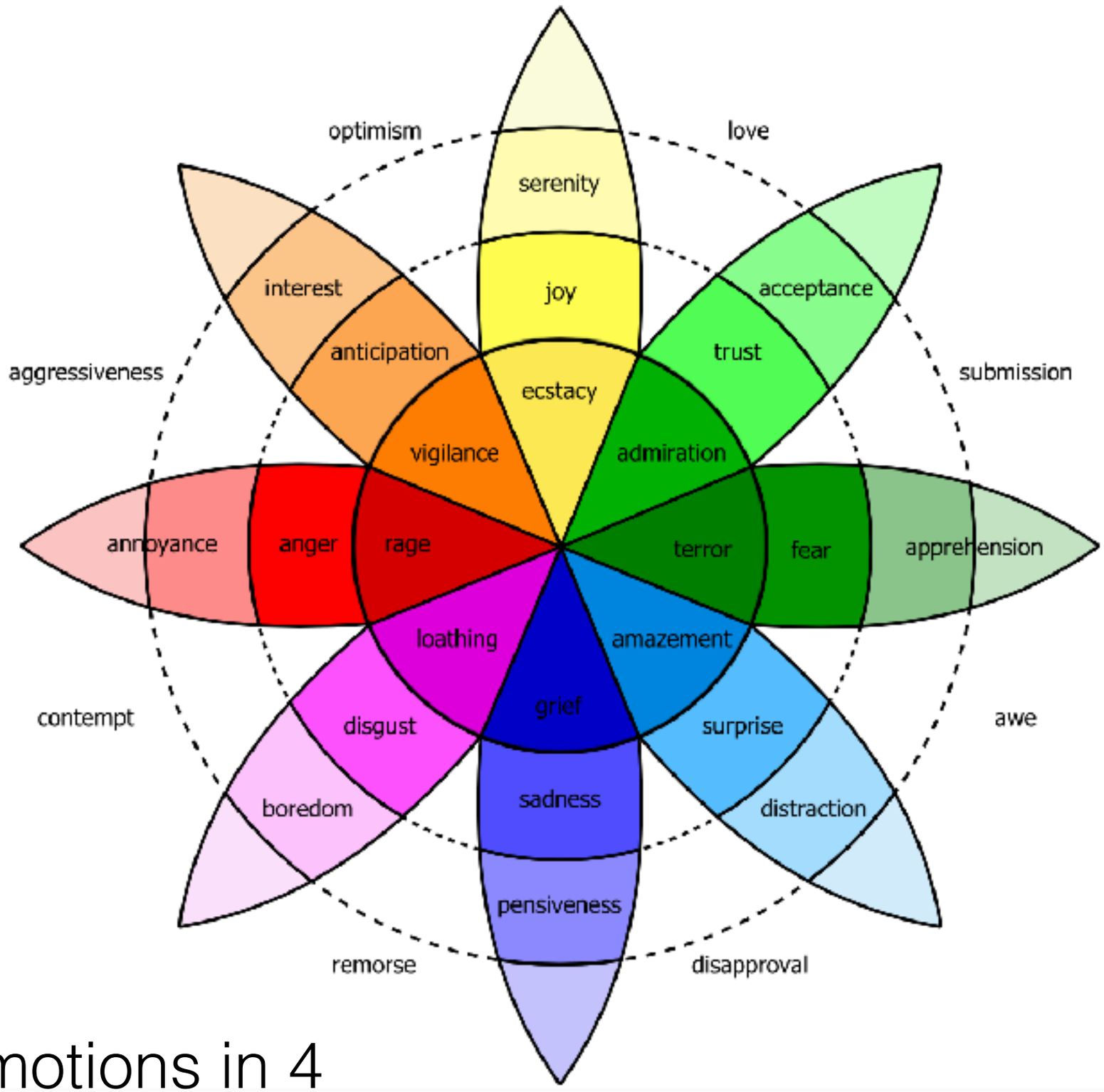
Sentiment Dictionaries

- General Inquirer (1966)
- MPQA subjectivity lexicon (Wilson et al. 2005) http://mpqa.cs.pitt.edu/lexicons/subj_lexicon/
- LIWC (Linguistic Inquiry and Word Count, Pennebaker 2015)
- AFINN (Nielsen 2011)
- NRC Word-Emotion Association Lexicon (EmoLex), Mohammad and Turney 2013

pos	neg
unlimited	lag
prudent	contortions
supurb	fright
closeness	lonely
impeccably	tenuously
fast-paced	plebeian
treat	mortification
destined	outrage
blessing	allegations
steadfastly	disoriented

State	Definitions	Terms
Emotion	Relatively brief episode of response to the evaluation of an external or internal event as being of major significance.	angry, sad, joyful, fearful, ashamed, proud, elated, desperate
Mood	Diffuse affect state, most pronounced as 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 in that situation.	distant, cold, warm, supportive, contemptuous, friendly
Attitude	Relatively enduring, affectively colored beliefs, preferences, and 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, jealous

Typology of affective states; Scherer 2000; SLP3



8 basic emotions in 4 opposing pairs

Plutchik 1980; SLP3

	anger	anticipation	disgust	fear	joy	sadness	surprise	trust	positive	negative
reward		1			1		1	1	1	
worry		1		1		1				1
tenderness					1				1	
sweetheart		1			1	1		1	1	
suddenly							1			

Mohamad and Turney 2013; SLP3

LIWC

- 73 separate lexicons designed for applications social psychology

Positive Emotion	Negative Emotion	Insight	Inhibition	Family	Negate
appreciat*	anger*	aware*	avoid*	brother*	aren't
comfort*	bore*	believe	careful*	cousin*	cannot
great	cry	decid*	hesitat*	daughter*	didn't
happy	despair*	feel	limit*	family	neither
interest	fail*	figur*	oppos*	father*	never
joy*	fear	know	prevent*	grandf*	no
perfect*	griev*	knew	reluctan*	grandm*	nobod*
please*	hate*	means	safe*	husband	none
safe*	panic*	notice*	stop	mom	nor
terrific	suffers	recogni*	stubborn*	mother	nothing
value	terrify	sense	wait	niece*	nowhere
wow*	violent*	think	wary	wife	without

Creating dictionaries

- Methods range from completely hand-crafted to fully learned.

Human labeling

- For every word in dictionary, solicit judgments from people on the dimension of interest
    - positive—negative
    - concrete—abstract
- Likert scales:
    - {not, weakly, moderately, strongly} associated (EmoLex)
    - [-9, 9] (Warriner et al. 2013)
    - [-5, 5] (AFINN)

How strongly is the word *car* associated with joy?

- not
- weakly
- moderately
- strongly

How strongly is the word *car* associated with joy?

- not
- weakly
- moderately
- strongly

→ included in lexicon

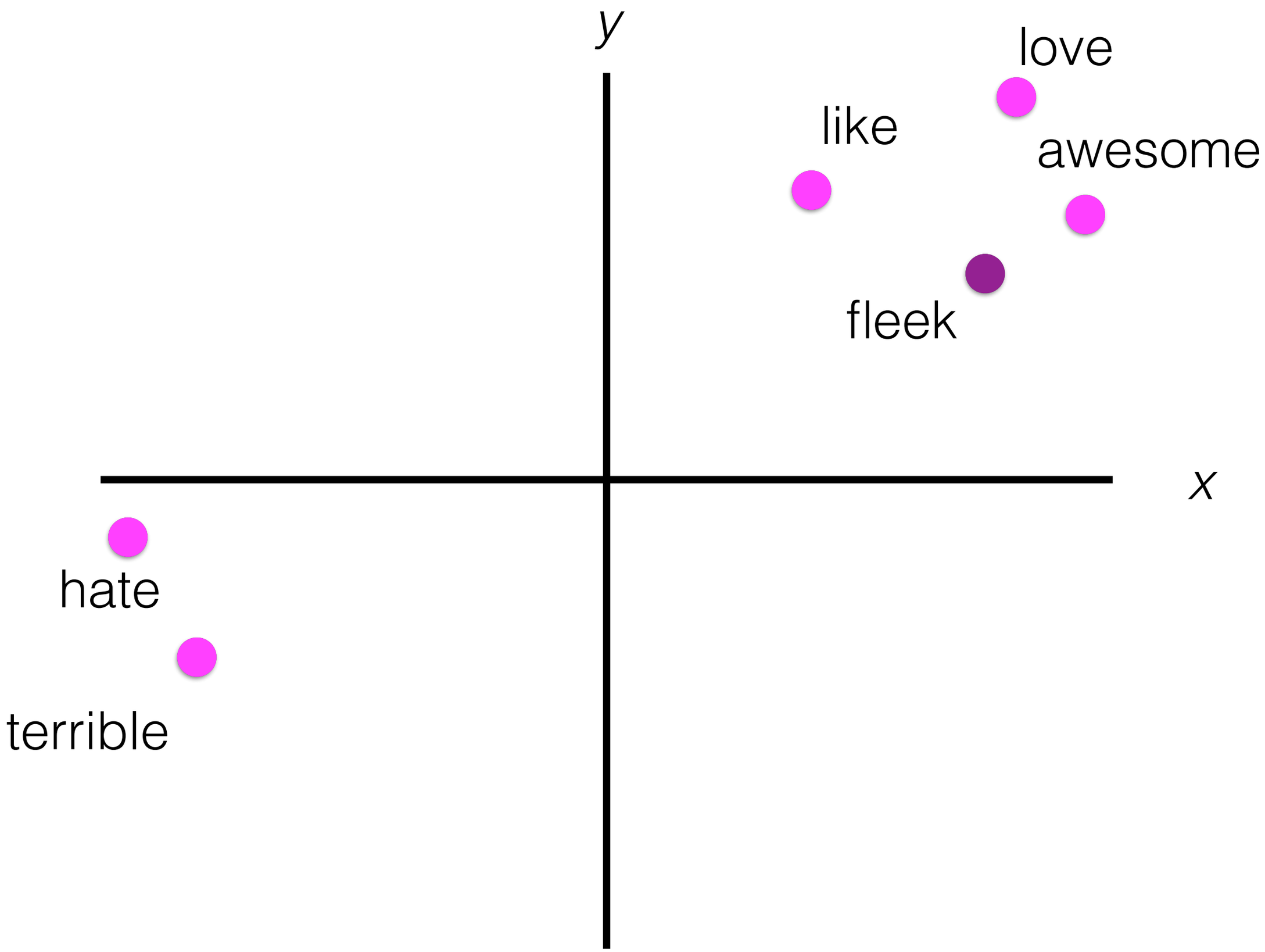
One a scale from -5 (most negative) to 5 (most positive), how would you rate the sentiment of the word *car?*

Semi-supervised

- Turney and Littman (2003), “Measuring Praise and Criticism: Inference of Semantic Orientation from Association”

- Start with a small set of seed words that define ends of a continuum:
    - positive (*good*) vs. negative (*bad*)
    - concrete (*building*) vs. abstract (*ideas*)

- Add words to lexicon that are most similar to words already in lexicon. (Presumes some representation of a word, which we’ll get to in word embeddings)


y
x
love
like
awesome
fleek
hate
terrible

Supervised

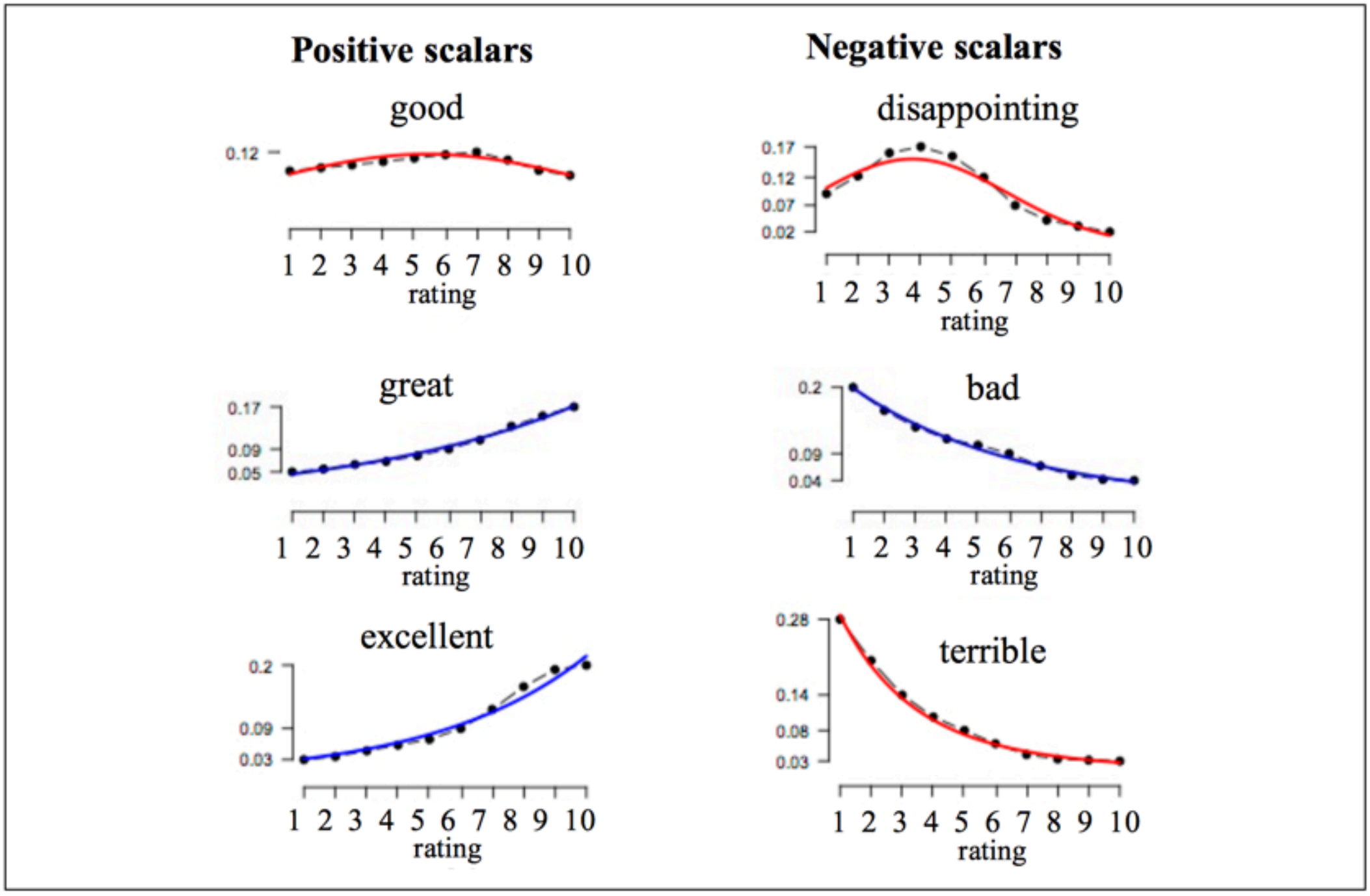
- Given training data in the form of text + label (e.g., 1-5 star rating, positive/negative, category 1 vs. category 2)

- Measure the degree to which one term is associated with a given category/rating

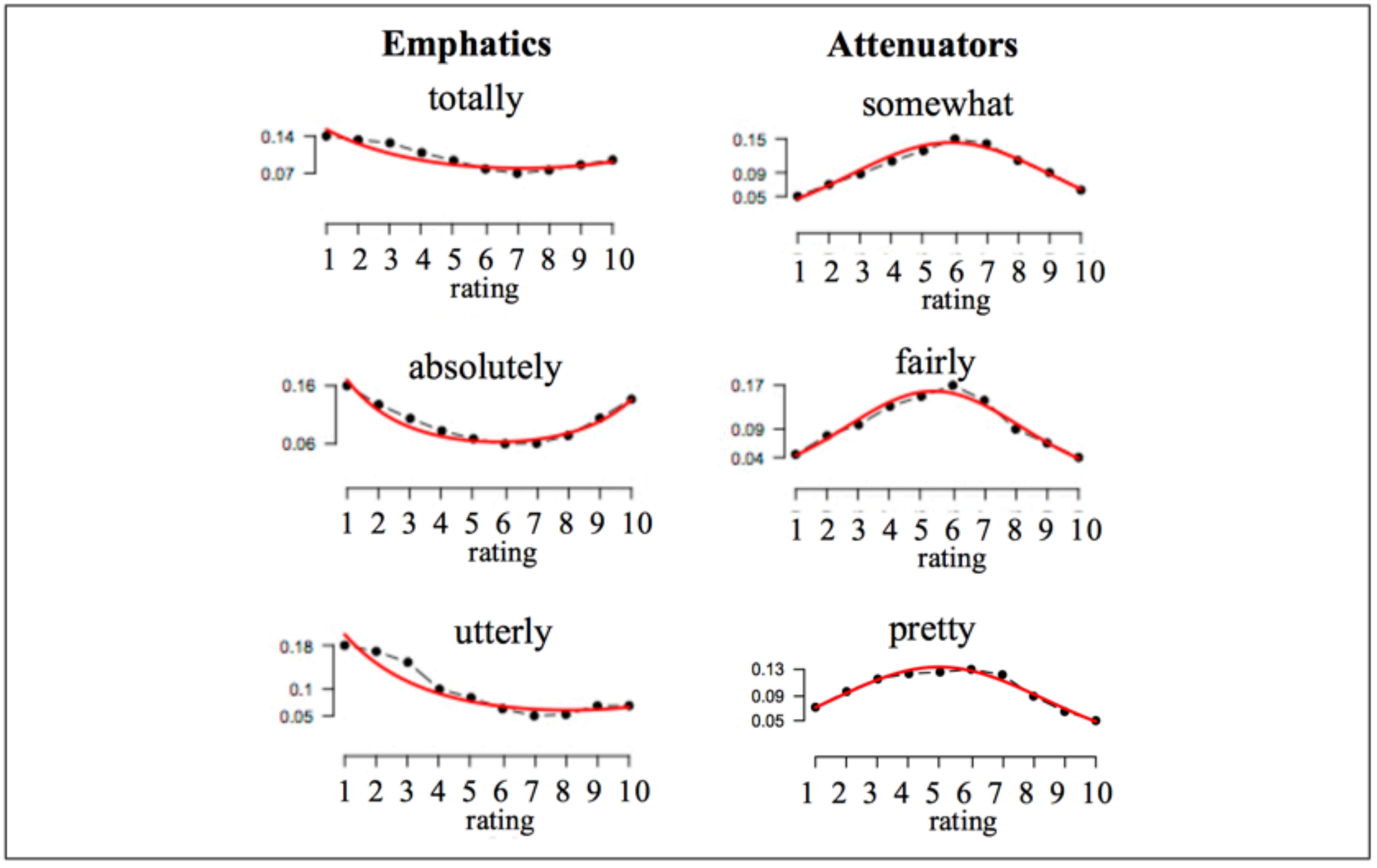
$$PottsScore(w) = \frac{P(\text{word} \mid \text{class})}{\sum_c P(\text{word} \mid \text{class})}$$

frequency of word in class

over all classes



Potts 2011; SLP3



Potts 2011; SLP3

Dictionaries for classification

$$f^+ = \sum_{w \text{ s.t. } w \in positivelexicon} \theta_w^+ count(w)$$

$$f^- = \sum_{w \text{ s.t. } w \in negativelexicon} \theta_w^- count(w)$$

$$sentiment = \begin{cases} + & \text{if } \frac{f^+}{f^-} > \lambda \\ - & \text{if } \frac{f^-}{f^+} > \lambda \\ 0 & \text{otherwise.} \end{cases}$$

Connotation Frames

- Verbs often connote information about the implicit attitudes expressed by the writers towards the subjects, and between the entities described.

Connotation Frames

[John] suffered [a heart attack] while shoveling snow.

- What's the writer's attitude toward John?
- What's the writer's attitude toward [a heart attack]?
- What's John's attitude toward [a heart attack]?

Connotation Frames

Verb	Subset of Typed Relations		Example Sentences	L/R
suffer	$\mathcal{P}(w \rightarrow \text{agent}) = +$ $\mathcal{P}(w \rightarrow \text{theme}) = -$ $\mathcal{P}(\text{agent} \rightarrow \text{theme}) = -$	$\mathcal{E}(\text{agent}) = -$ $\mathcal{V}(\text{agent}) = +$ $\mathcal{S}(\text{agent}) = -$	The story begins in Illinois in 1987, when *a 17-year-old girl* **suffered** *a botched abortion.*	R
guard	$\mathcal{P}(w \rightarrow \text{agent}) = +$ $\mathcal{P}(w \rightarrow \text{theme}) = +$ $\mathcal{P}(\text{agent} \rightarrow \text{theme}) = +$	$\mathcal{E}(\text{theme}) = +$ $\mathcal{V}(\text{theme}) = +$ $\mathcal{S}(\text{theme}) = +$	In August, *marshals* **guarded** *25 clinics* in 18 cities.	L
uphold	$\mathcal{P}(w \rightarrow \text{theme}) = +$ $\mathcal{P}(\text{agent} \rightarrow \text{theme}) = +$	$\mathcal{E}(\text{theme}) = +$ $\mathcal{V}(\text{theme}) = +$	A hearing is scheduled to make a decision on whether to **uphold** *the clinic's suspension.*	R

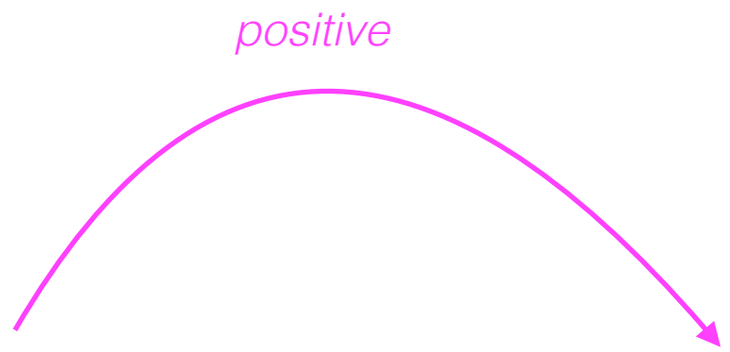
Connotation Frames

- Annotation:
  - Most frequent 1000 verbs in NYT
  - Crowdsourced, 15 labels per verb
  - “How do you think the agent feels about the event described in this sentence?”

writer→agent	writer→patient	agent→patient
save	speak	praise
rescue	praise	cheer
protect	honor	like
forgive	unite	defend
calm	celebrate	win
…		
murder	avoid	hate
disappoint	regret	attack
plague	contract	regret
abuse	suffer	fear
harm	commit	accuse

most positive

most negative



[_____] praised [_____] in a speech today, …

(one of the important uses of syntax in week 12)

Caveats

- Type vs. token distinction
- Dictionaries make decisions about the membership of a word type, not token. They don't consider the context of a word's use.
- Be careful when using dictionaries developed for one domain and applied to another; the sentiment and valence of many words can flip between domains ("tax", "cost", "crude" usually negative but positive in earnings reports) [Loughran and McDonald 2011; Grimmer and Stewart 2013]

Activity

- Work with partner; discuss the intent of their dictionary — what is it trying to capture?
- Swap dictionaries and run it on:
    - trump_tweets
    - aoc_tweets
- Identify examples (individual tweets) where the dictionary succeeds and fails.

256 project proposal

- Final project involving 1 to 3 students involving natural language processing -- involving natural language processing in support of an empirical research question.

- Proposal (2 pages):
    - outline the work you're going to undertake
    - motivate its rationale as an interesting question worth asking
    - assess its potential to contribute new knowledge by situating it within related literature in the scientific community. (cite 5 relevant sources)
    - who is the team and what are each of your responsibilities (everyone gets the same grade)

- Feel free to come by my office hours and discuss your ideas!