Modelling Valence and Arousal in Facebook Posts

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Motivation

Data Sources

Product reviews
Opinions towards products, restaurants, events, etc.
Long, more structured

Affective states
Feelings towards self or others.
Short, less structured

Models of product sentiment and emotion should be different

Motivation

Models of emotion

Discrete Emotions

Most popular in NLP are Ekman's six emotions: anger, disgust, fear, joy sadness, surprise

Matsumoto & Ekman - Japanese and Caucasian Facial Expressions of Emotion

Some emotions driven by similar words (*hell*, *bad* → sadness, fear, anger)

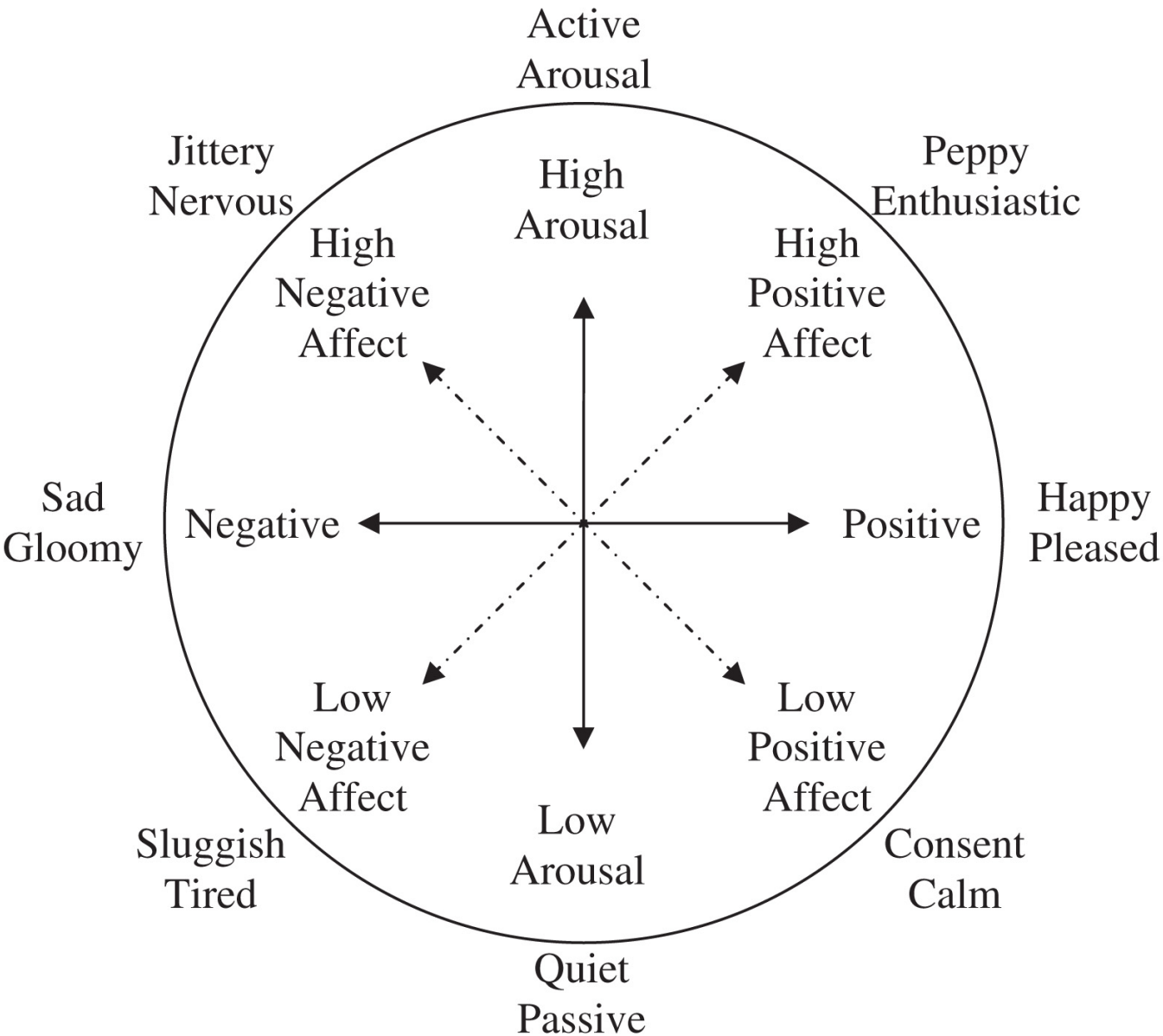
Dimensional Models

Each affective state is a combination of real-valued components

Most popular is the circumplex model (*Russel 1980, Posner 2005)*)

Two independent neurophysiological systems: valence (or sentiment) and arousal

Emotion Circumplex



Source: Jonker & Van der Merwe - Emotion episodes of Afrikaans-speaking employees in the workplace

Applications

Goal: Automated large-scale psychological studies

- measuring time-of-day and day-of-week mood swings
  - and what causes them
- mental illness detection
  - bipolar, schizophrenic breaks ...
- analysing movies and books
  - and how they vary in emotion content
- correlating with external effects
  - e.g. weather, sports game outcomes, ...

Measuring Valence and Arousal

- **Valence (or sentiment or polarity)**
  - 1 (very negative) – 5 (neutral/objective) – 9 (very positive)
- **Arousal (or intensity)**
  - 1 (neutral/objective post) – 9 (very high intensity)

Examples

Message	**V**	**A**
Is the one whoz GOing to Light Up your Day!!!!!!!!!!!!	7	8
Blessed with a baby boy today ...	7.5	2
the boring life is back :(...	3	2.5
IS SUPER STRESSED AND ITS JUST THE SECOND MONTH OF SCHOOL ..D:	2.5	7

*Example of posts annotated with average valence (**V**) and arousal (**A**) ratings.*

Data Source

3120 Facebook posts

Stratified by:

- Age (13-35)
- Gender (M/F)

Each message from a distinct user

All messages from the same time interval

Annotation

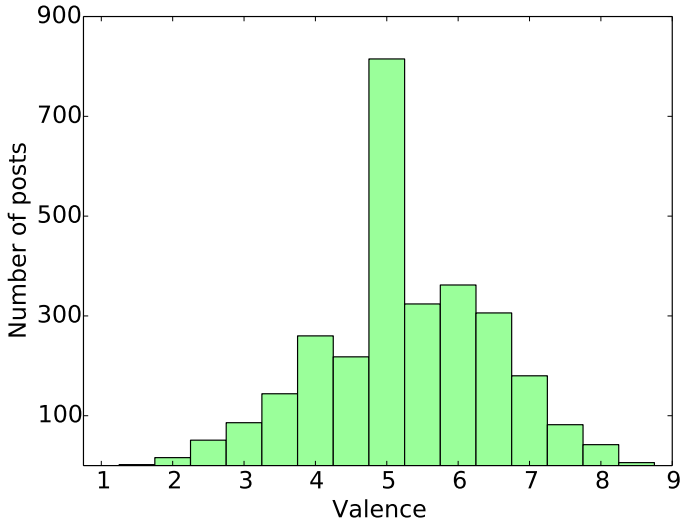
Two annotators:

- psychology students
- received training in annotating these traits, including anchoring
- no distractions that may affect they mood (music, etc.)

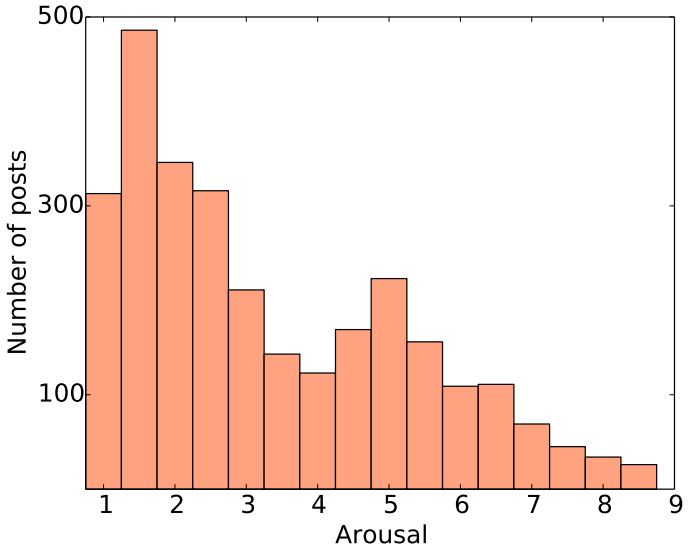
Messages are un-ratable if they are not in English or contain no cues

- 235 messages (~7.5%)
- Cohens Kappa $\kappa = .93$

Annotation Results



Valence



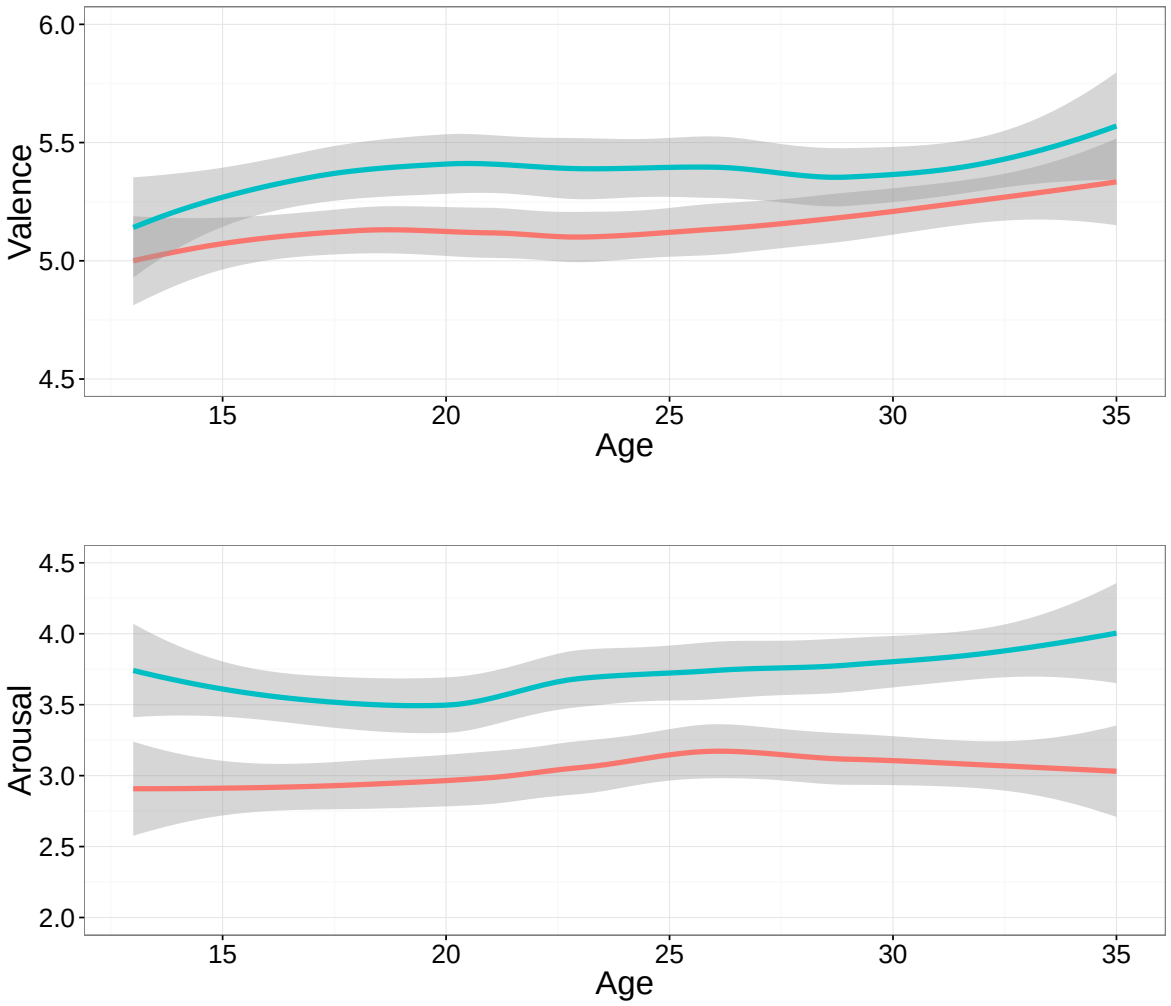
Arousal

Histograms of average rating scores.

Valence–Arousal $\rightarrow r = 0.222$

Valence–Arousal $\rightarrow r = 0.085$ (ignoring neutral posts)

Gender and Age Differences



Variation in valence and arousal with age in our data set using a LOESS fit. Data is split by gender: **Male** and **Female**.

Predicting Valence & Arousal

Train a classifier for predicting valence and arousal separately

Features: Bag-of-words (only unigrams)

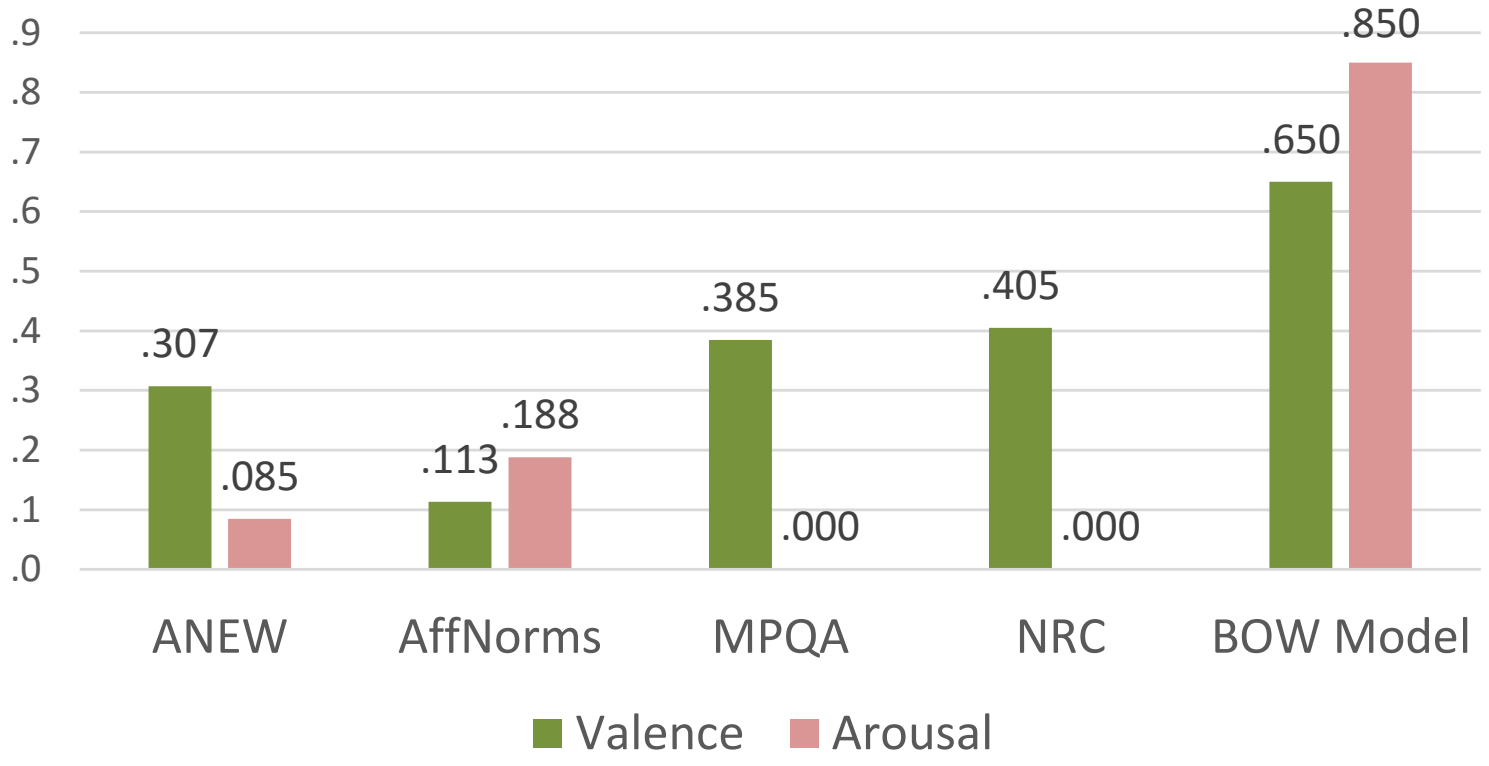
Model: Linear regression with elastic net regularization

Test: 10 fold cross-validation

Baseline Models

1. ANEW
   - valence and arousal ratings for ~1400 words *(Bradley and Lang, 1999)*
2. AffNorms
   - valence and arousal ratings for ~14000 words *(Warriner et al., 2013)*
3. MPQA
   - 7629 words rated for positive or negative sentiment *(Wilson et al. 2005)*
4. NRC
   - Hashtag Sentiment Lexicon adapted to Social Media *(Mohammad et al., 2013)*

Results



Message rating prediction accuracy (in Pearson *r*).

Results on 10 fold cross-validation.

Quantitative Analysis – Valence

+ Valence	*r*	**– Valence**	*r*
!	.251	hate	-.163
:)	.237	:(	-.159
birthday	.212	?	-.117
happy	.197	sick	-.112
thank	.196	why	-.102
great	.195	:'(	-.094
love	.195	not	-.093
thanks	.179	bored	-.092
wishes	.170	stupid	-.089
wonderful	.159	...	-.087

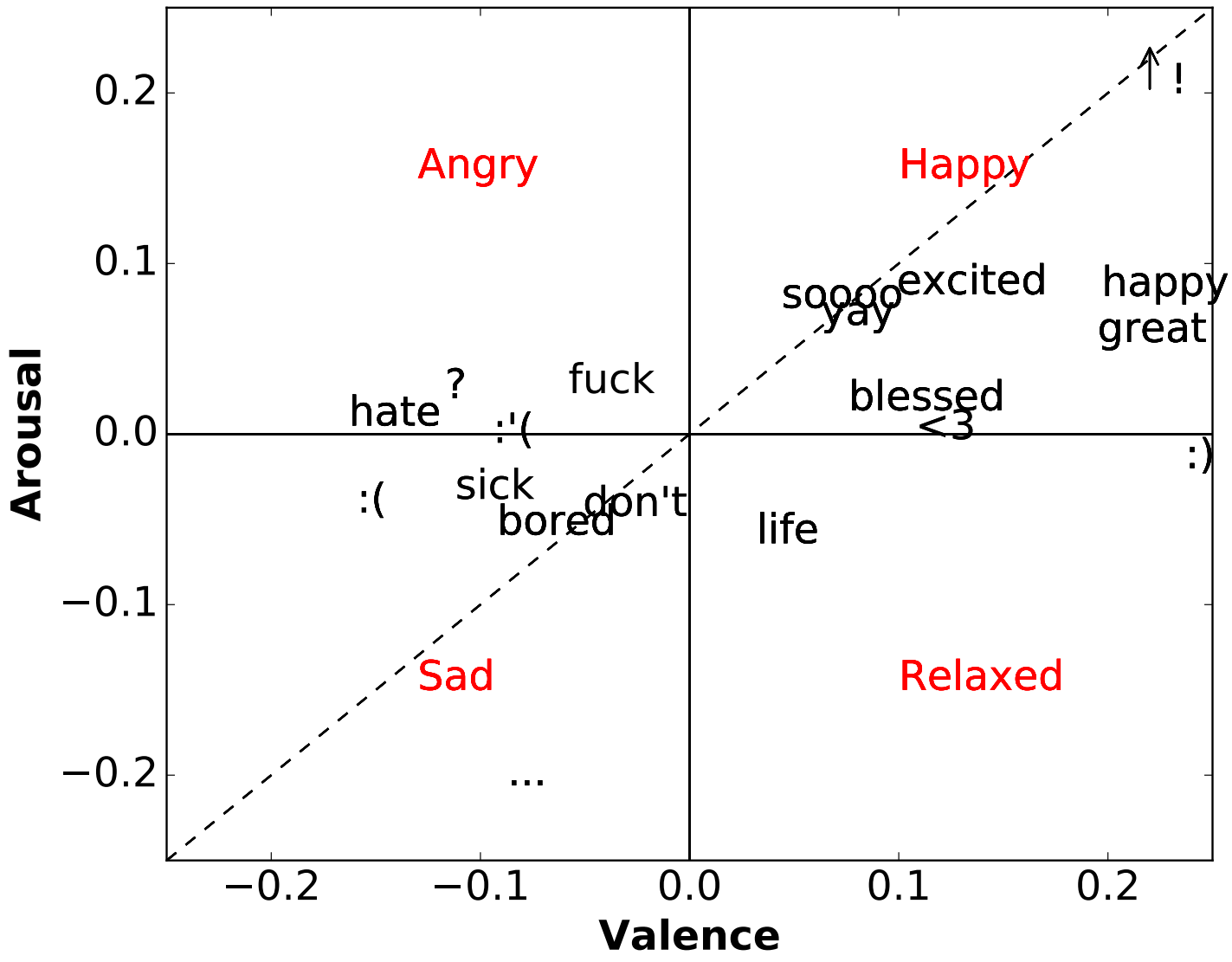
Words most positively and negatively correlated with valence

Quantitative Analysis – Arousal

+ Arousal	r	– Arousal	r
!	.773	...	-.206
birthday	.097	.	-.164
happy	.081	status	-.064
its	.079	life	-.064
wishes	.076	people	-.060
soooo	.074	bored	-.059
thanks	.073	:/	-.056
christmas	.071	of	-.056
sunday	.069	deal	-.056
yay	.064	every	-.054

Words most positively and negatively correlated with arousal

Quantitative Analysis - Circumplex



Take Aways

Reviews ≠ Personal Feelings

Valence/Arousal ≠ Discrete Emotions

Annotated Facebook data set and bag-of-words model available

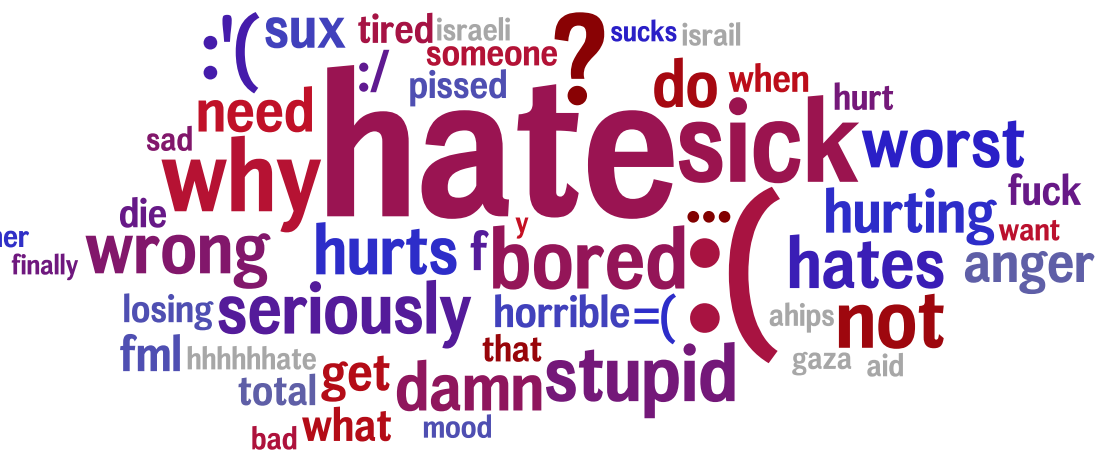
`http://wwbp.org/publications.html`

`http://lexhub.org/`

Thank you!

Questions?

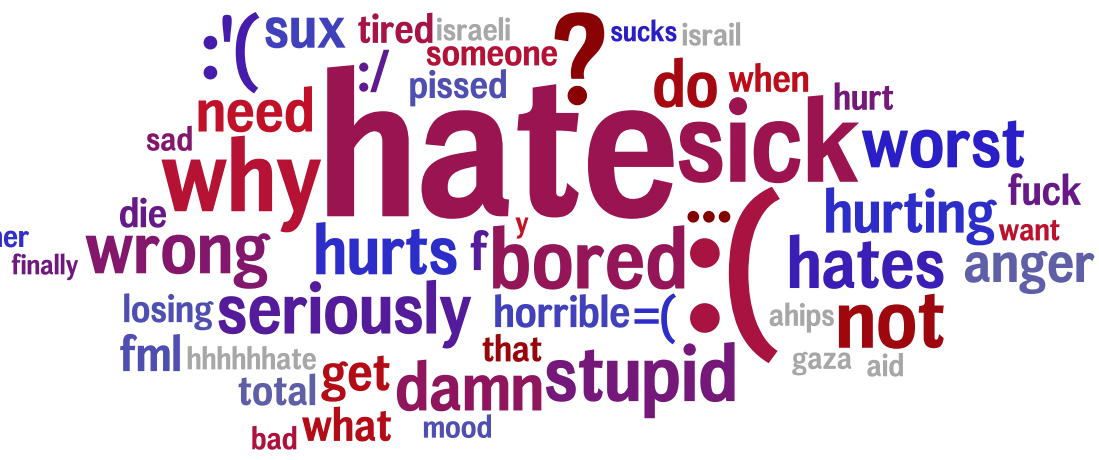
+ Valence



– Valence

Quantitative Analysis – Valence

+ Valence



– Valence

Quantitative Analysis – Arousal

+ Arousal

– Arousal

Agreement

Dimension	**R1** $\mu \pm \sigma$	**R2** $\mu \pm \sigma$	**IA Corr.**
Valence	5.274 ± 1.04	5.250 ± 1.49	.768
Arousal	3.363 ± 1.96	3.342 ± 2.18	.827

Individual rater mean and standard deviation and inter-annotator correlation (IA Corr)