The Role of Personality, Age and Gender in Tweeting about Mental Illnesses

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Problem

- Mental illnesses are massively underdiagnosed
- Goal is unobtrusive measurement via Social Media
- Focus on depression and PTSD

This presentation:

- Study the predictive power of multiple features
- Study the insights provided by each feature

Data

- based on Twitter self-reports

  ‘I have been diagnosed with depression’

  483 users with depression

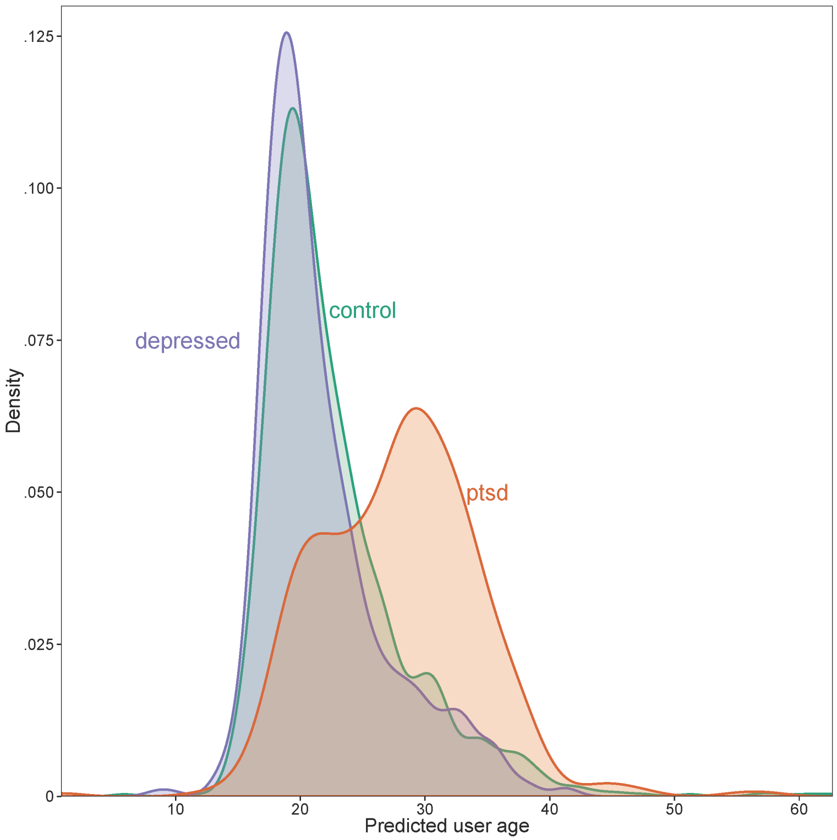
  370 users with PTSD

  1104 control users
- each user has avg. 3400 messages

(Coppersmith et. al, CLPsych 2014)

Age, Gender

- automatically inferred from Twitter posts
  (Sap et. al, EMNLP 2014)
- age predictive language use plays a massive role in separating PTSD users
- gender differences are smaller but still significant



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Age, Gender

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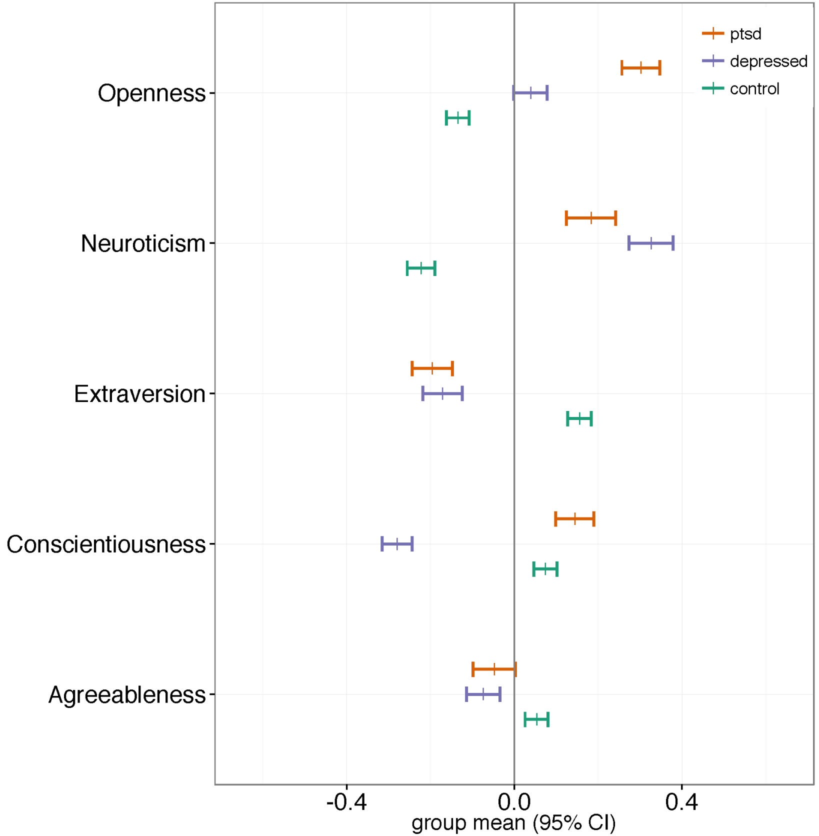
Personality

- automatically inferred from Twitter posts
  (Park et. al 2014)
- Big Five model of personality
- showing group means of each trait



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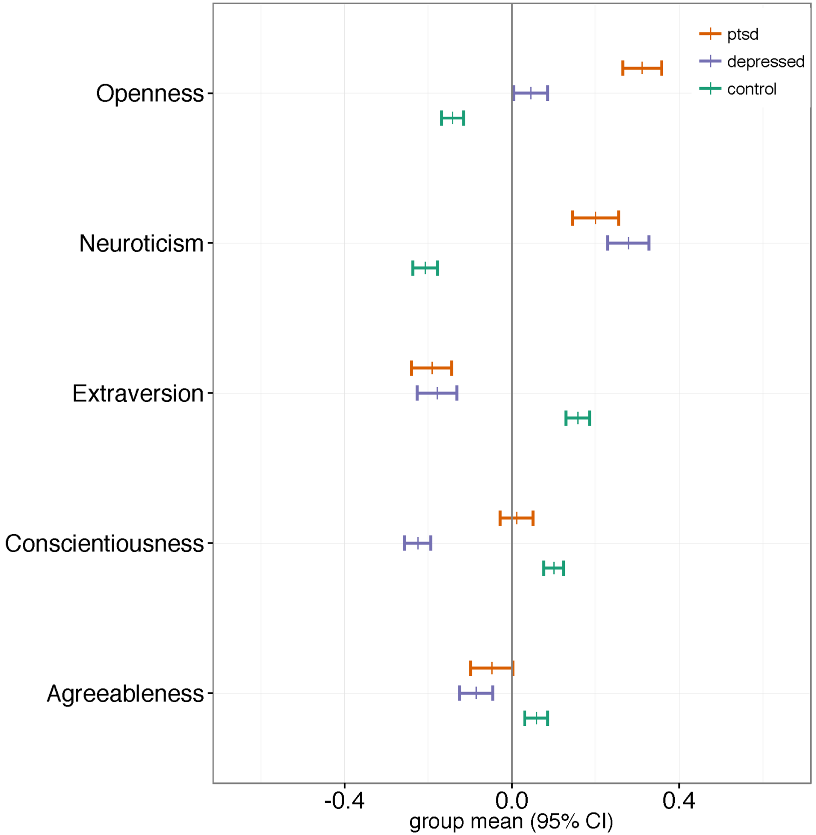
Personality

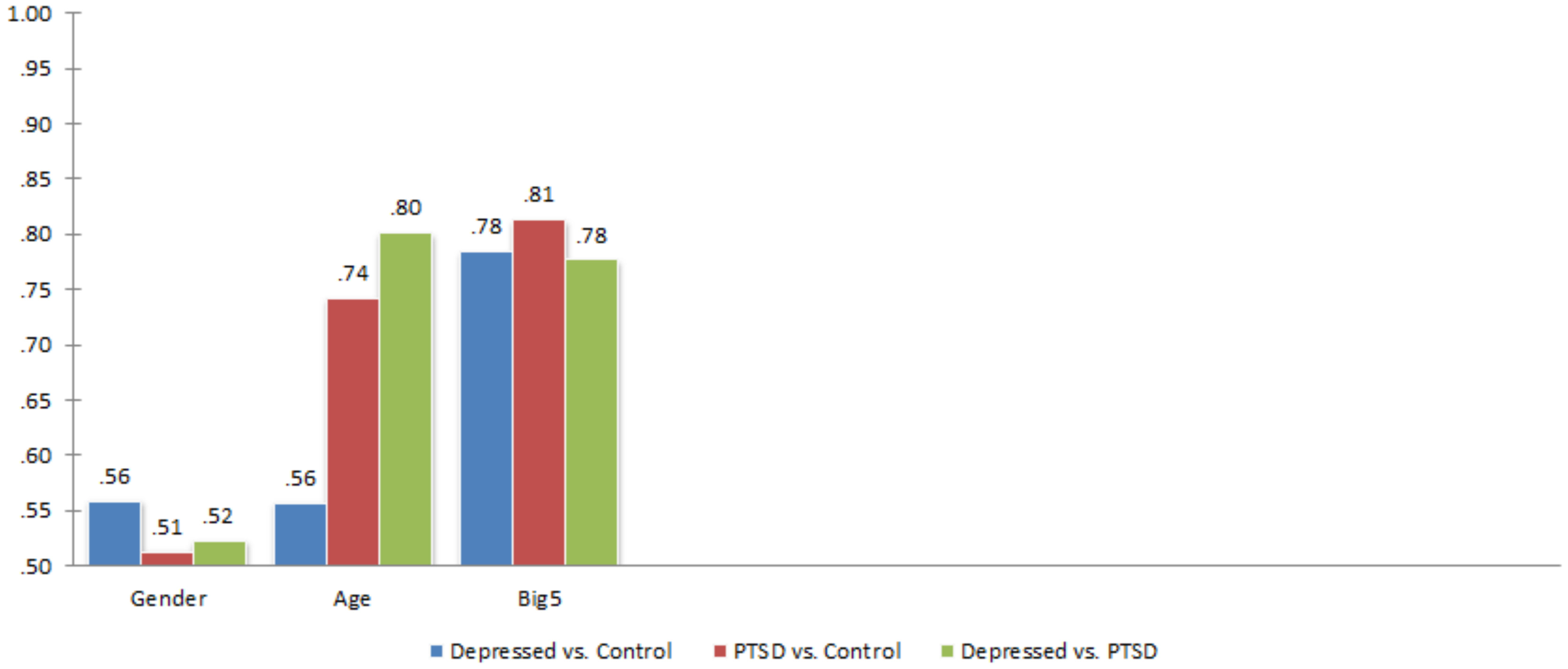
- controlling for age/gender
- mentally ill users:

1. high on neuroticism
2. more introverted
3. less agreeable

- age removes some conscientiousness and neuroticism differences



Personality



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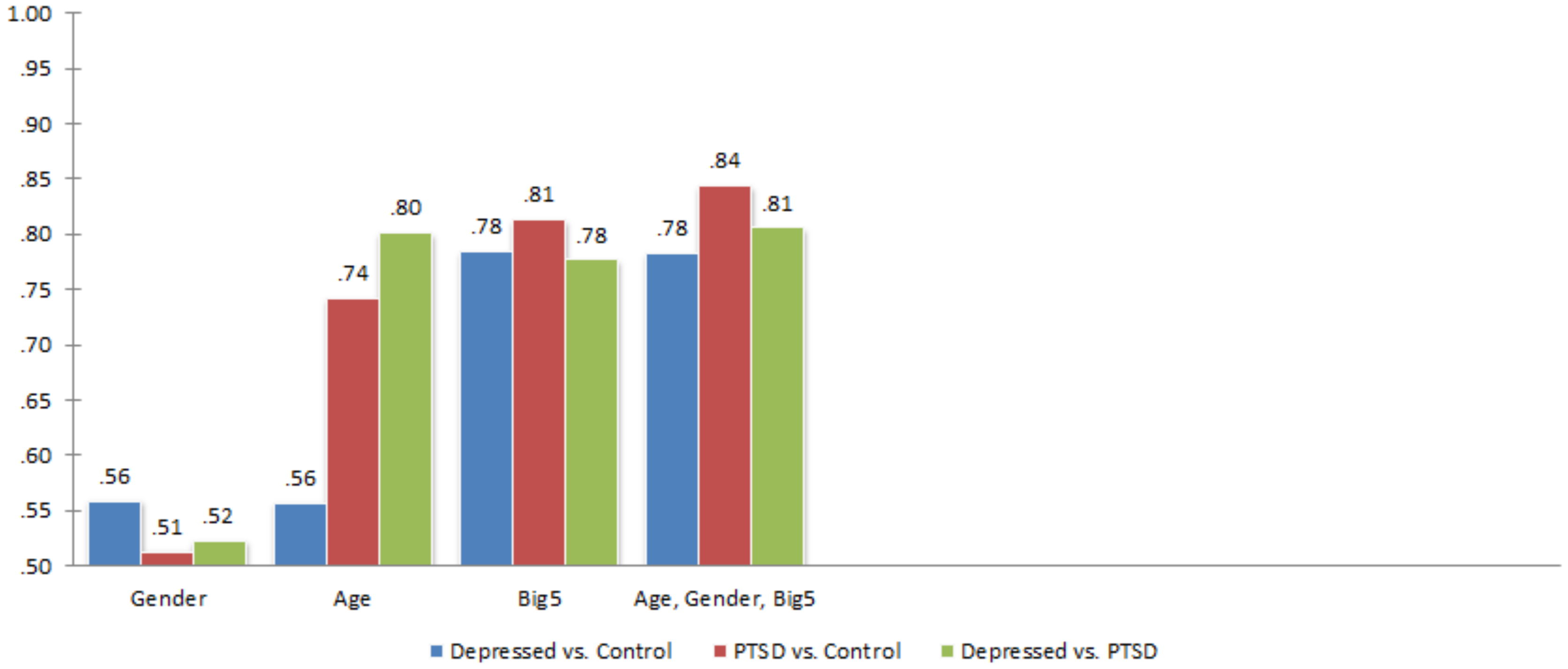
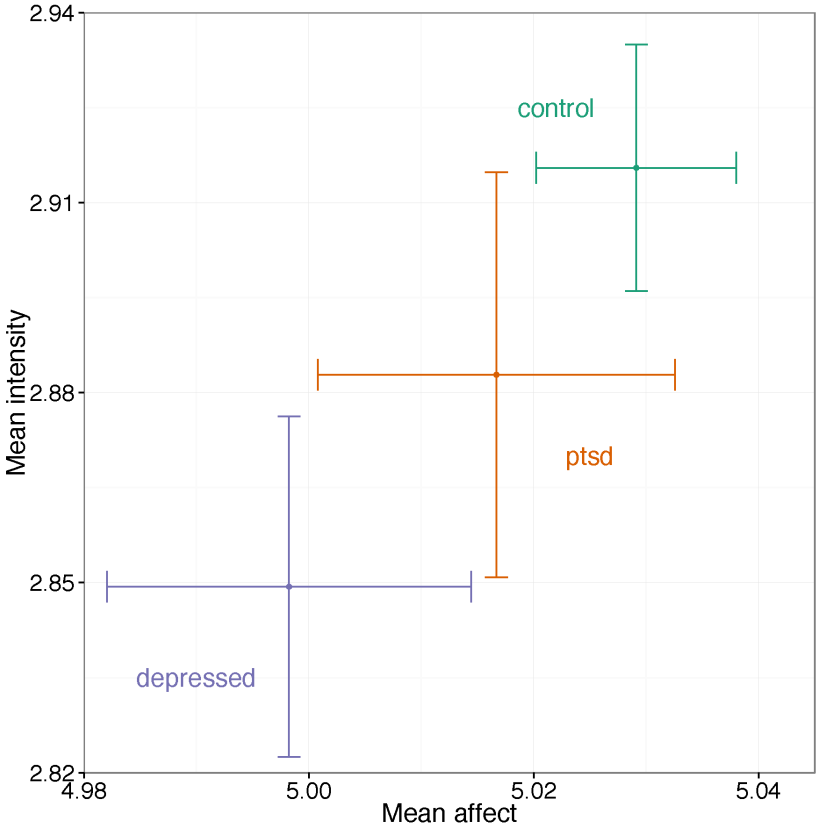
Age, Gender, Personality



Affect and Intensity

- Model trained on 3000 annotated FB posts and applied to all user posts
- circumplex model similar to valence & arousal (ANEW)
- mentally ill users are less aroused and less positive



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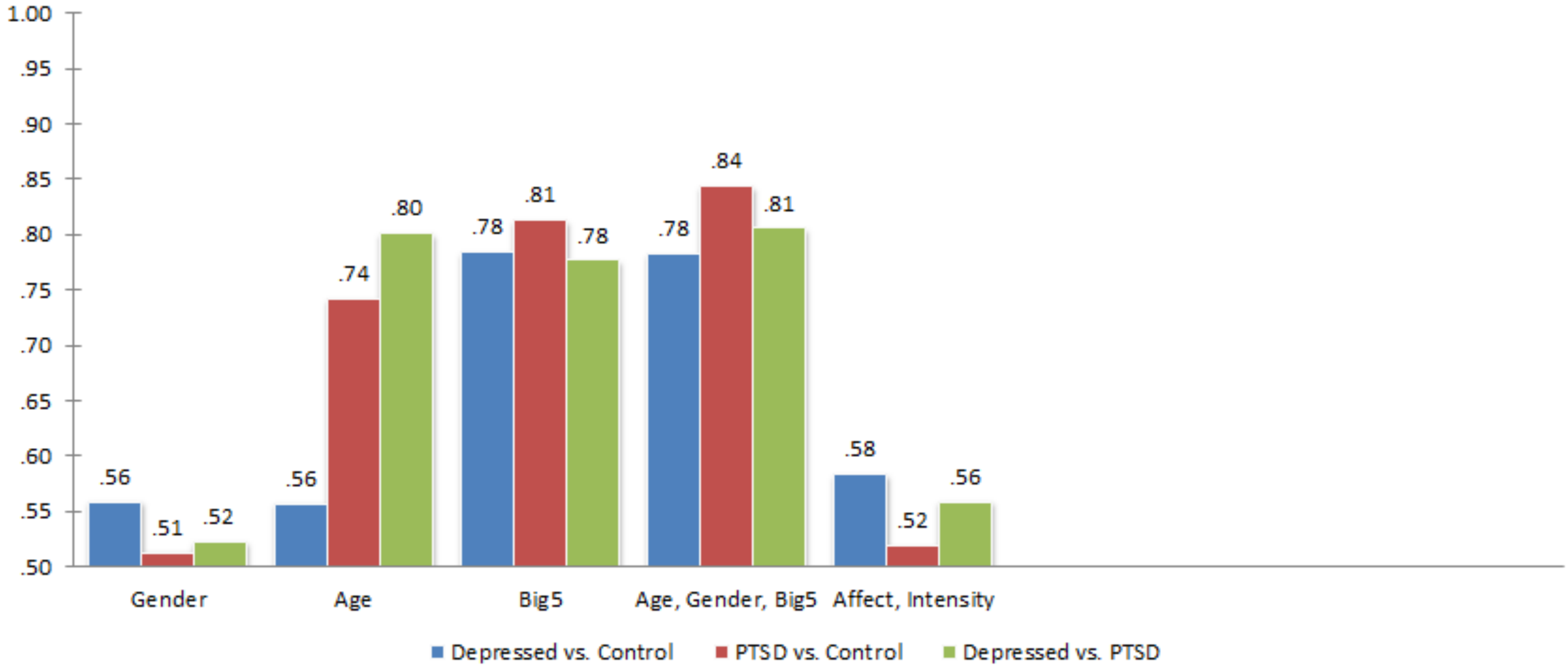
Affect and Intensity



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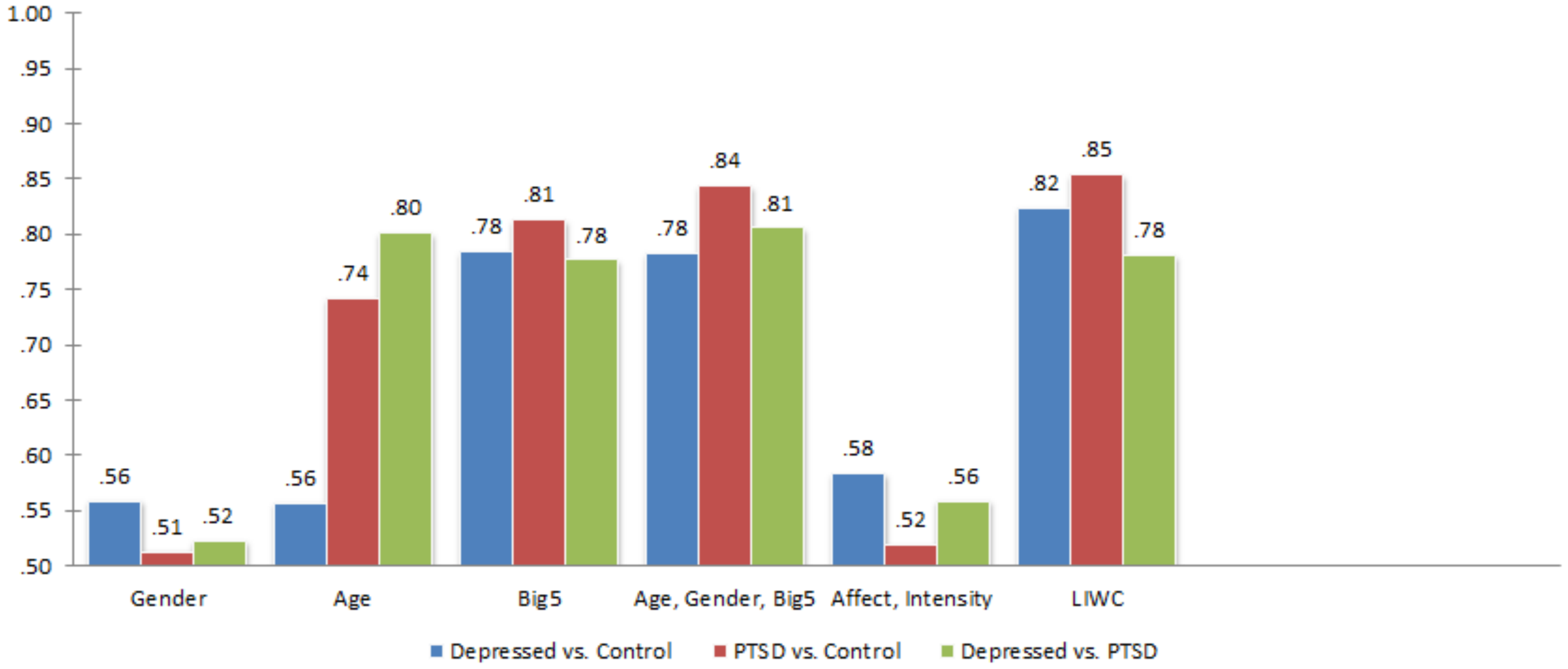
LIWC

- standard psychologically inspired dictionaries
- 64 categories such as:
    - parts-of-speech
    - topical categories
    - emotions
- standard baseline for open vocabulary approaches

LIWC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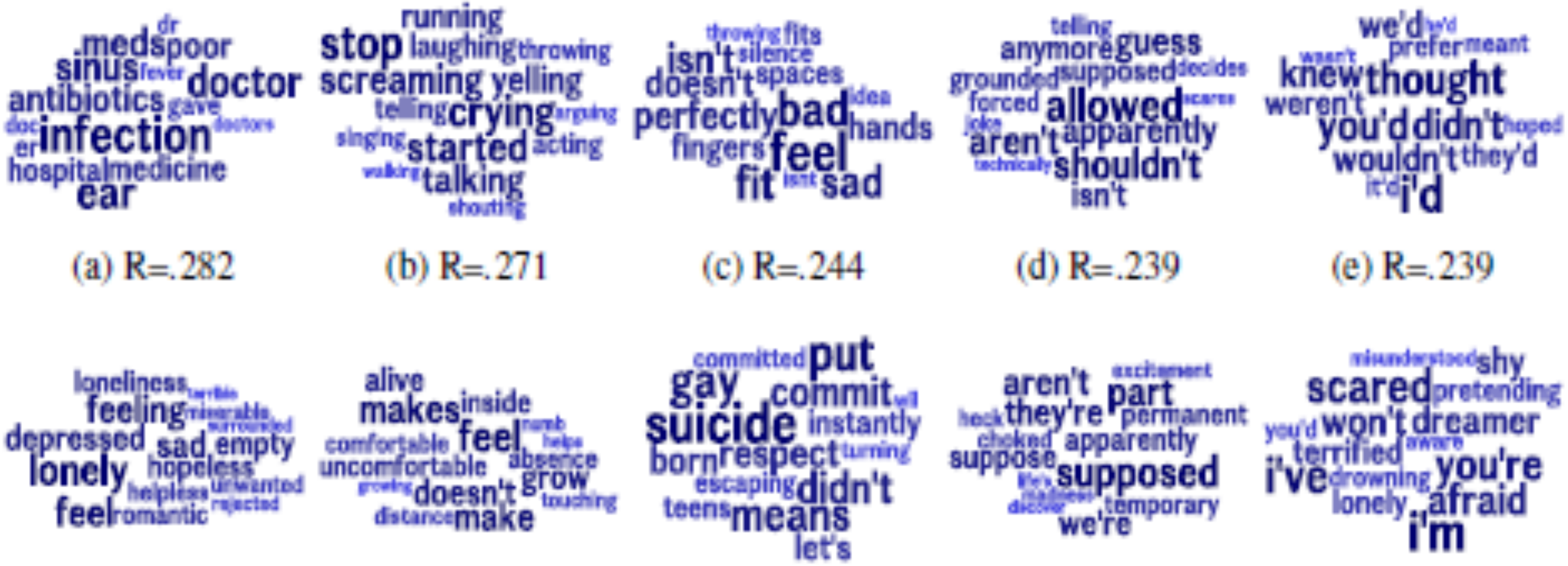
Gender
Age
Big5
Age, Gender, Big5
Affect, Intensity
LIWC
Depressed vs. Control
PTSD vs. Control
Depressed vs. PTSD

Topics

- computed using Latent Dirichlet Allocation (LDA)
- underlying set of Facebook statues
- 2000 topics in total
- soft clusters: a word can belong to multiple topics with a probability

Topics: Depression



(a) R=.282 (b) R=.271 (c) R=.244 (d) R=.239 (e) R=.239

(f) R=.238 (g) R=.237 (h) R=.235 (i) R=.230 (j) R=.229

Topics controlled for age and gender

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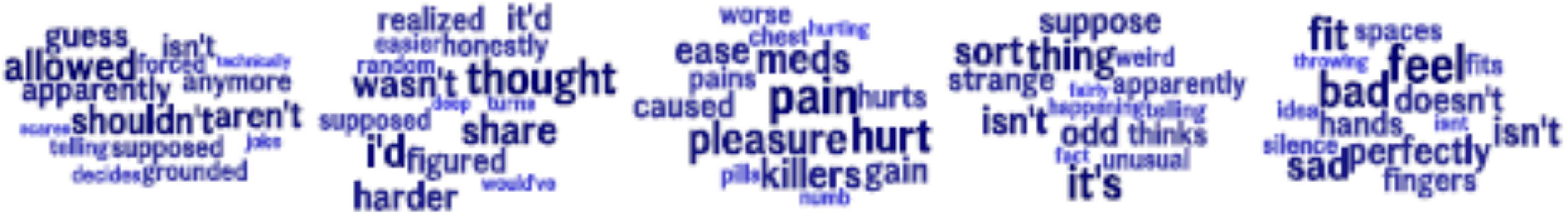
Topics: PTSD



(a) R=.280 (b) R=.280 (c) R=.277 (d) R=.266 (e) R=.255

(f) R=.254 (g) R=.254 (h) R=.248 (i) R=.241 (j) R=.237

Topics controlled for age and gender

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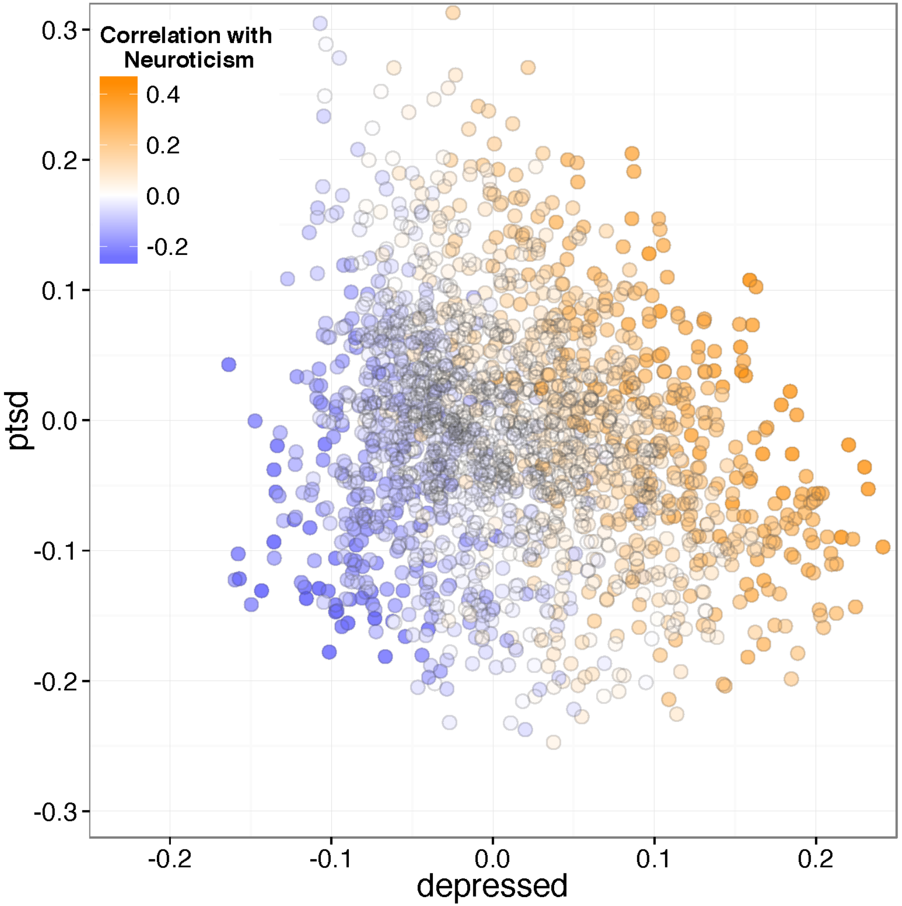
Topics: PTSD, Depression & Neuroticism

- Analysis of high neuroticism topics
- Neuroticism topics are high in both illnesses, but different ones are activated in each illness



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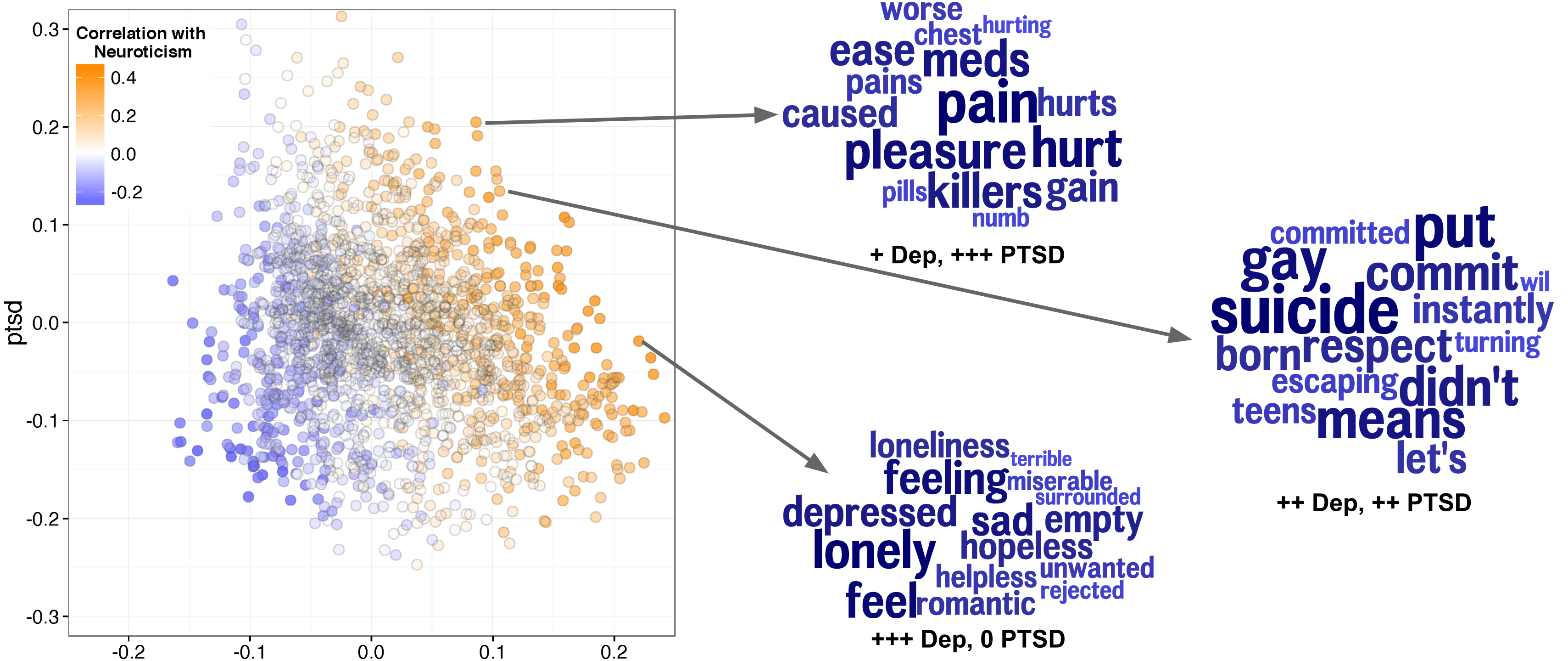
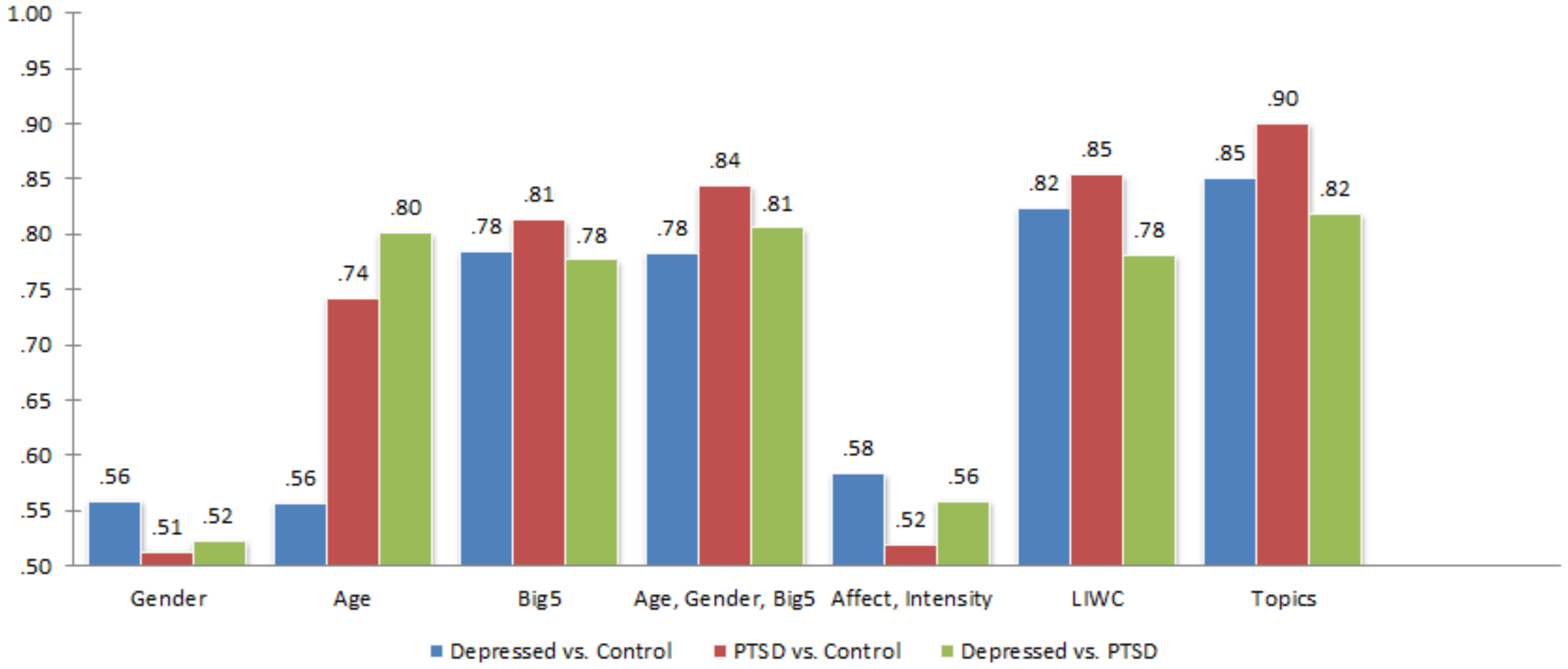
Topics: PTSD, Depression & Neuroticism



Topics



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1-3 grams: Depressed vs. Controls

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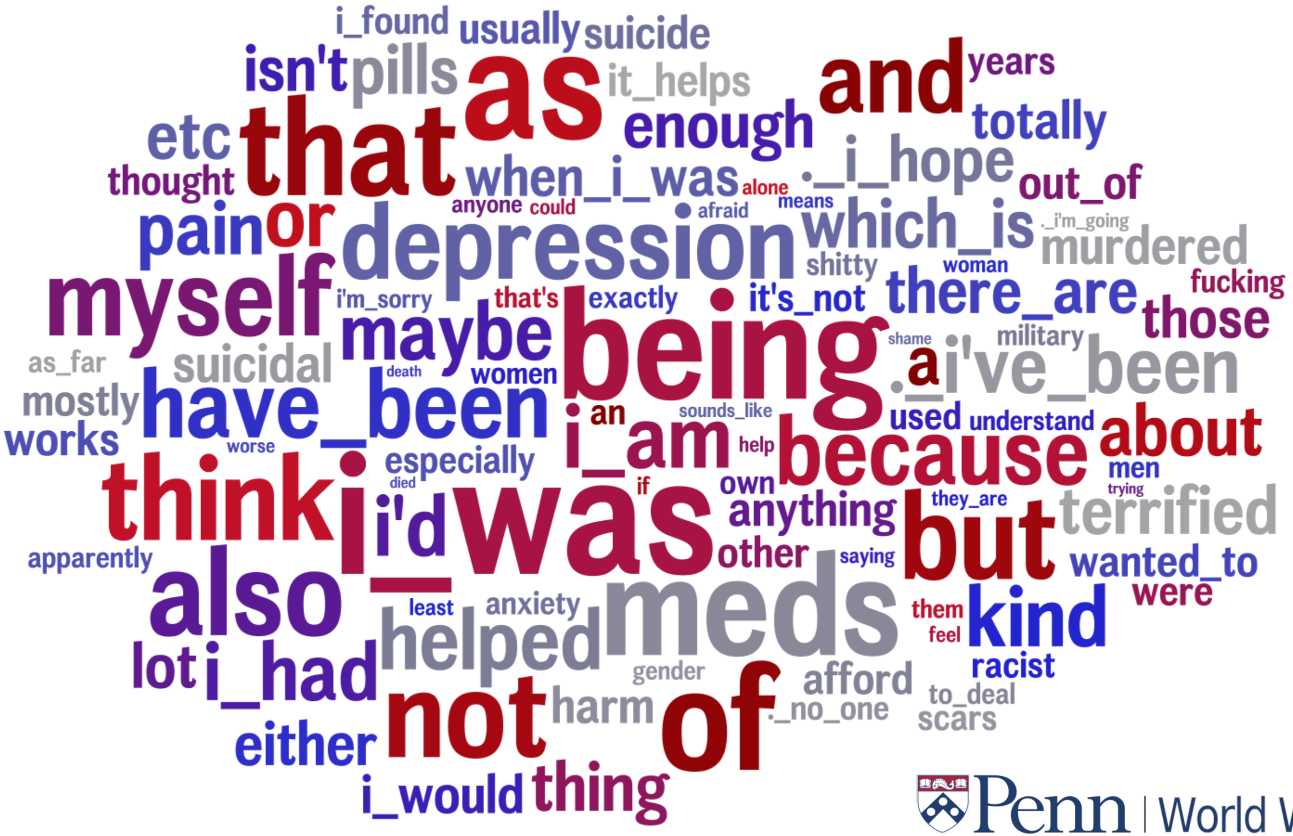
1-3 grams: PTSD vs. Controls



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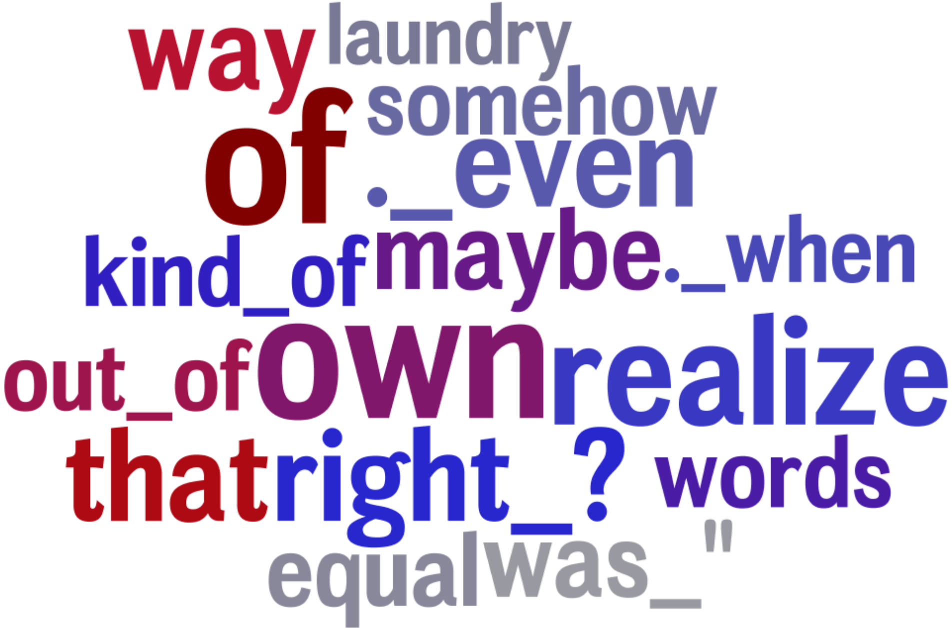
1-3 grams: Depressed vs. PTSD

depression



Almost nothing left when controlling for age and gender

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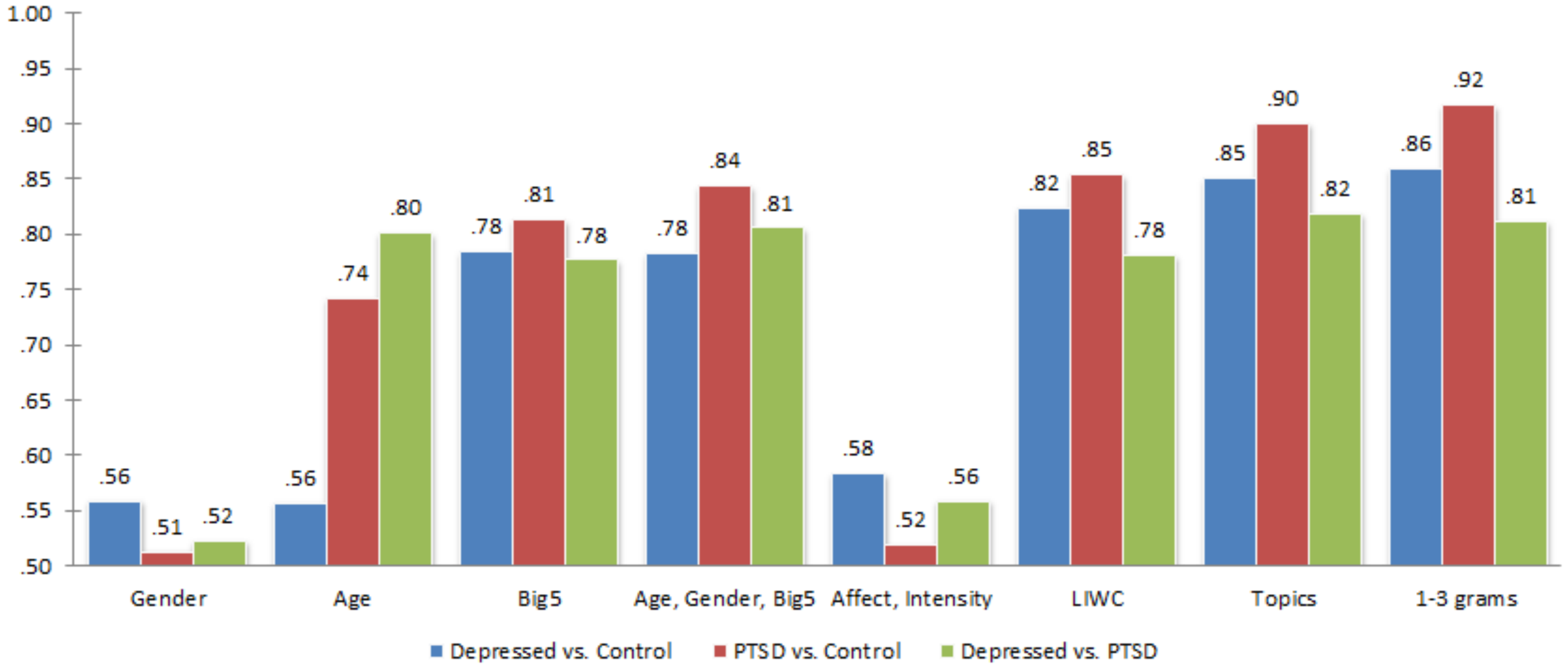
1-3 grams



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Better Predictions

- use metadata features

  # friends, #statuses

- use different word clusters

  Brown clustering, NPMI Spectral clustering, Word2Vec/GloVe embeddings

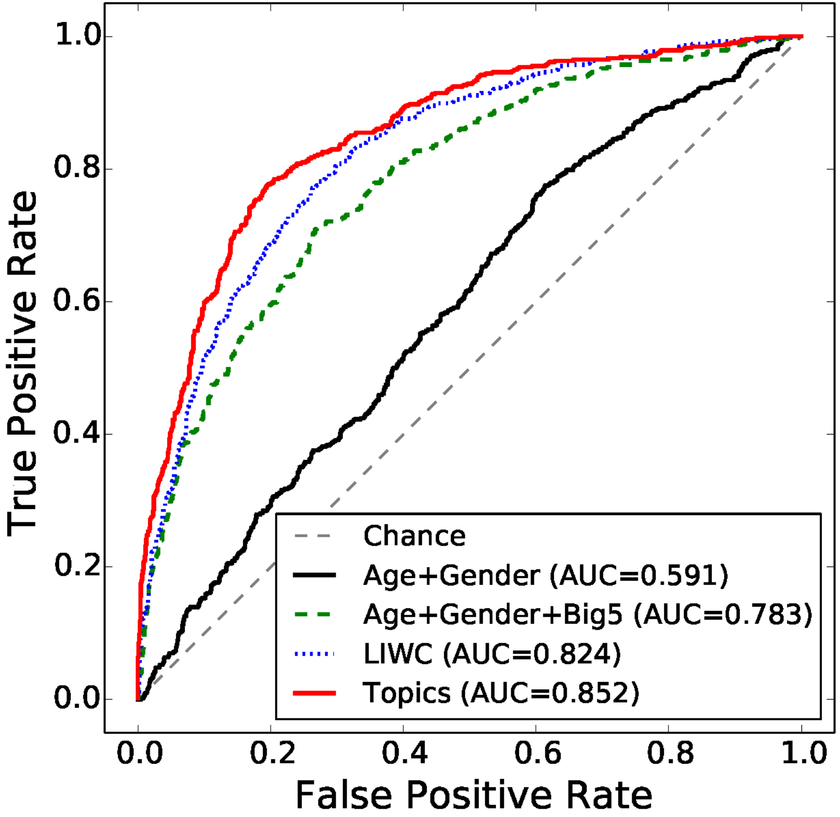
- linear ensemble of logistic regression classifiers

ROC Curve

Depressed

vs.

Controls



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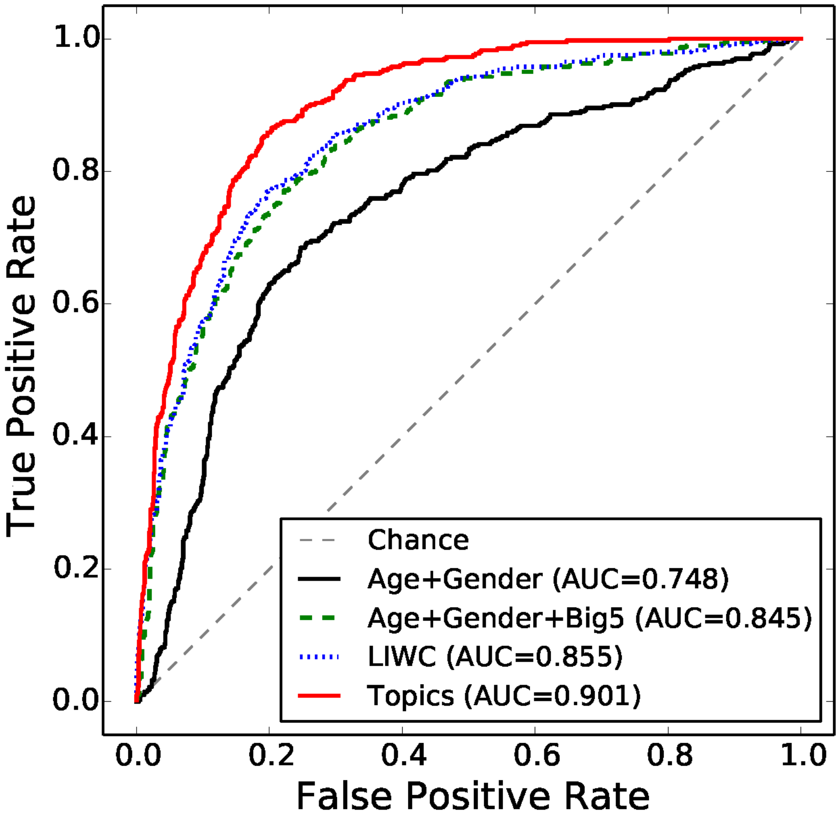
ROC Curve

PTSD

vs.

Controls



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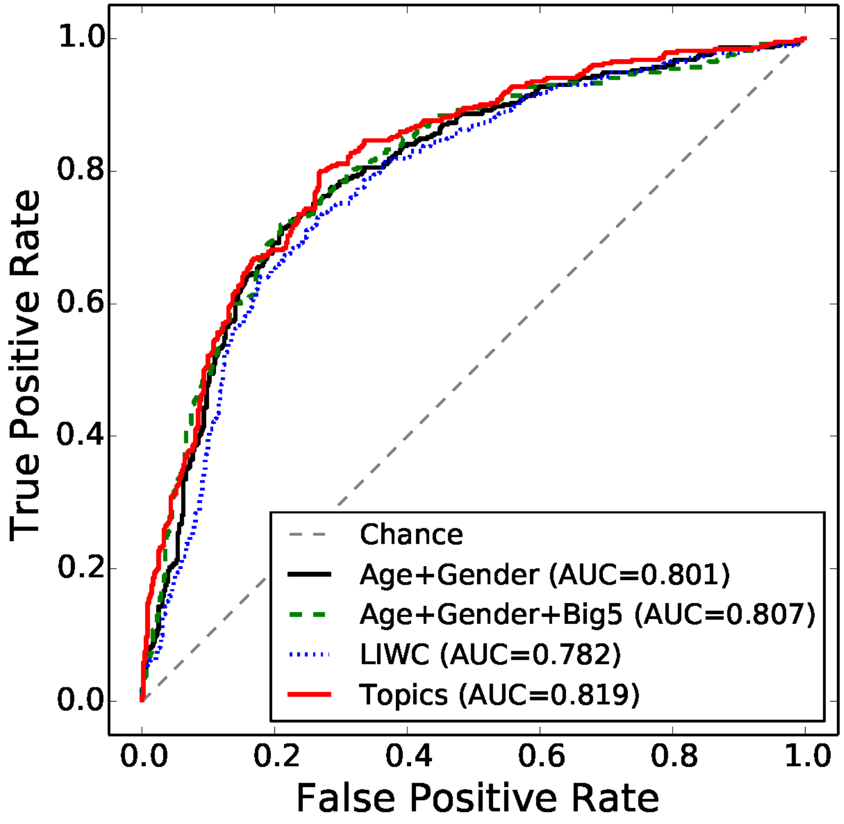
ROC Curve

Depressed

vs.

PTSD



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Take Home

- Control the analysis for age & gender
- Personality plays an important role in mental illnesses
- Language use of depressed/PTSD users uncovers interesting patterns

Thank you!

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