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

Daniel Preoţiuc-Pietro, Johannes Eichstaedt, Gregory Park, Maarten Sap
Laura Smith, Victoria Tobolsky, H. Andrew Schwartz and Lyle Ungar

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Problem

- Mental illnesses are underdiagnosed
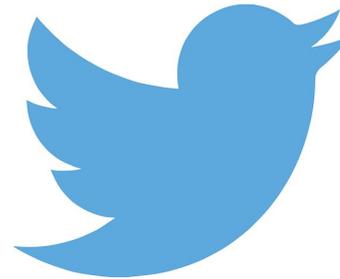
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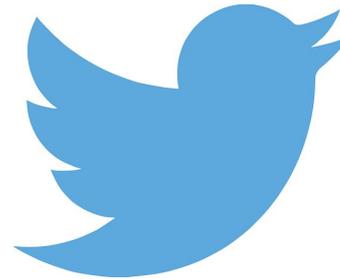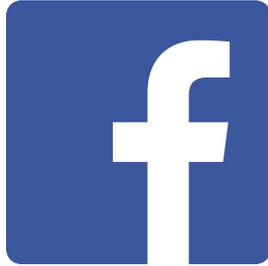
This Study:

- Explore the predictive power of demographic and personality based features.
- Find insights provided by each feature.

Data

- Twitter self-reports

    'I have been diagnosed with depression'

  - depression: 483
  - PTSD: 370
 - controls: 1104

- each user has avg. 3400 messages

   (Coppersmith et. al, CLPsych 2014)

Study Setup

Study Setup

Twitter → language → age, gender, personality? → (classification) → mental illness

Age, Gender

- Model from FB and Twitter data
  (Sap et. al, EMNLP 2014)

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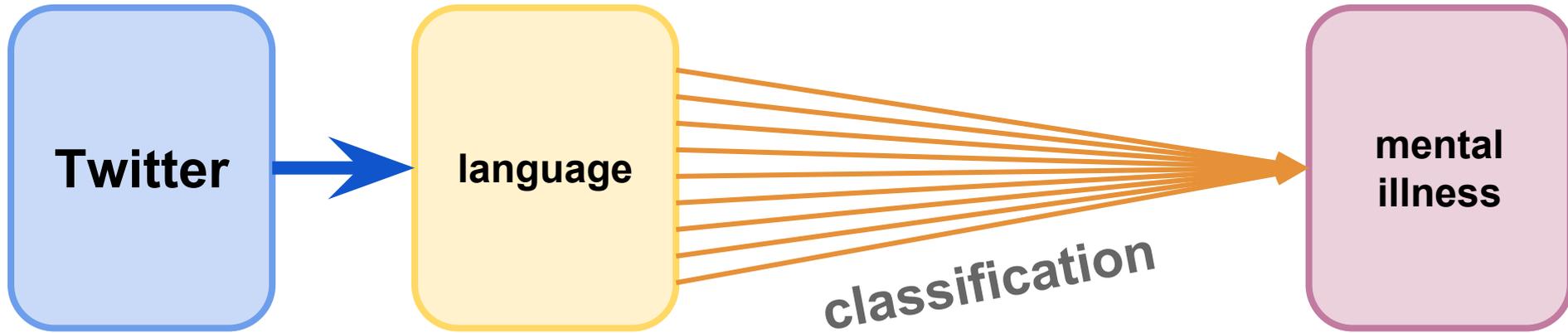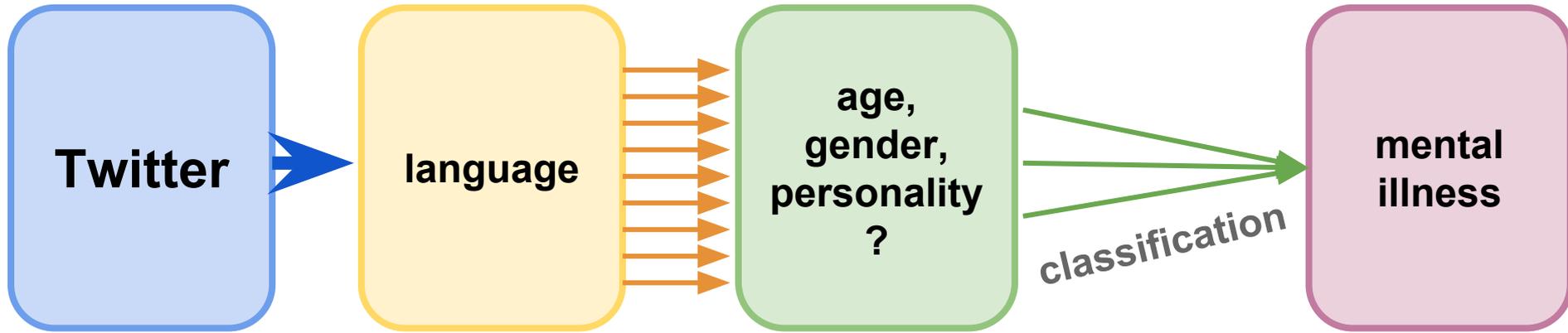
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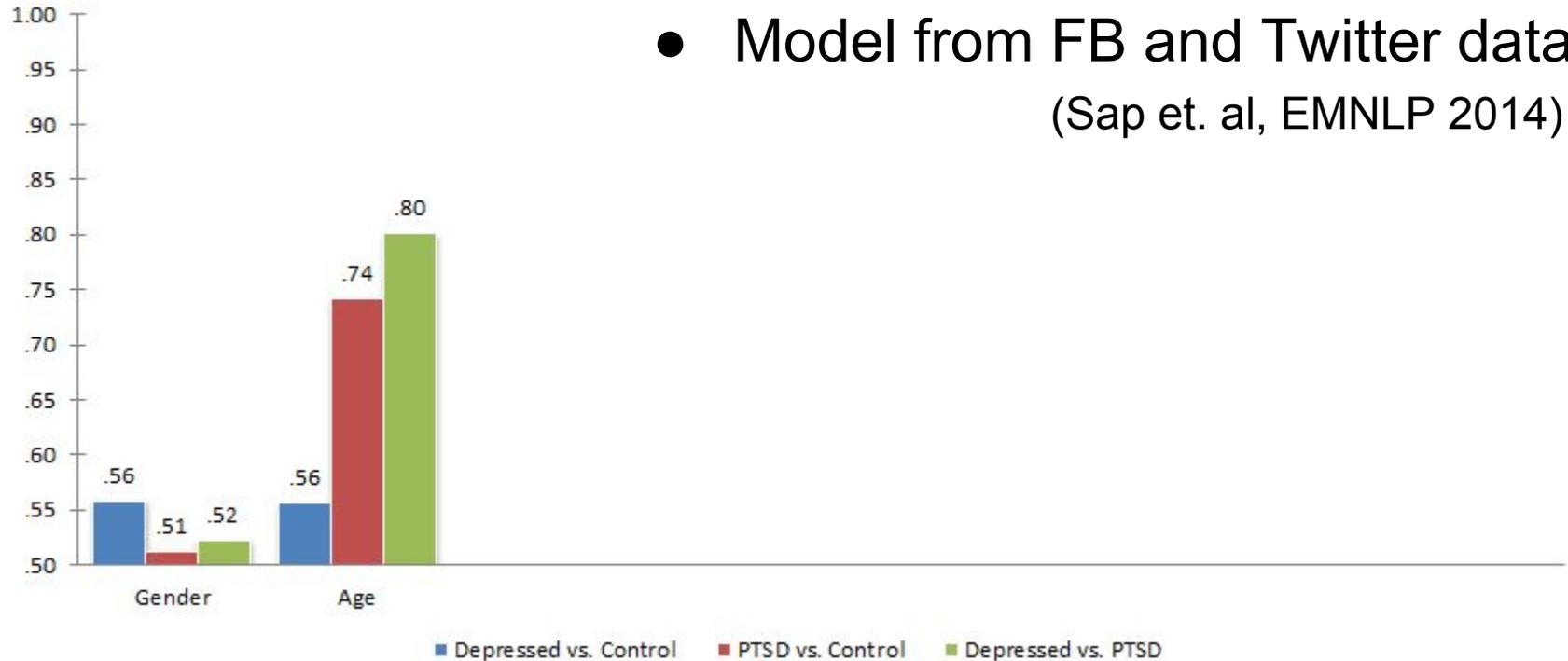
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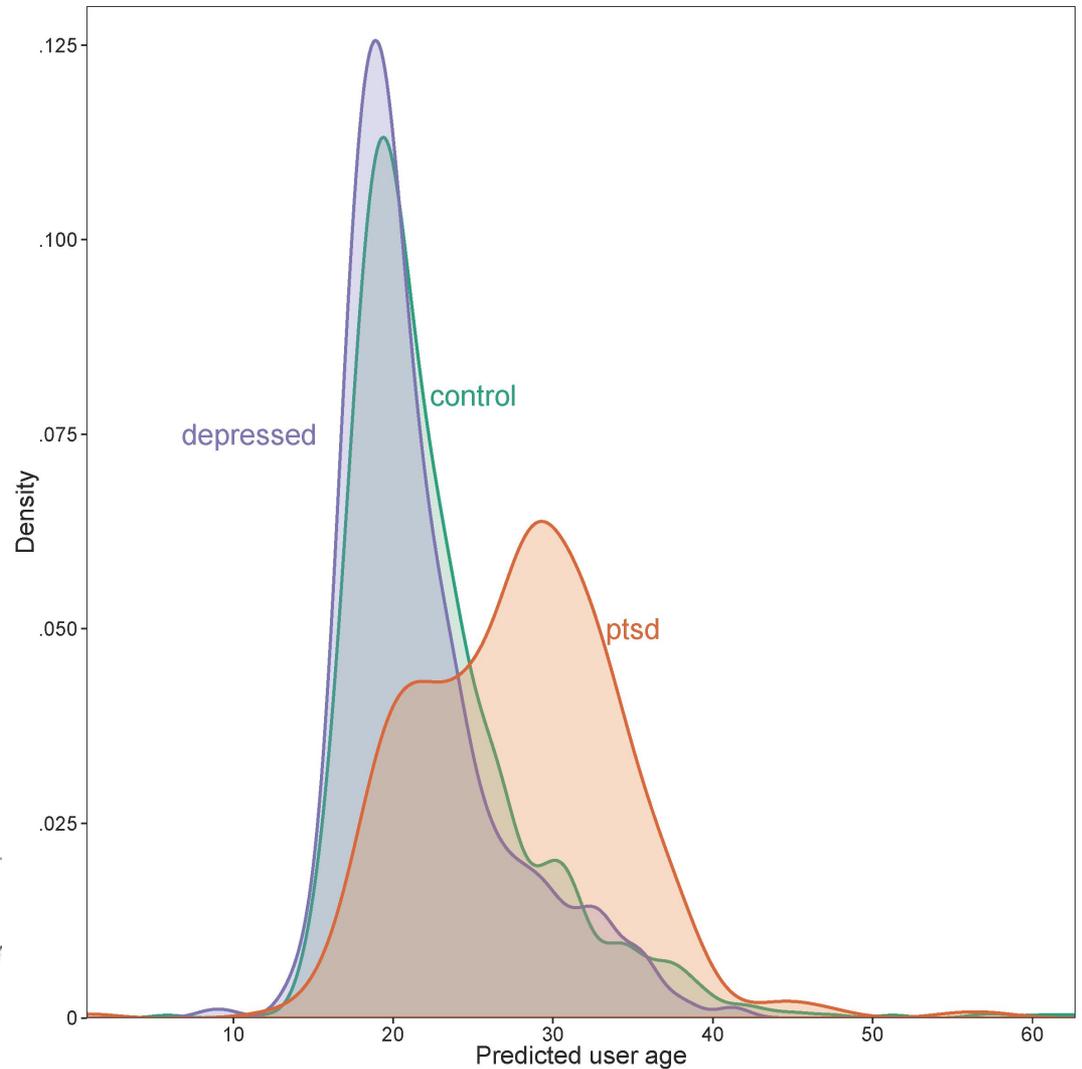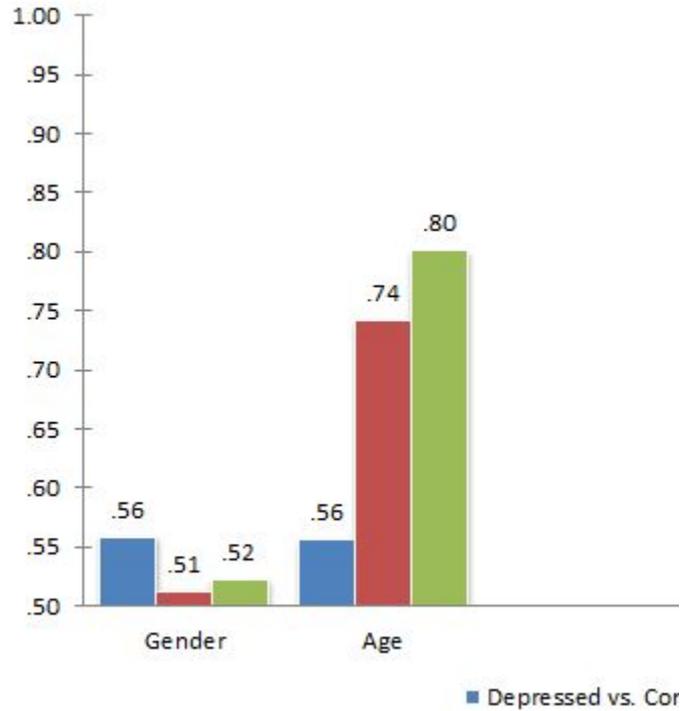
Personality
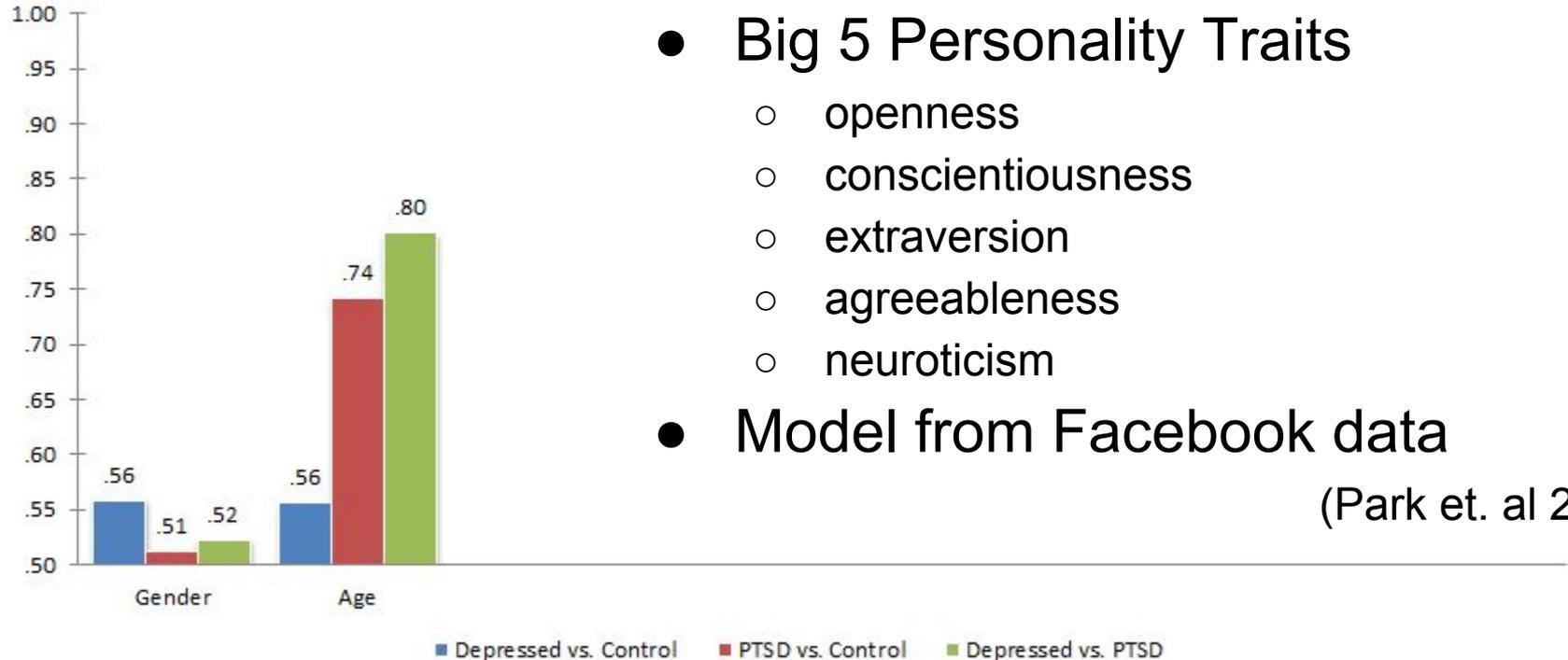
- Big 5 Personality Traits
  - openness
  - conscientiousness
  - extraversion
  - agreeableness
  - neuroticism
- Model from Facebook data

(Park et. al 2014)

Personality

- Big 5 Personality Traits
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 - neuroticism
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(Park et. al 2014)

Chart legend: Depressed vs. Control | PTSD vs. Control | Depressed vs. PTSD

Values — Gender: .56, .51, .52; Age: .56, .74, .80; Big5: .78, .81, .78

Personality

- mentally ill users:
1. high on neuroticism
2. more introverted
3. less agreeable
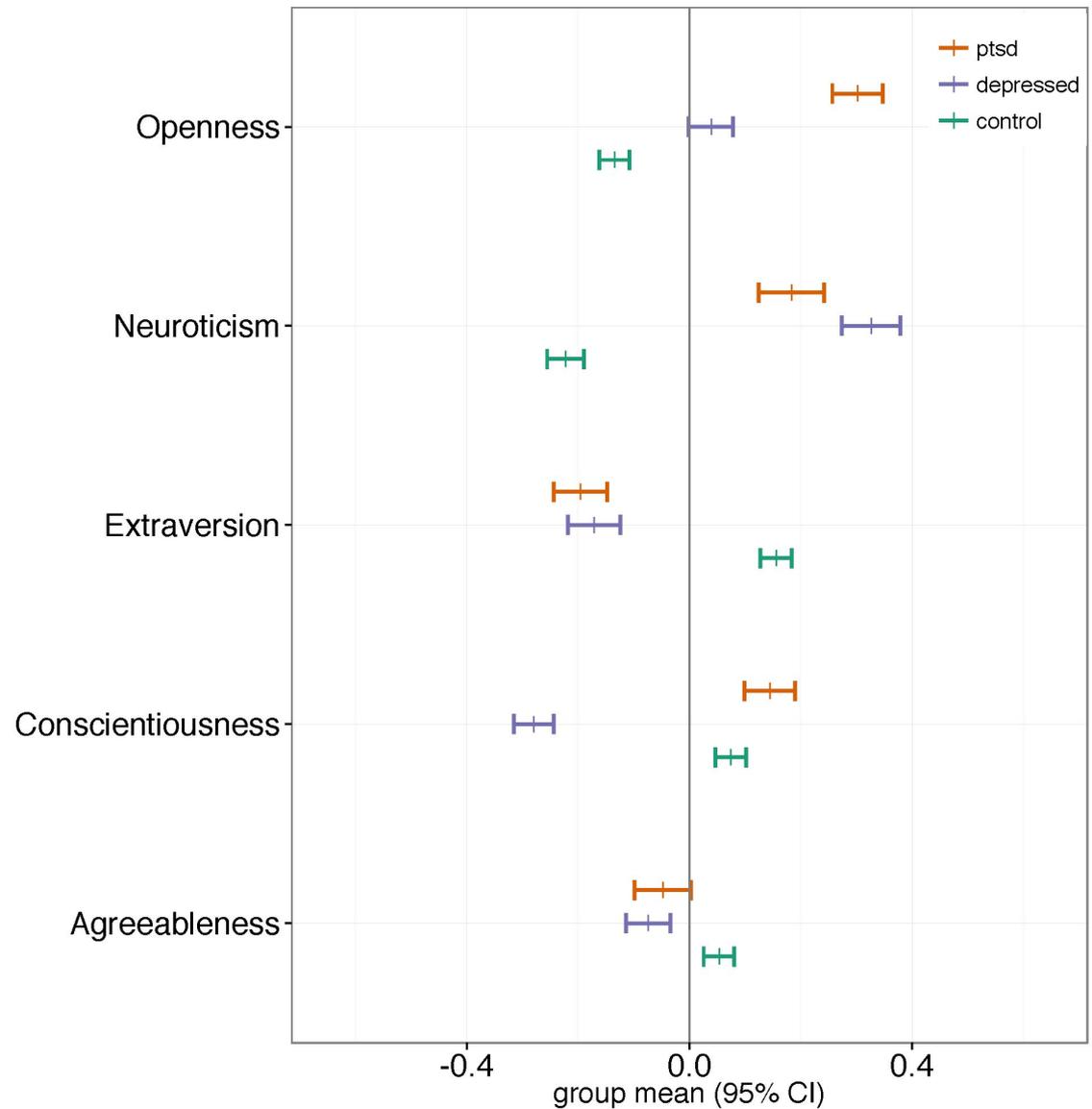
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- controlling for age and gender
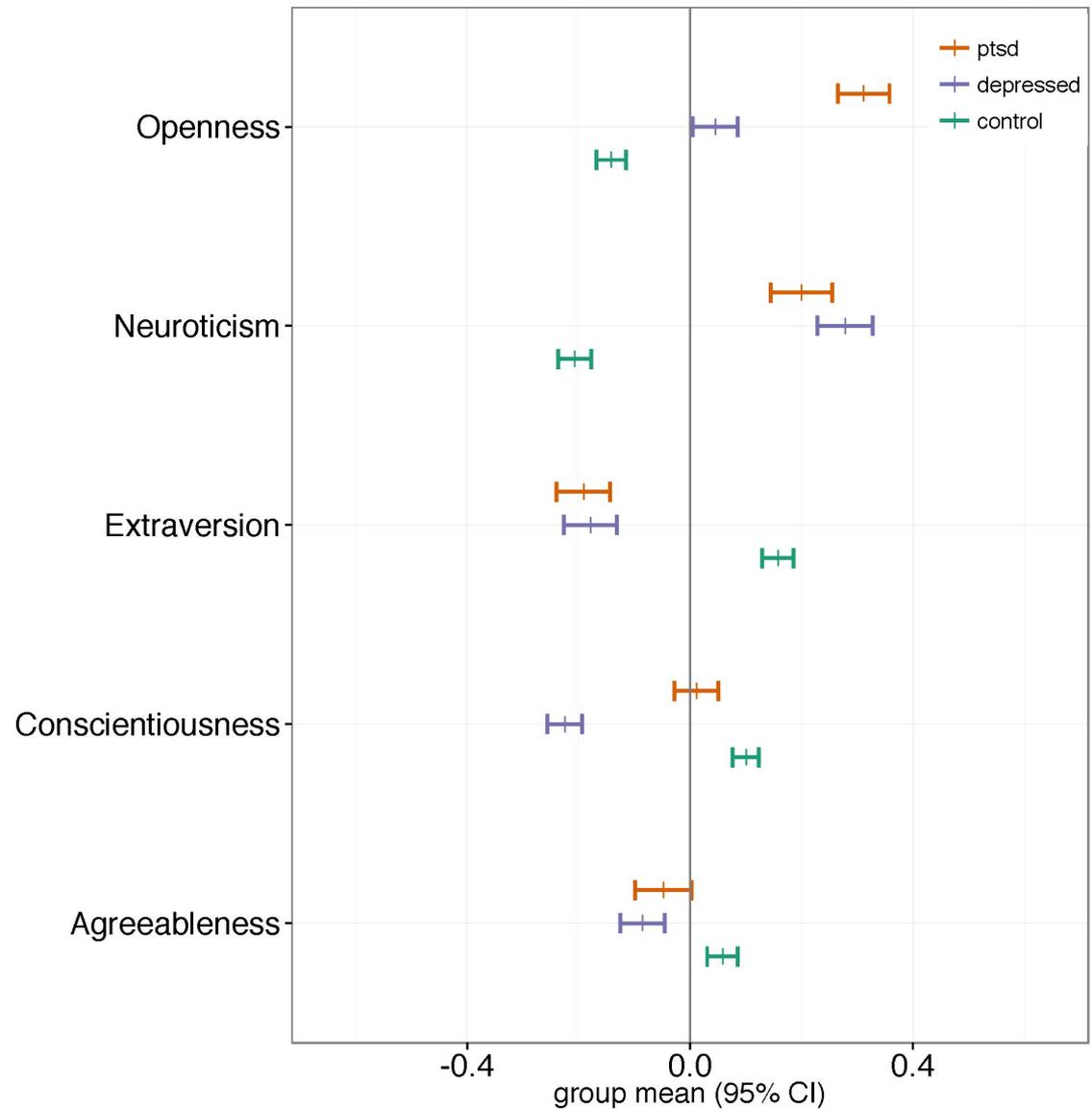
Personality
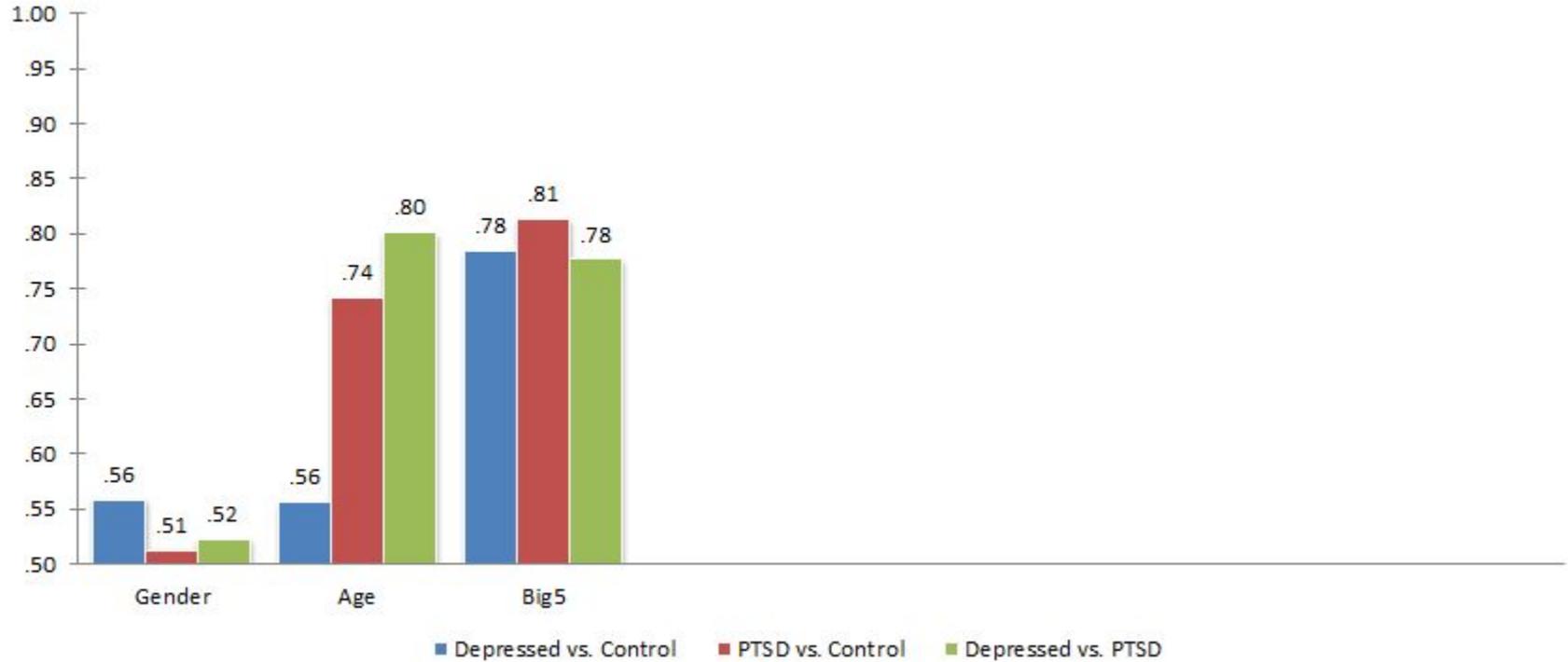
Age, Gender, Personality
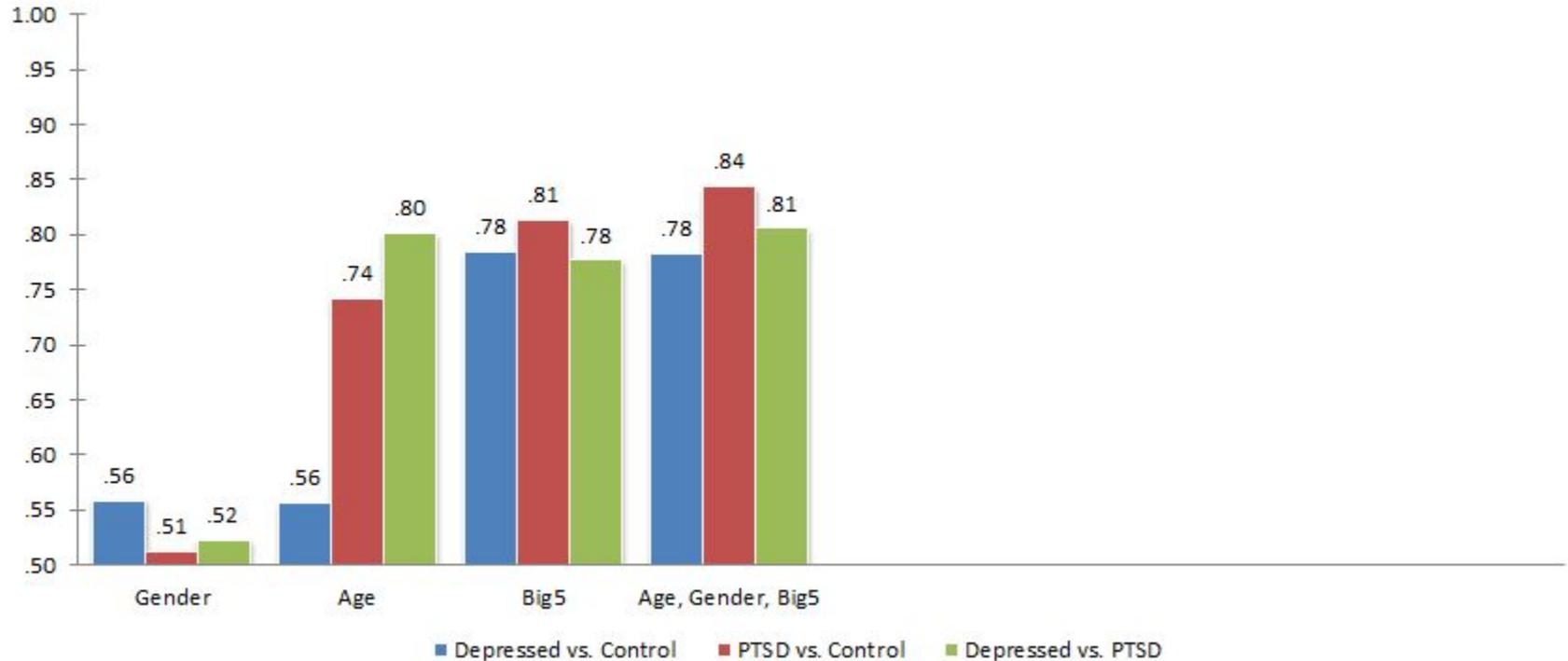
Affect and Intensity

- Model trained on 3000 annotated FB posts and applied to all user posts (to be published)
- circumplex model similar to valence & arousal (ANEW)
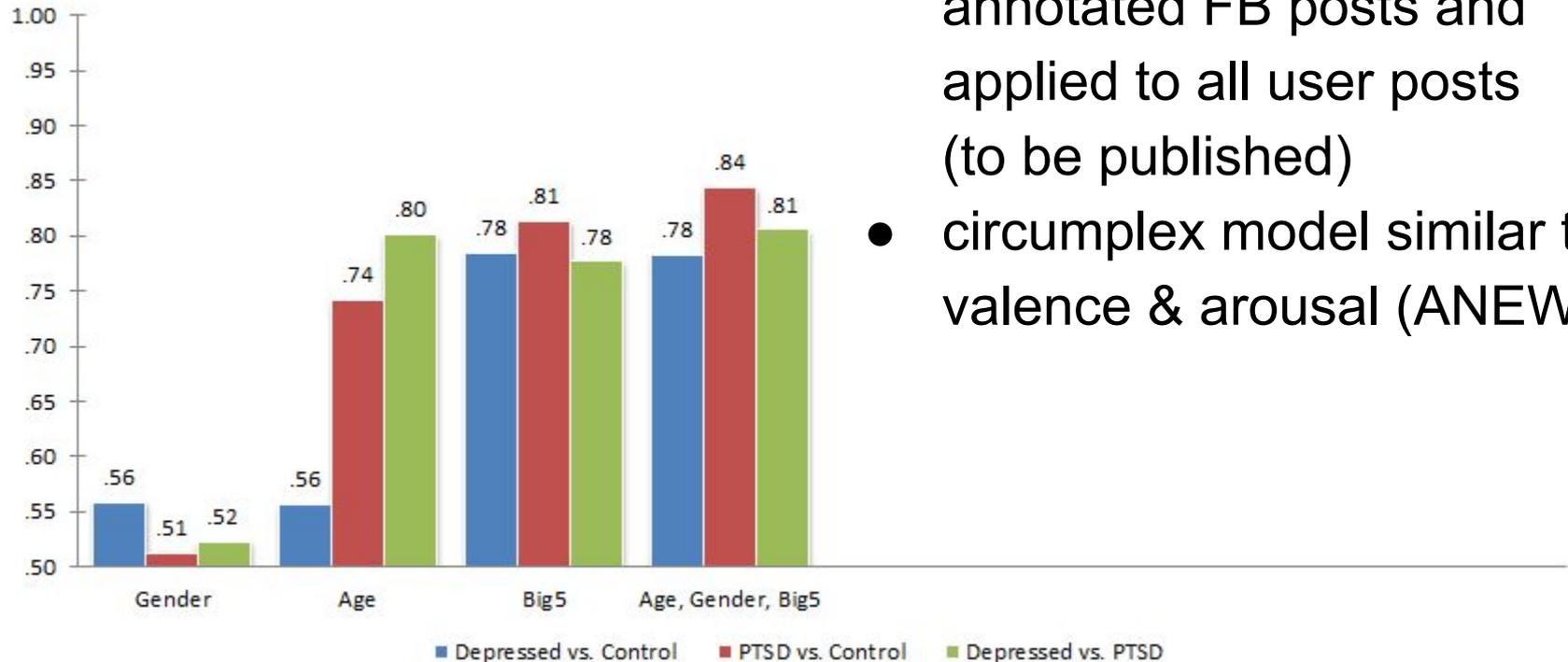
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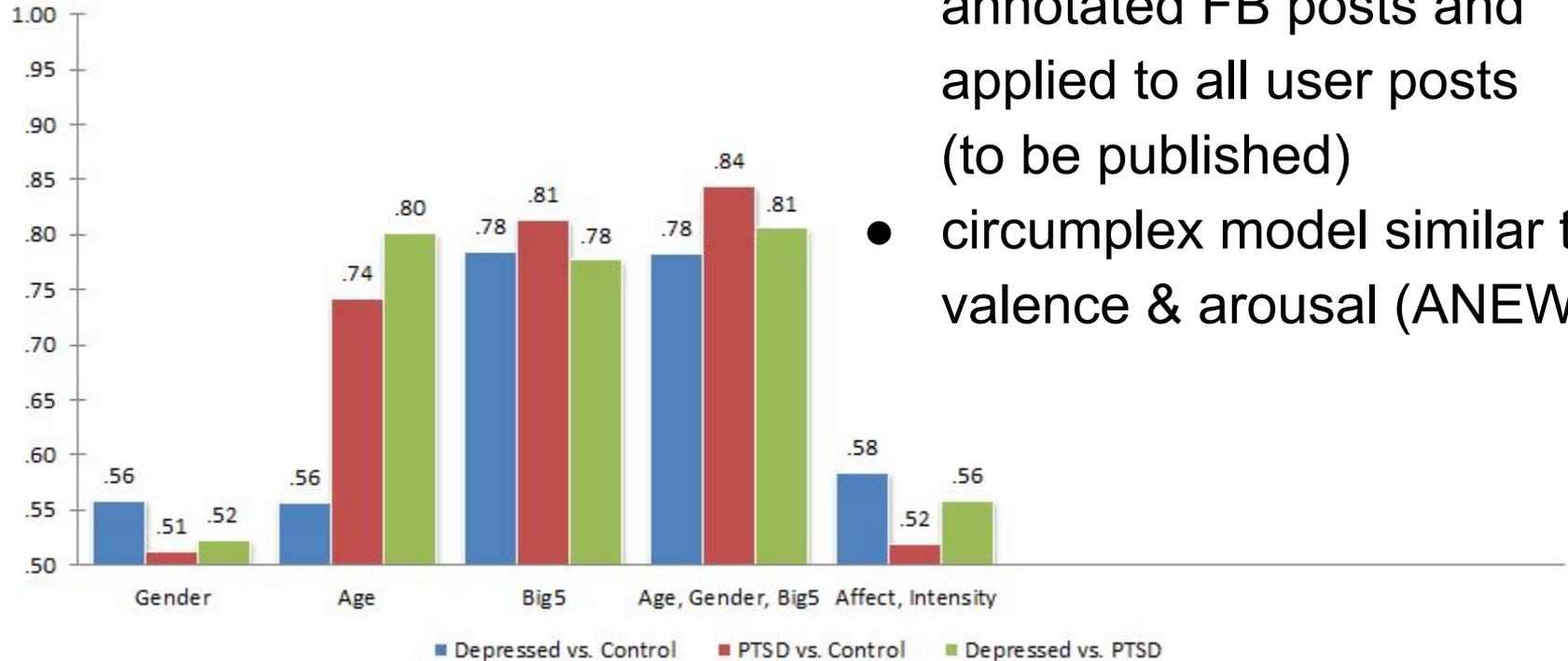
Affect and Intensity

- mentally ill users are less aroused and less positive
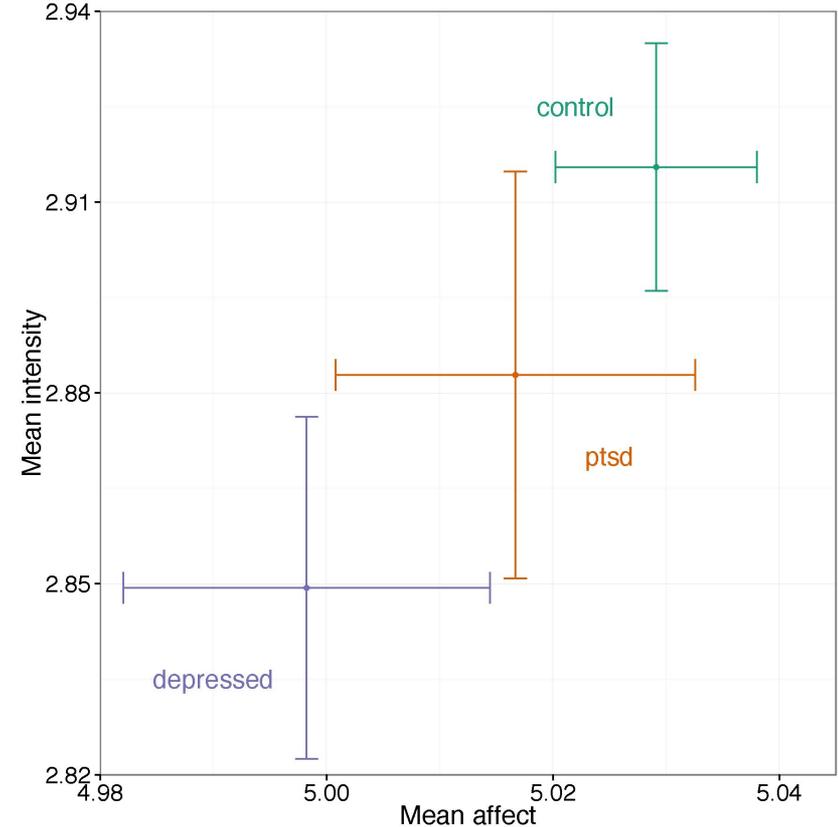
LIWC

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

LIWC
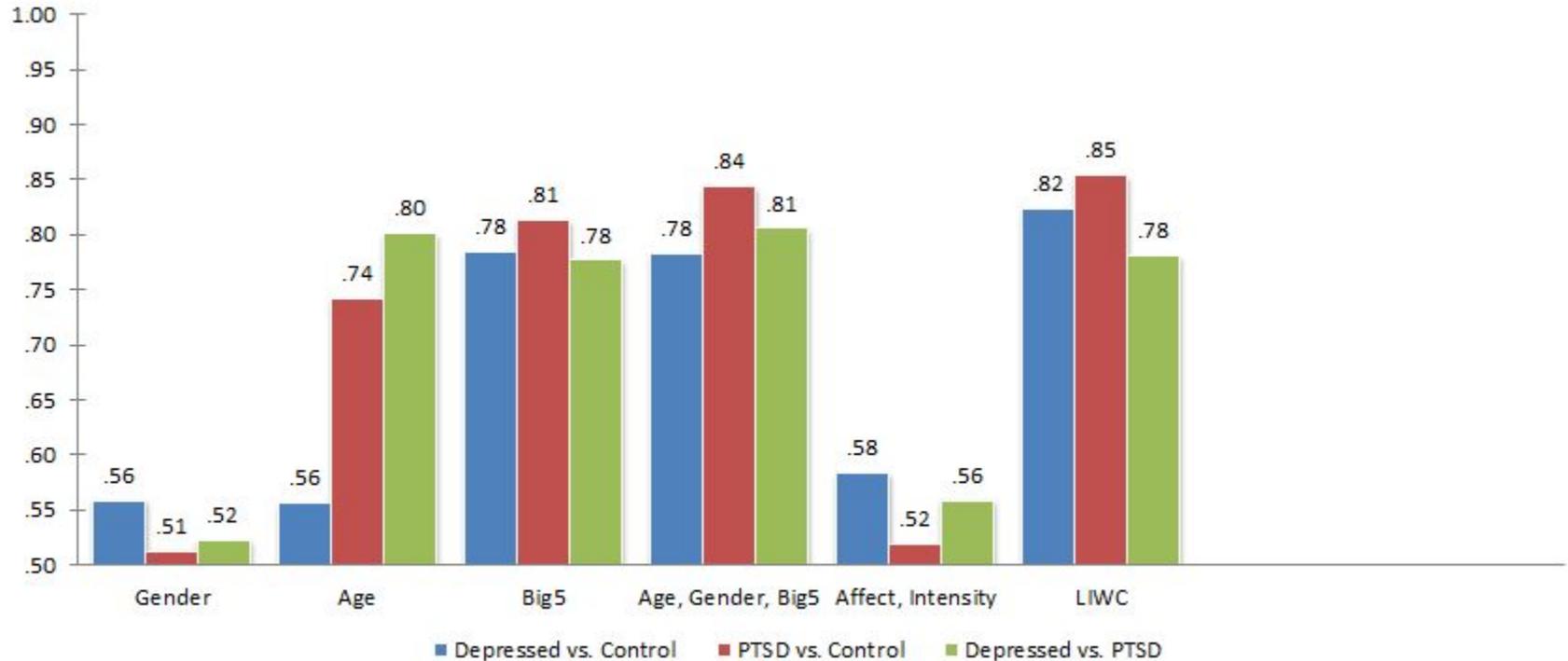
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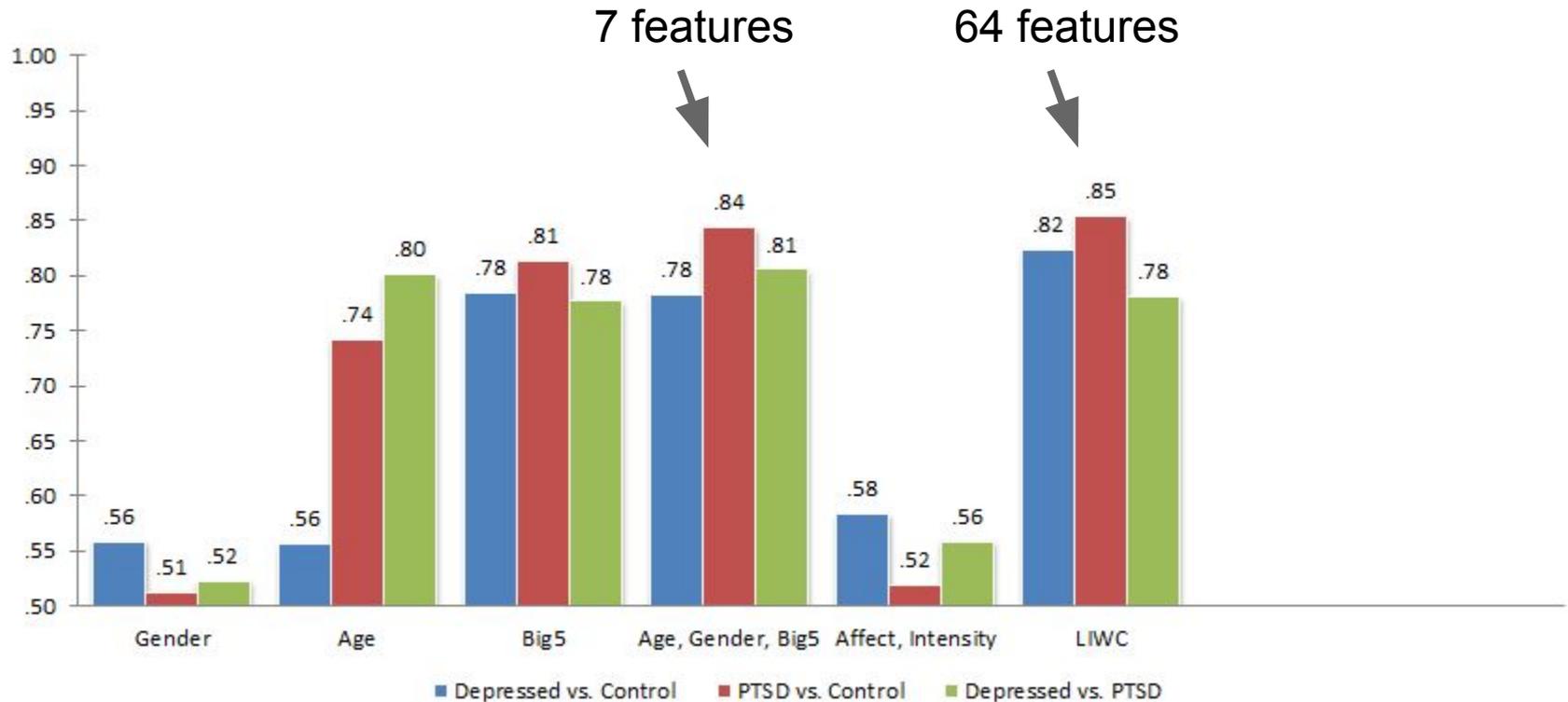
Topics

- posteriors computed using Latent Dirichlet Allocation (LDA)
- underlying set of Facebook statues (same data as personality model)
- 2000 topics in total

Topics

Topics

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
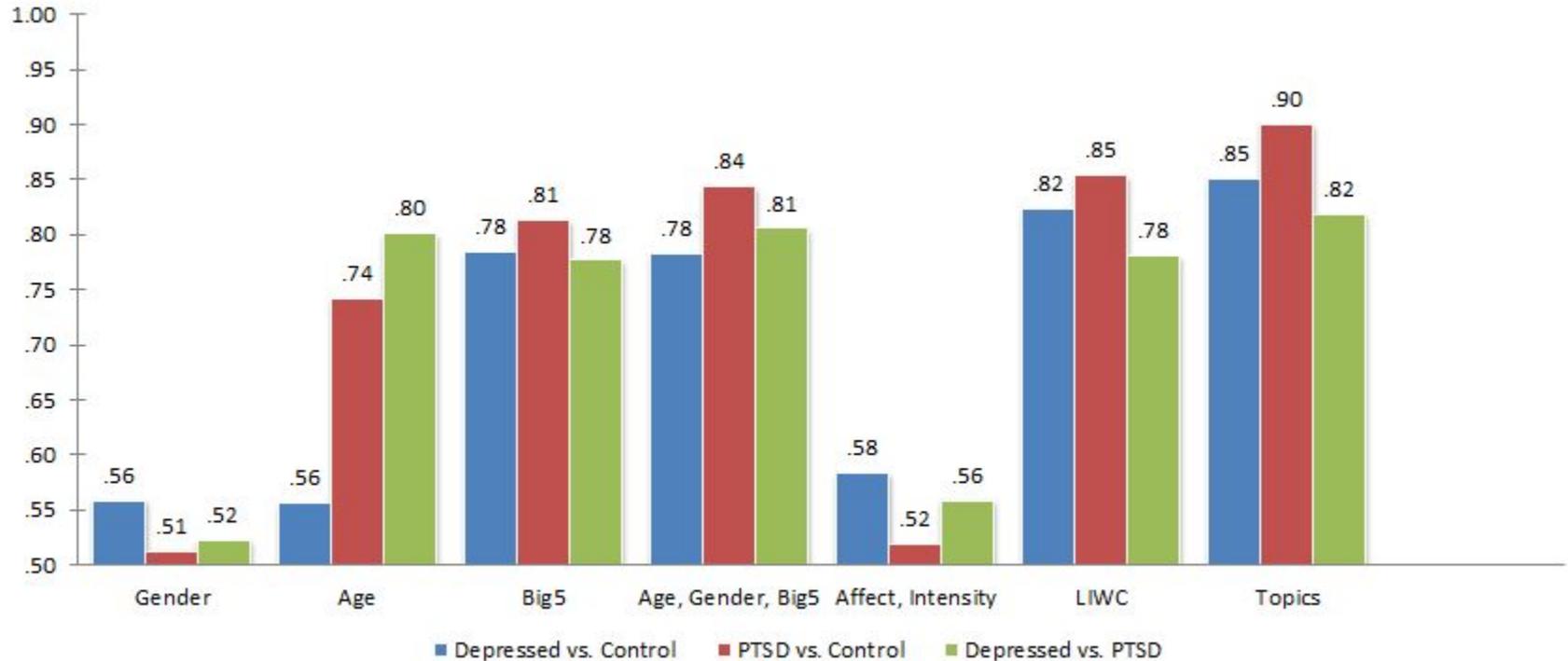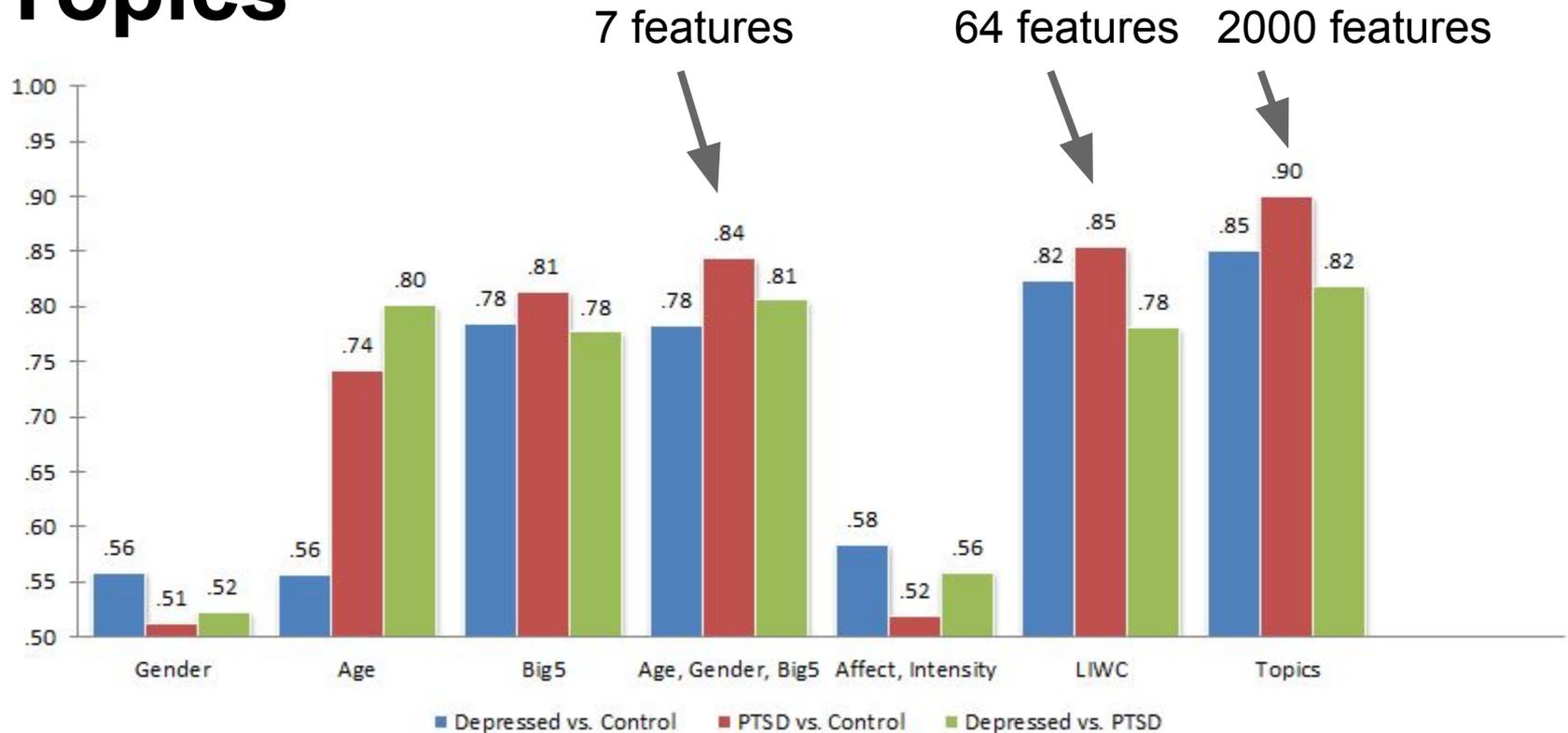
Topics: PTSD

(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
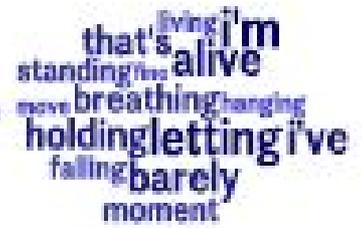
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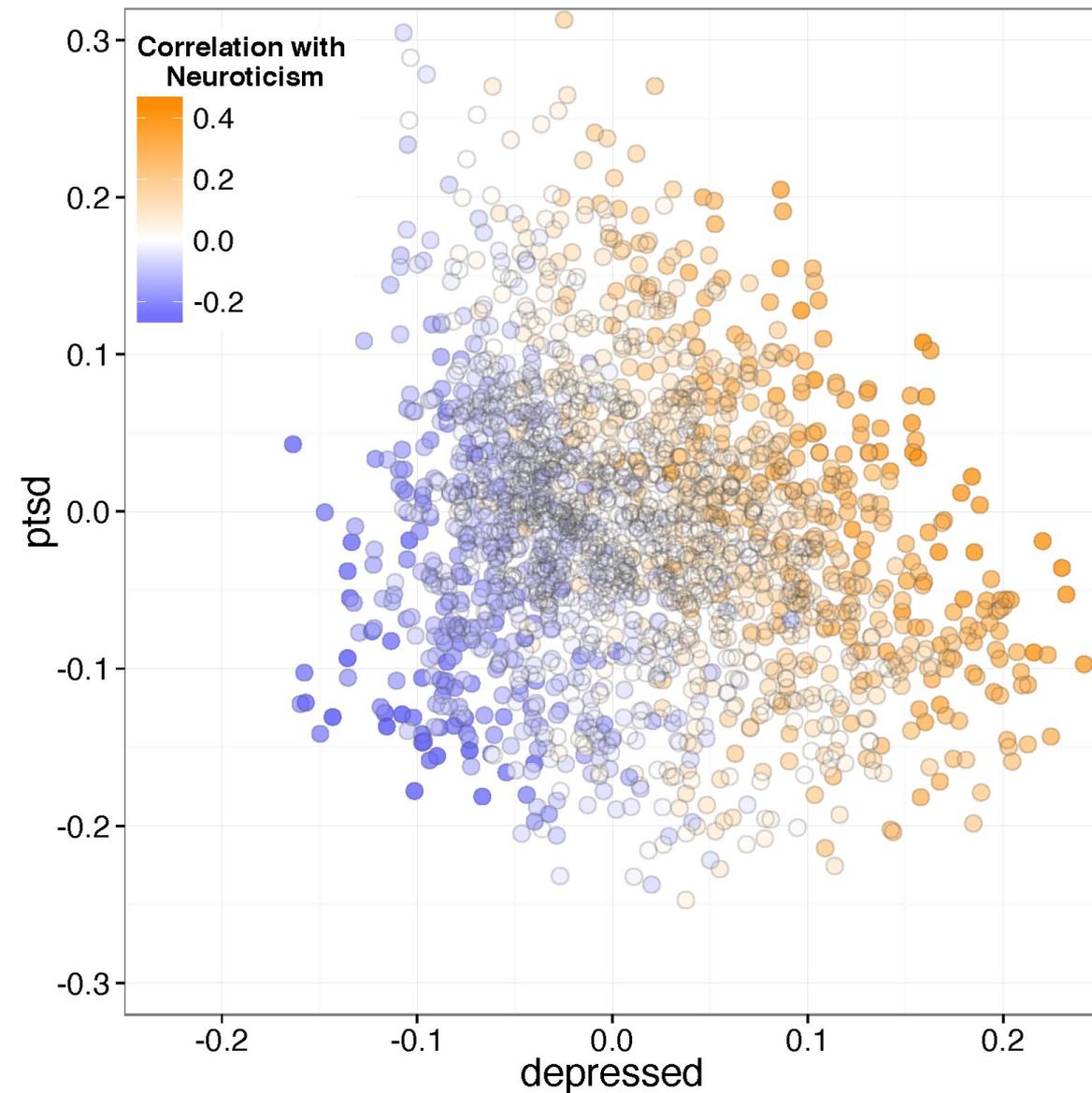
Topics:
PTSD,
Depression, &
Neuroticism
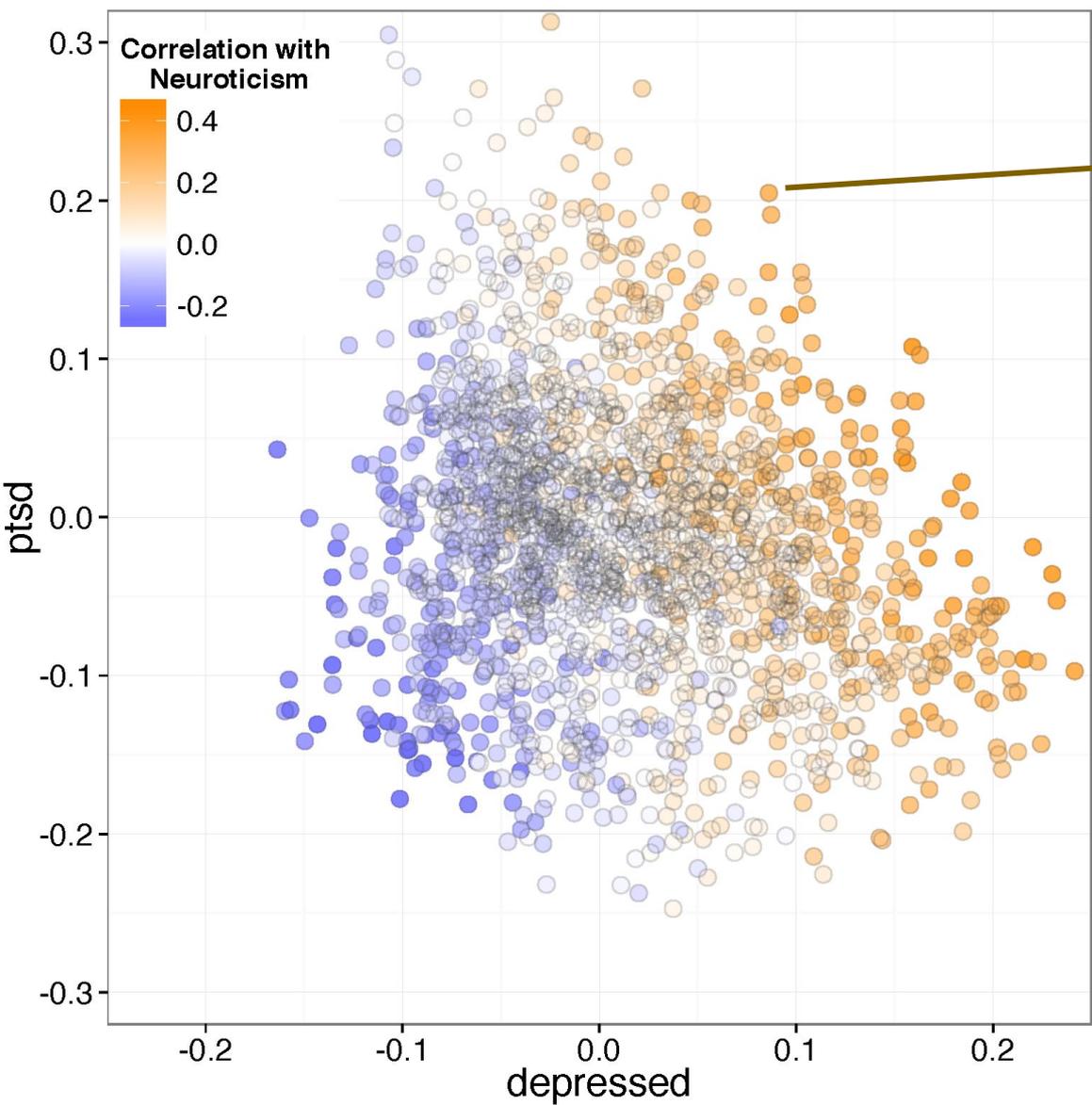
Correlation with Neuroticism

+ Dep, +++ PTSD

++ Dep, ++ PTSD

+++ Dep, 0 PTSD
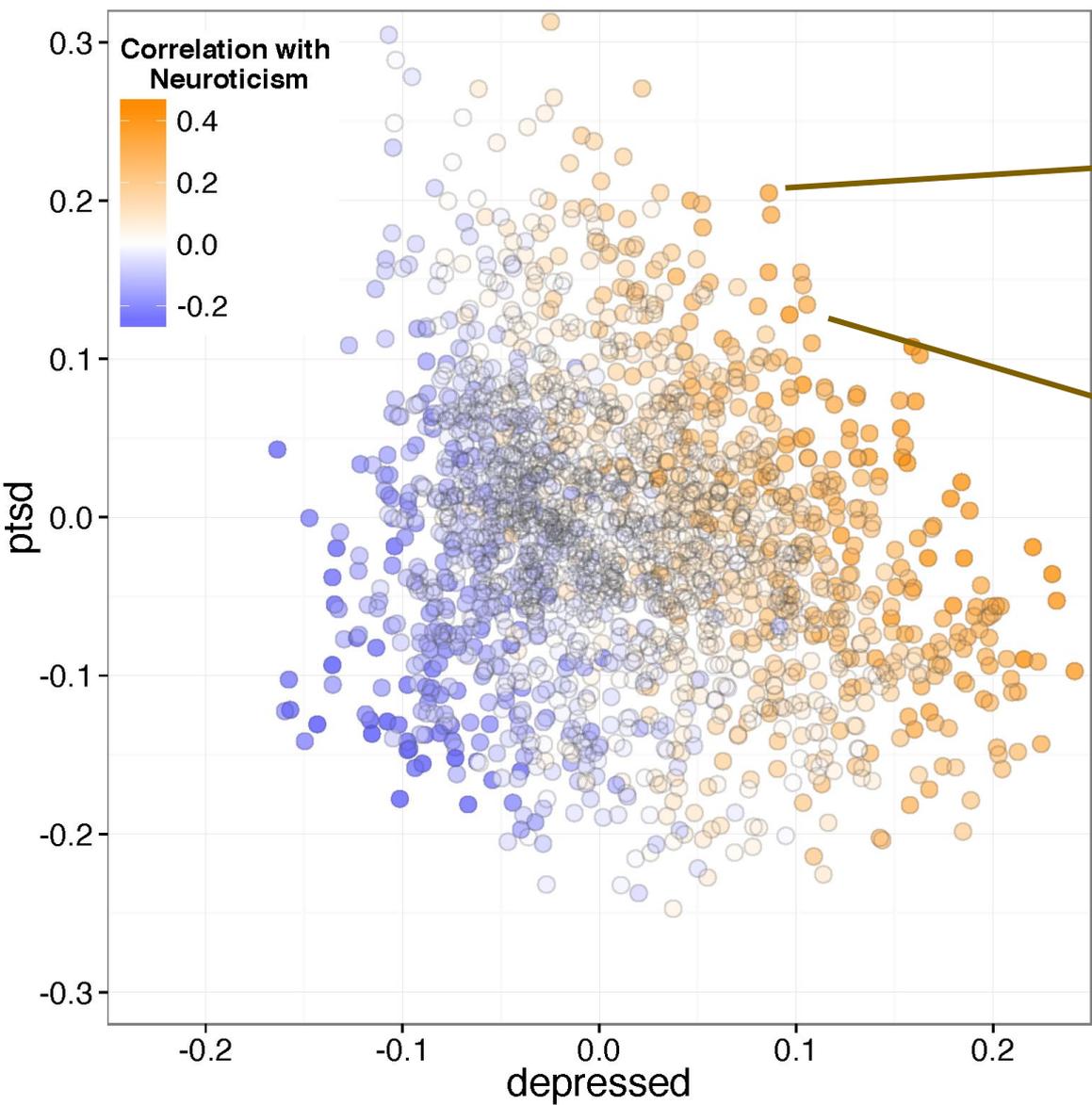
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Correlation with Neuroticism

worse
chest hurting
ease meds
pains pain hurts
caused
pleasure hurt
pills killers gain
numb

+ Dep, +++ PTSD

committed put
gay commit wil
suicide instantly
born respect turning
escaping didn't
teens means
let's

++ Dep, ++ PTSD

+++ Dep, 0 PTSD
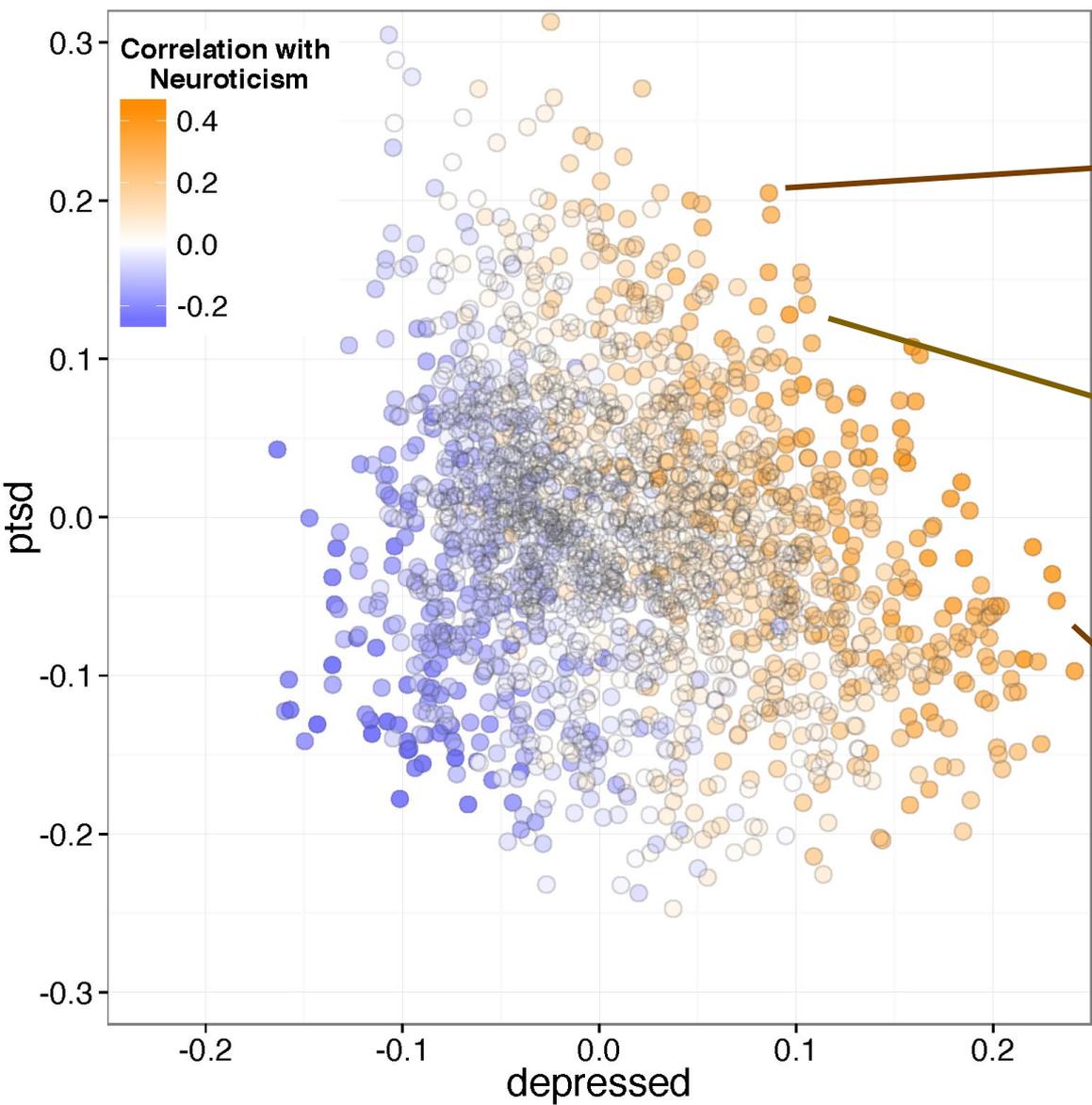
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+++ Dep, 0 PTSD

loneliness terrible
feeling miserable
depressed sad empty surrounded
lonely hopeless
helpless unwanted
feel romantic rejected

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Topics

	Gender	Age	Big5	Age, Gender, Big5	Affect, Intensity	LIWC	Topics
Depressed vs. Control	.56	.56	.78	.78	.58	.82	.85
PTSD vs. Control	.51	.74	.81	.84	.52	.85	.90
Depressed vs. PTSD	.52	.80	.78	.81	.56	.78	.82

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1-3 grams

Bar chart showing classification accuracy (scale .50 to 1.00) across feature sets for three comparisons: Depressed vs. Control (blue), PTSD vs. Control (red), Depressed vs. PTSD (green).

| Feature set	Depressed vs. Control	PTSD vs. Control	Depressed vs. PTSD
Gender	.56	.51	.52
Age	.56	.74	.80
Big5	.78	.81	.78
Age, Gender, Big5	.78	.84	.81
Affect, Intensity	.58	.52	.56
LIWC	.82	.85	.78
Topics	.85	.90	.82
1-3 grams	.86	.92	.81

# 1-3 grams

1-3 grams: Depressed vs. Controls

1-3 grams: PTSD vs. Controls
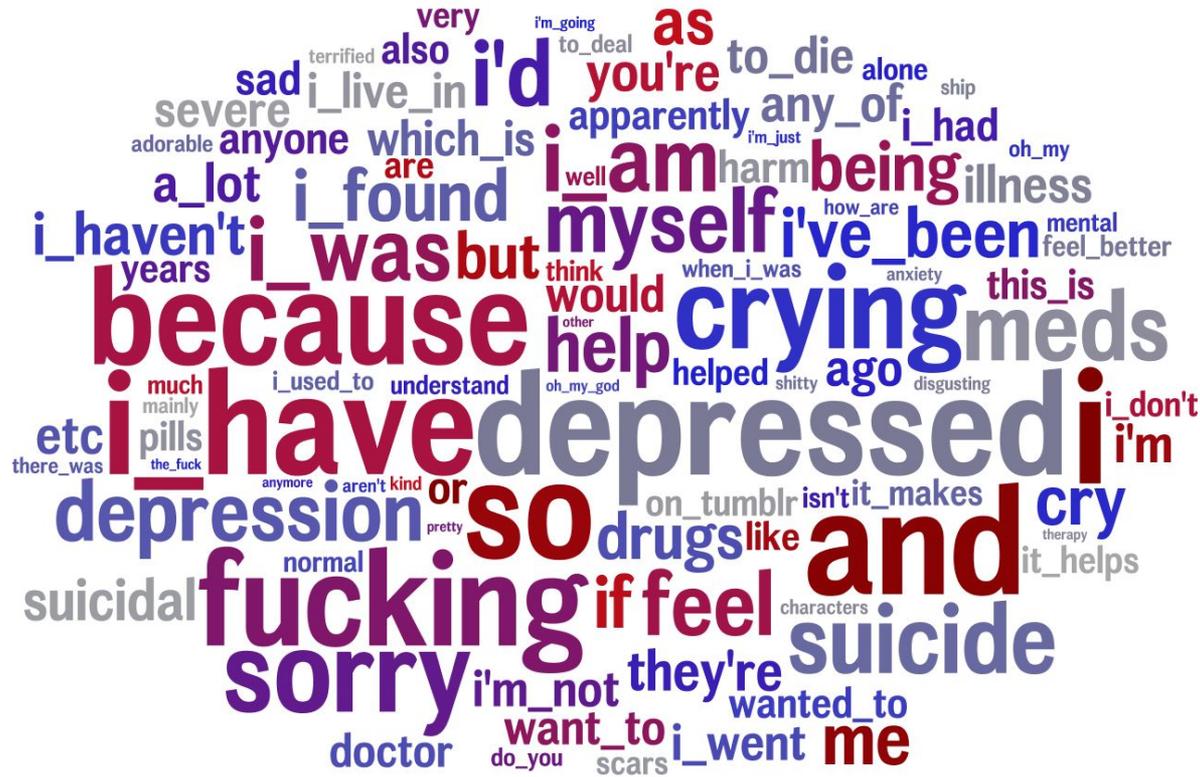
1-3 grams: Depressed vs. PTSD

depression

way laundry
somehow
of ._even
kind_of maybe ._when
out_of own realize
that right_? words
equal was_"

Almost nothing left when controlling for age and gender

Other features…

- ## use metadata features
  # friends, #statuses

- ## use different word clusters
  Brown clustering, NPMI Spectral clustering, Word2Vec/GloVe embeddings

- ## linear ensemble of logistic regression classifiers

Mental Illness detection at the World Well-Being Project for the CLPsych 2015 Shared Task

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# ROC Curve

Depressed

vs.
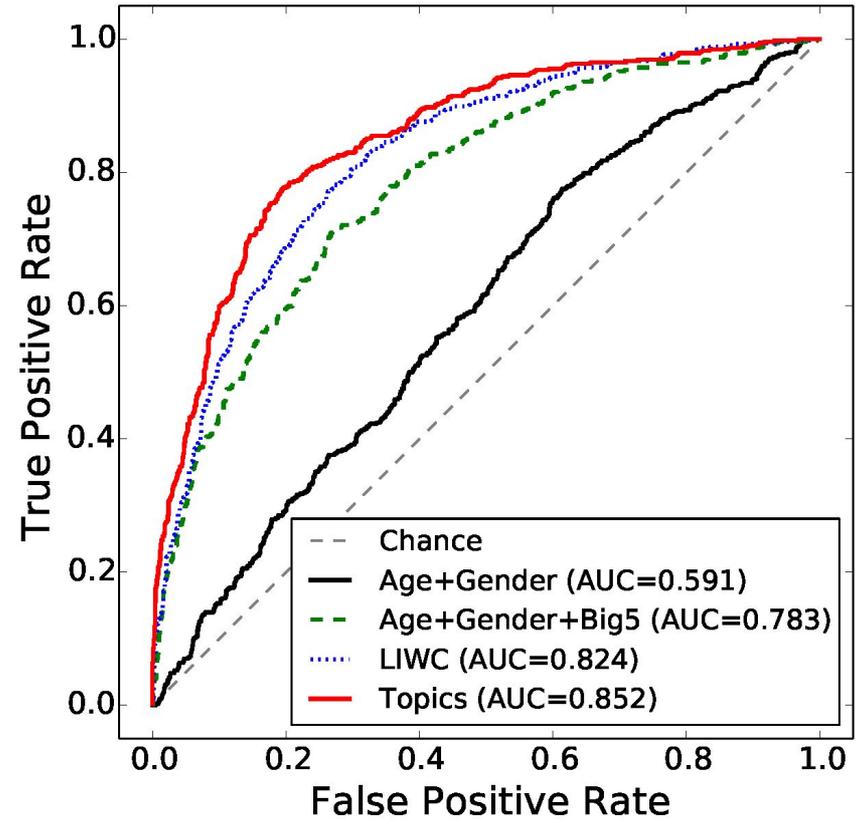
Controls

ROC Curve

PTSD

vs.

Controls
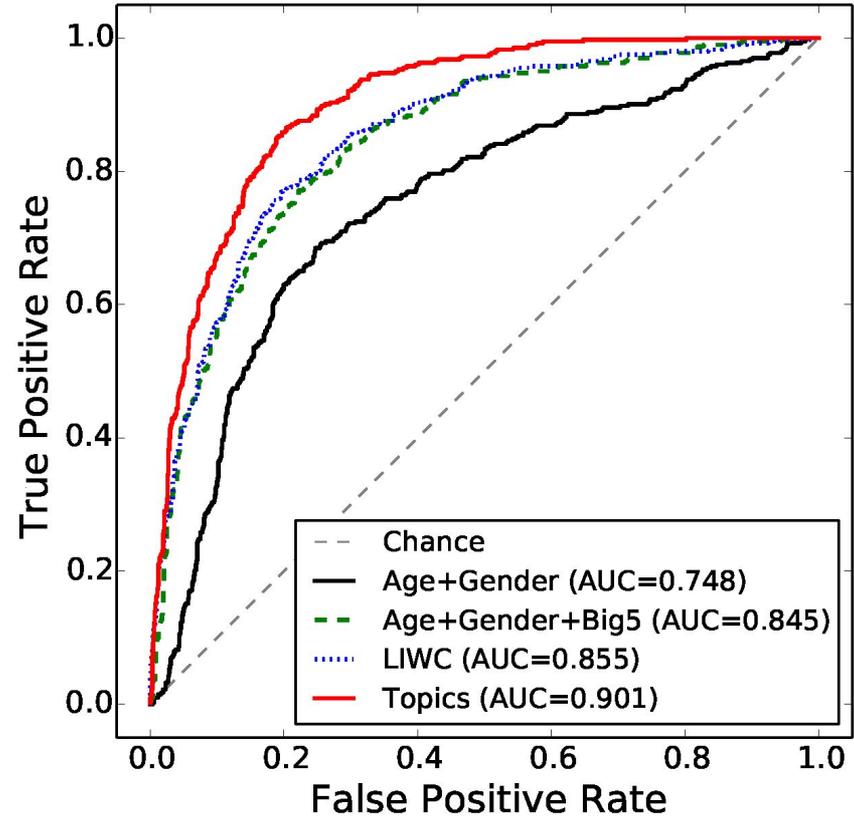
ROC Curve

Depressed vs. PTSD
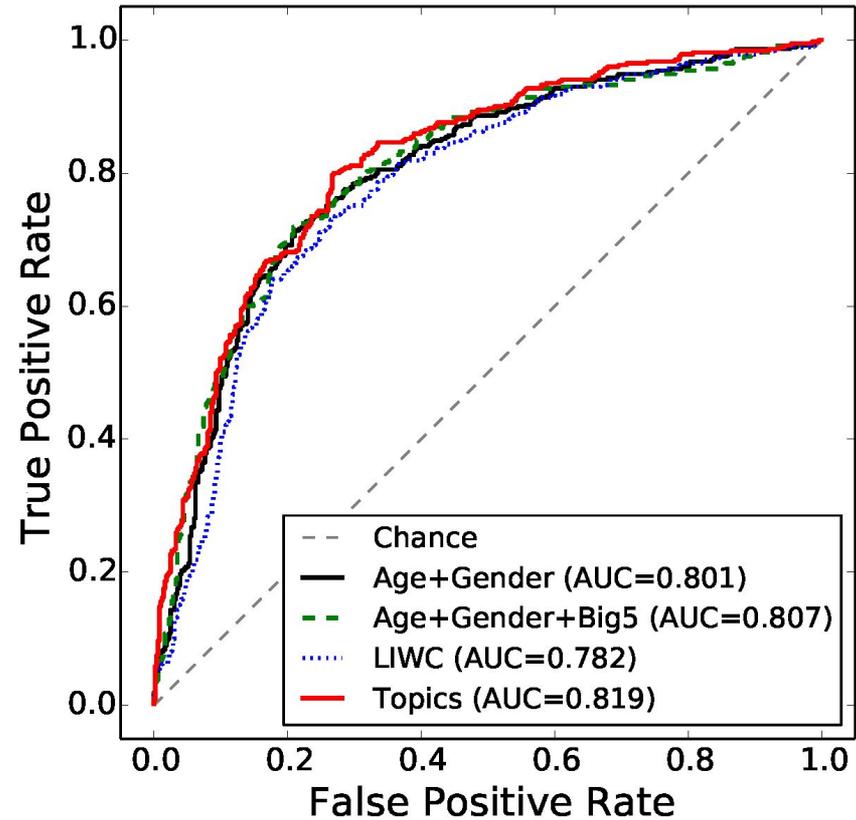
Take Home

- Control the analysis for age & gender

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- Personality plays an important role in mental illnesses (depression auc: 7 features -> .78; 25k features-> .86)

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- Personality plays an important role in mental illnesses (depression auc: 7 features -> .78; 25k features-> .86)

- Language use of depressed/PTSD reveals symptoms, emotions, and cognitive processes.

Thank you!

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