NLP meets Computational Social (Media) Science

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@dirk_hovy

Social Media

BUSINESS

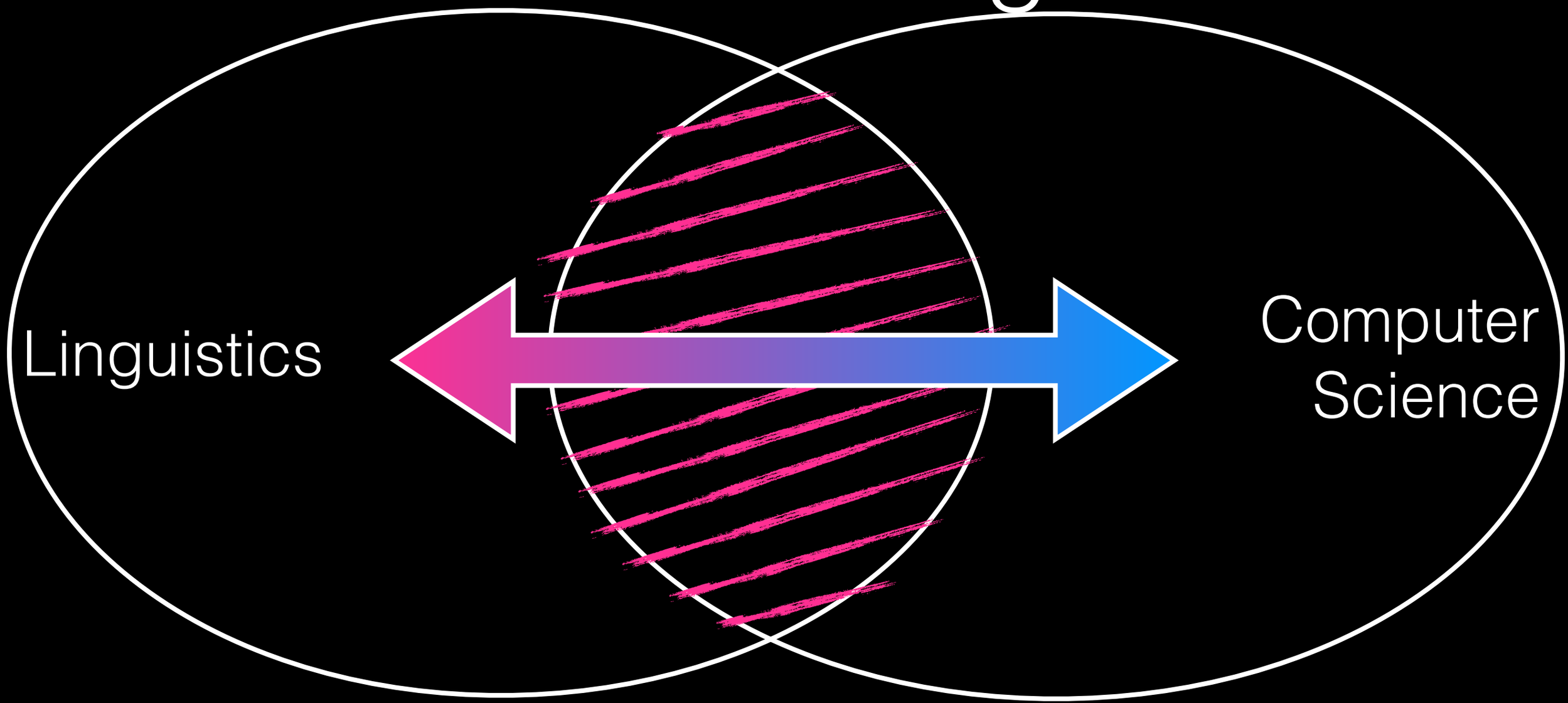
PSYCHOLOGY

POL. SCI.

SOCIOLOGY

SOCIOLINGUISTICS

Natural Language Processing



informed linguistic hypotheses large-scale statistical analysis

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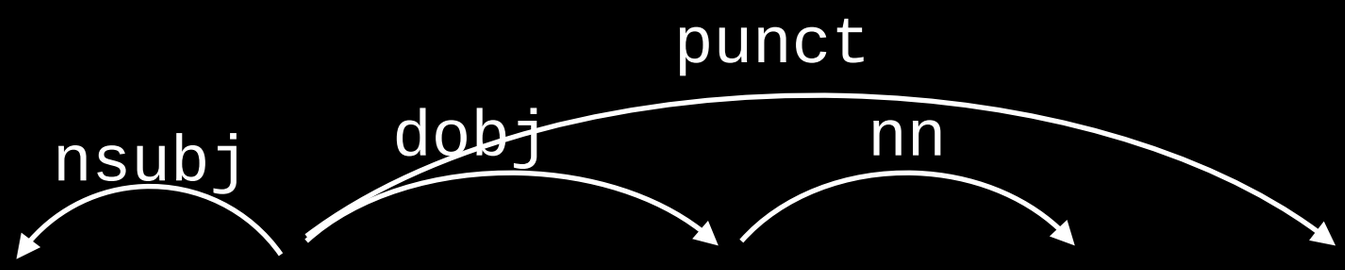
Natural Language Processing

SENT. ANALYSIS positive

NER O O PERSON PERSON O

PARSING



POS PRON VERB NAME NAME PUNCT

I admire Rosa Parks .

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Who buys what?

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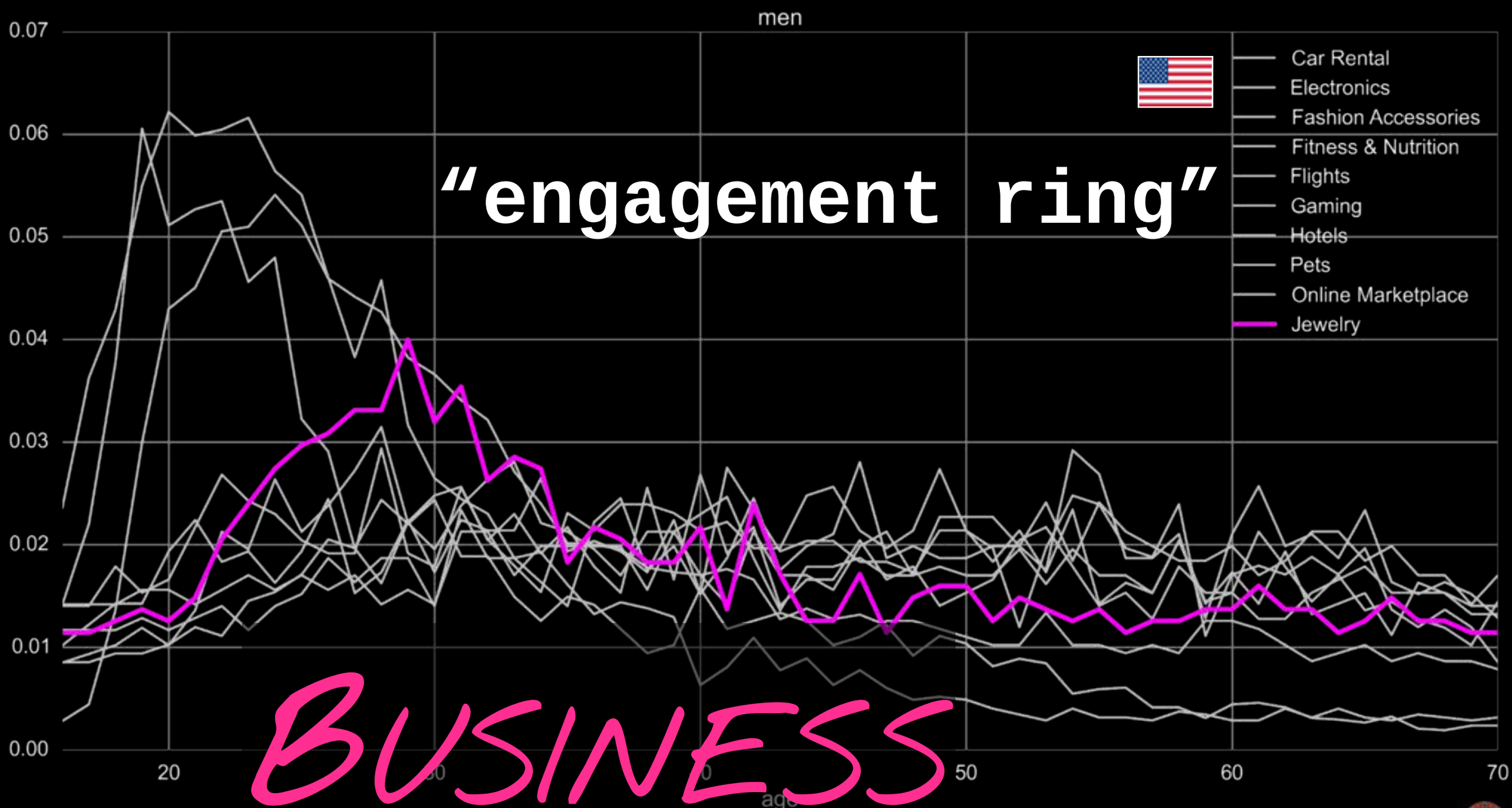
Who buys what?



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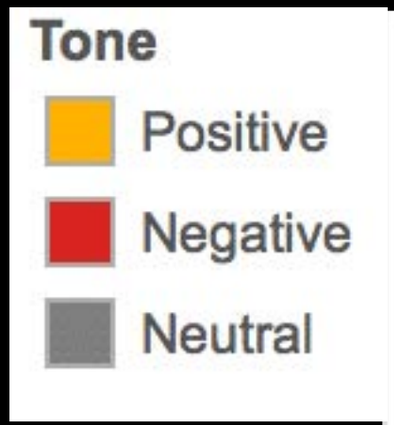
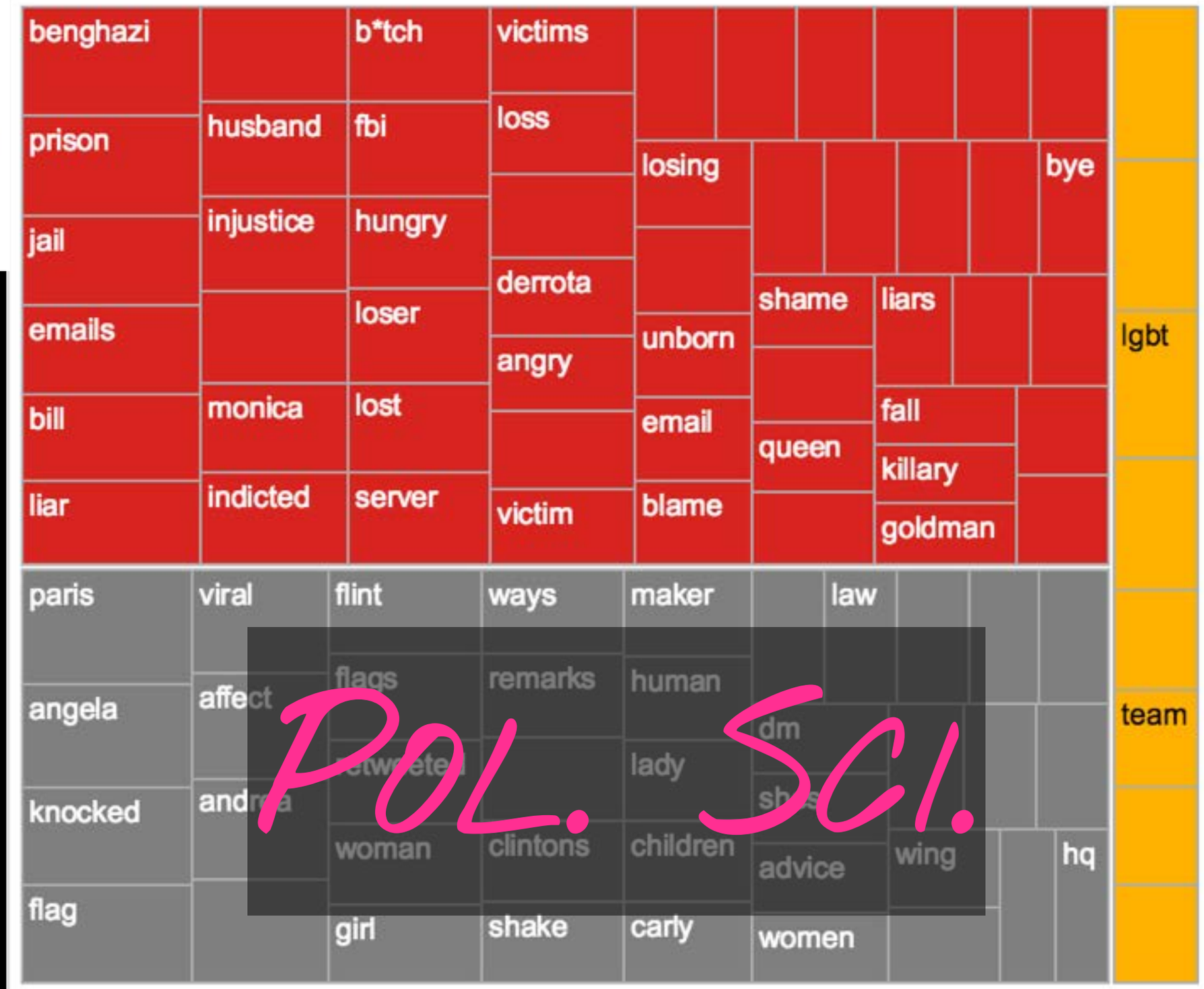
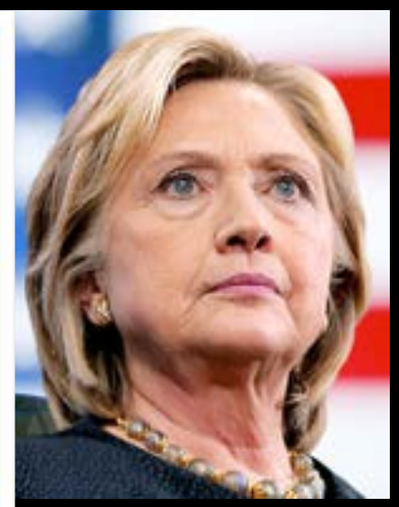
https://www.washingtonpost.com/news/monkey-cage/wp/2016/02/24/these-6-charts-show-how-much-sexism-hillary-clinton-faces-on-twitter/

Sexism in Politics







POL. SCI.

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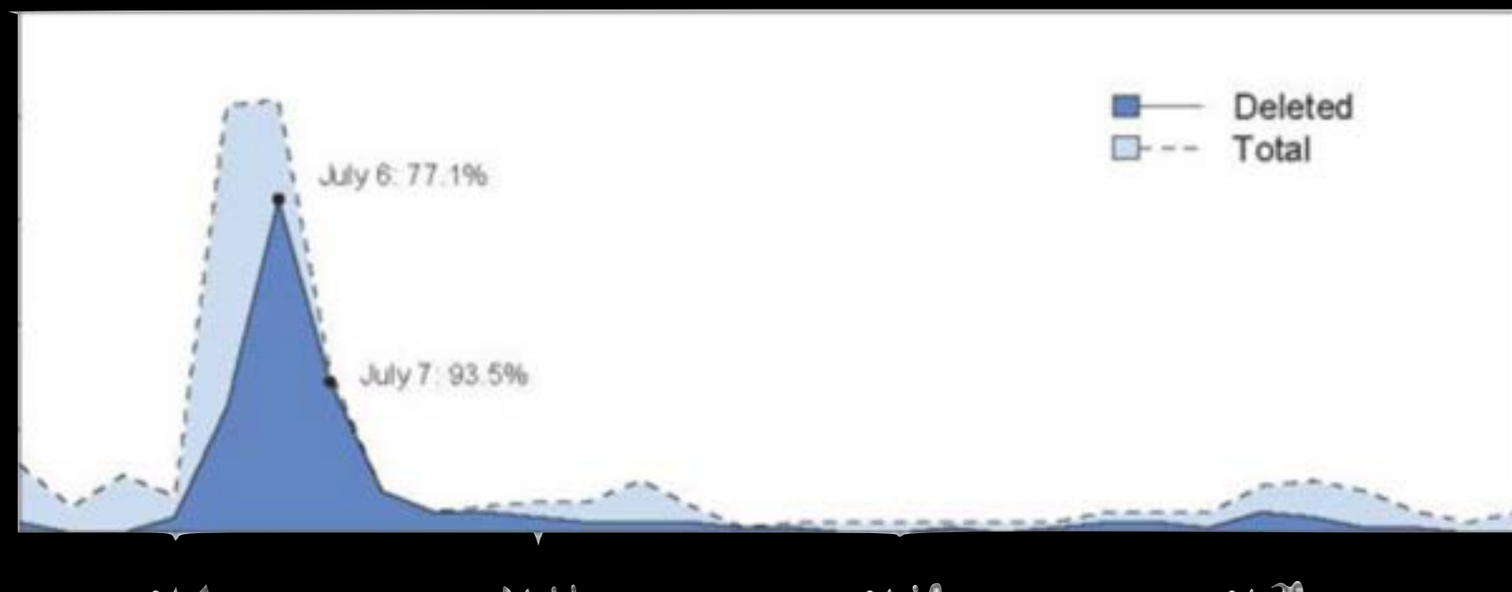
Bamman et al. (2012)

Censorship



POL. SCI.

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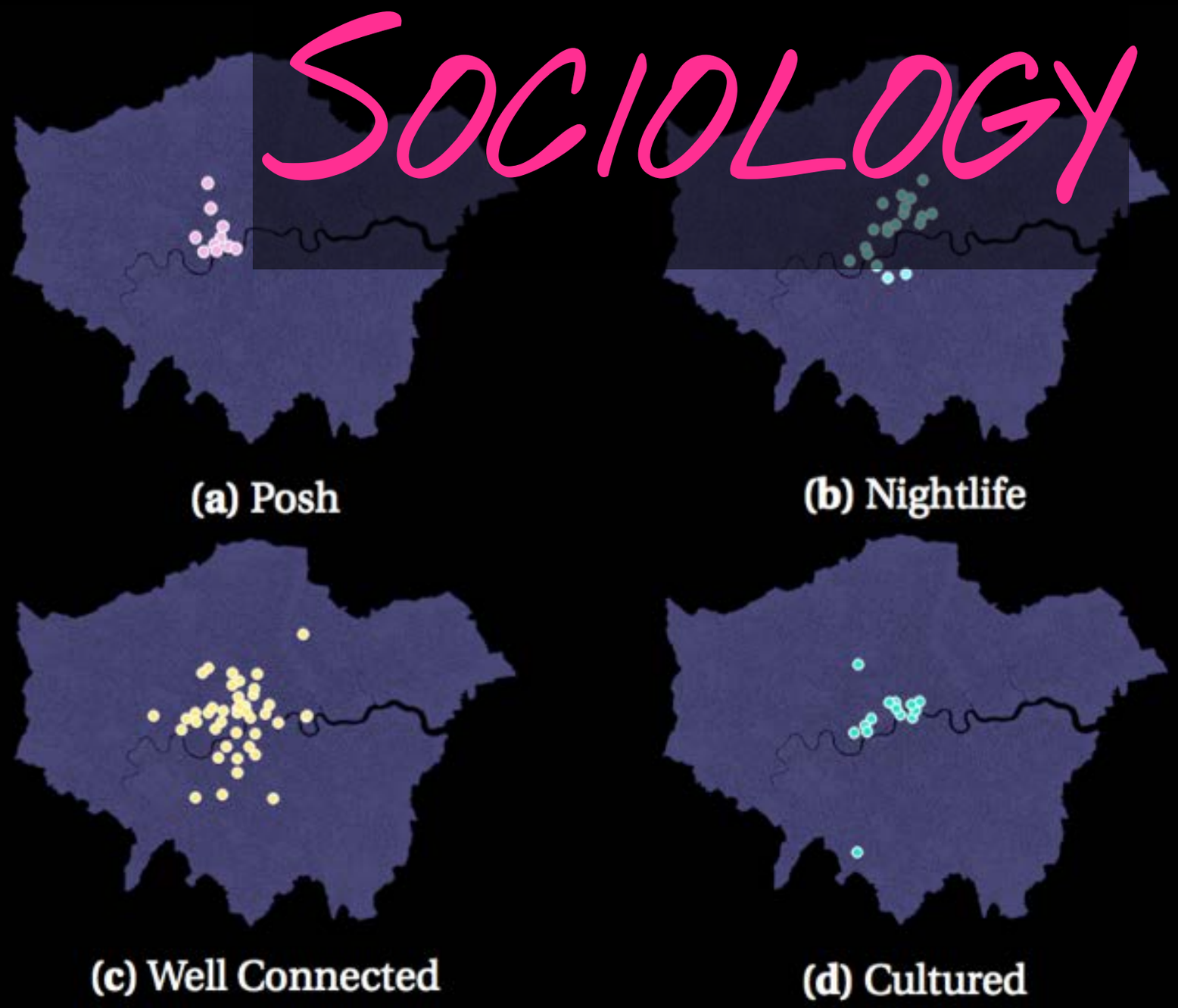
Saeidi et al., 2017

Neighborhoods

Q: What area of London should i live in?

A: Cool areas to live in at the moment are: / Clapham / Balham / Battersea / Hoxton / Camden



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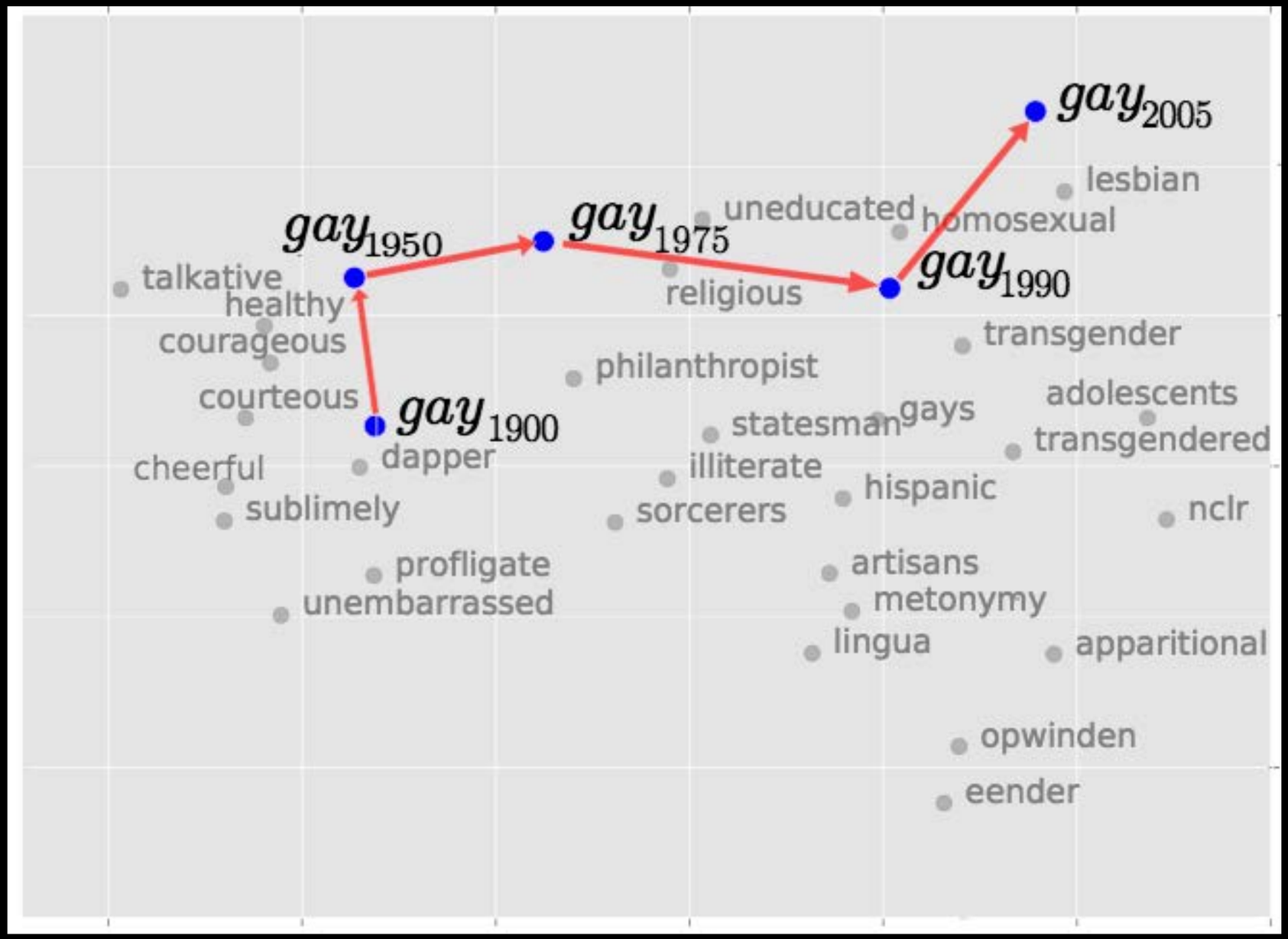
Kulkarni et al., 2014

Language Change



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Hovy/Johannsen (2016)

Measuring Language Variation

SOCIOLINGUISTICS

Humboldt Explorer Search About Contact

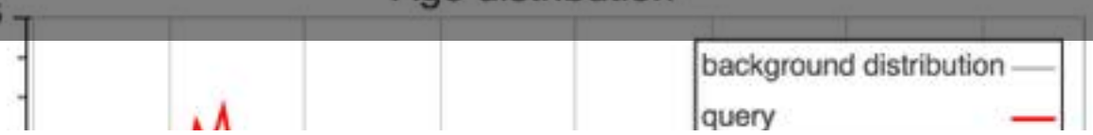
Your search for *træls* found 2,794 results.

Note that we don't have the same amount of information for every demographic factor, so even though there might be enough data to display, e.g., a gender distribution, there might not be enough information to compute an age distribution.

Age and gender

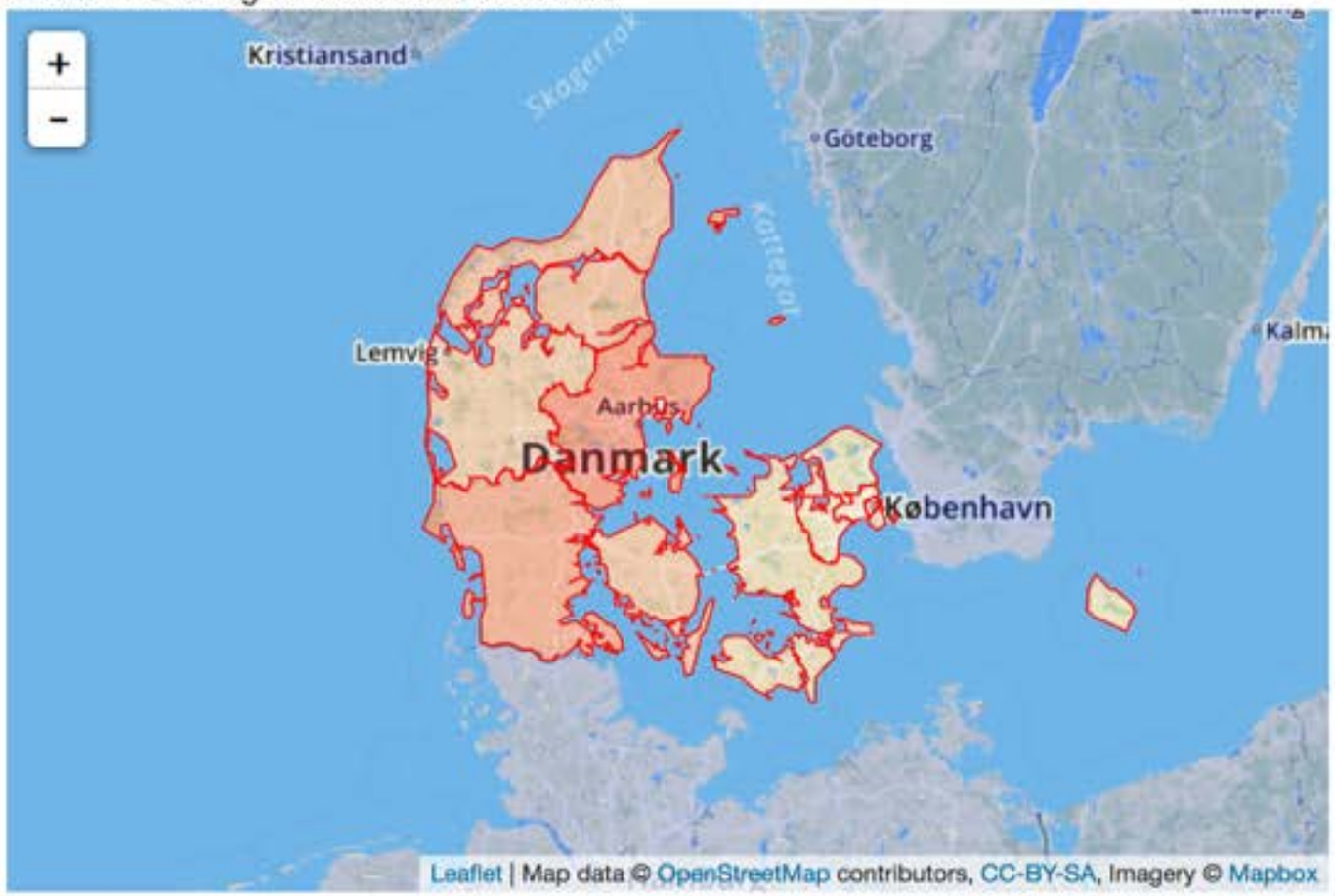
Gender distribution

Age distribution



Total records with NUTS information: 1,048

The map shows the percentage of records for each NUTS region that use the term *træls*.

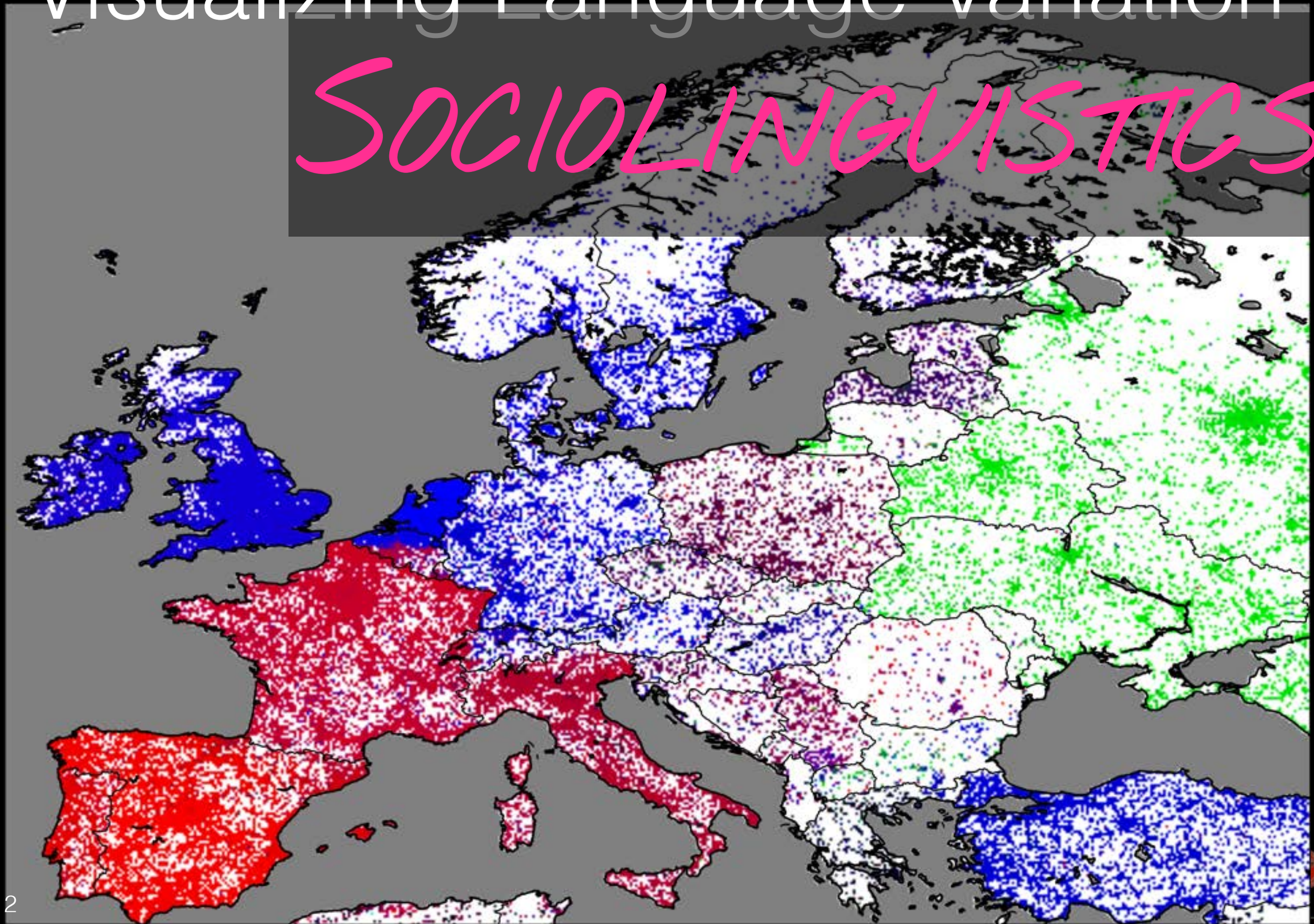


The term is used more frequently than average in following regions: Byen København (DK011), Fyn (DK031), Nordjylland (DK050), Sydjylland (DK032), Vestjylland (DK041), Østjylland (DK042) (the ratio of term in the vocabulary of these regions is larger than the average ratio across regions).

www.languagevariation.com

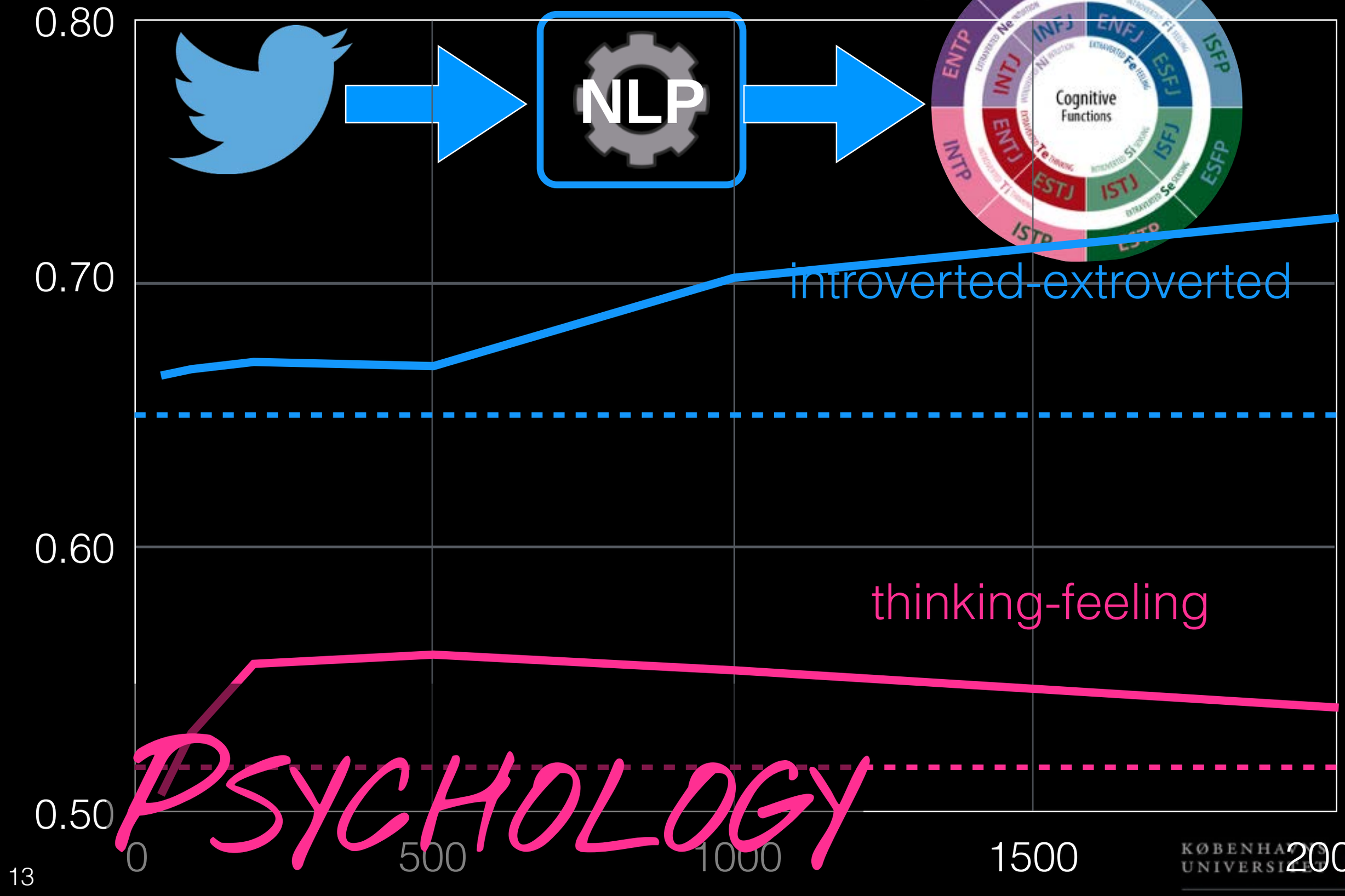
Visualizing Language Variation

SOCIOLINGUISTICS



Plank & Hovy (EMNLP 2015)

Personality



The Transparent User

age	Rosenthal and McKeown, 2011; Nguyen et al., 2011
gender	Alowibdi et al., 2013; Ciot et al., 2013; Liu and Ruths, 2013; Volkova et
profession	Preoţiuc-Pietro et al., 2015
income	Preoţiuc-Pietro et al., 2015b
personality	Plank and Hovy, 2015
politicalviews	Volkova et al., 2014
location	Bergsma et al., 2013; Rahimi et al., 2016

PSYCHOLOGY

Workshop on NLP and Computational Social Sciences

@ACL

Aug 3, 2017

Vancouver, Canada

https://sites.google.com/site/nlpandcss/

@nlpandcss

That's it, NLP can help social science and business

All is great!

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…no,

really…

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Ok, so maybe there's *one* thing

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The Assumption

=

All language is i.i.d.

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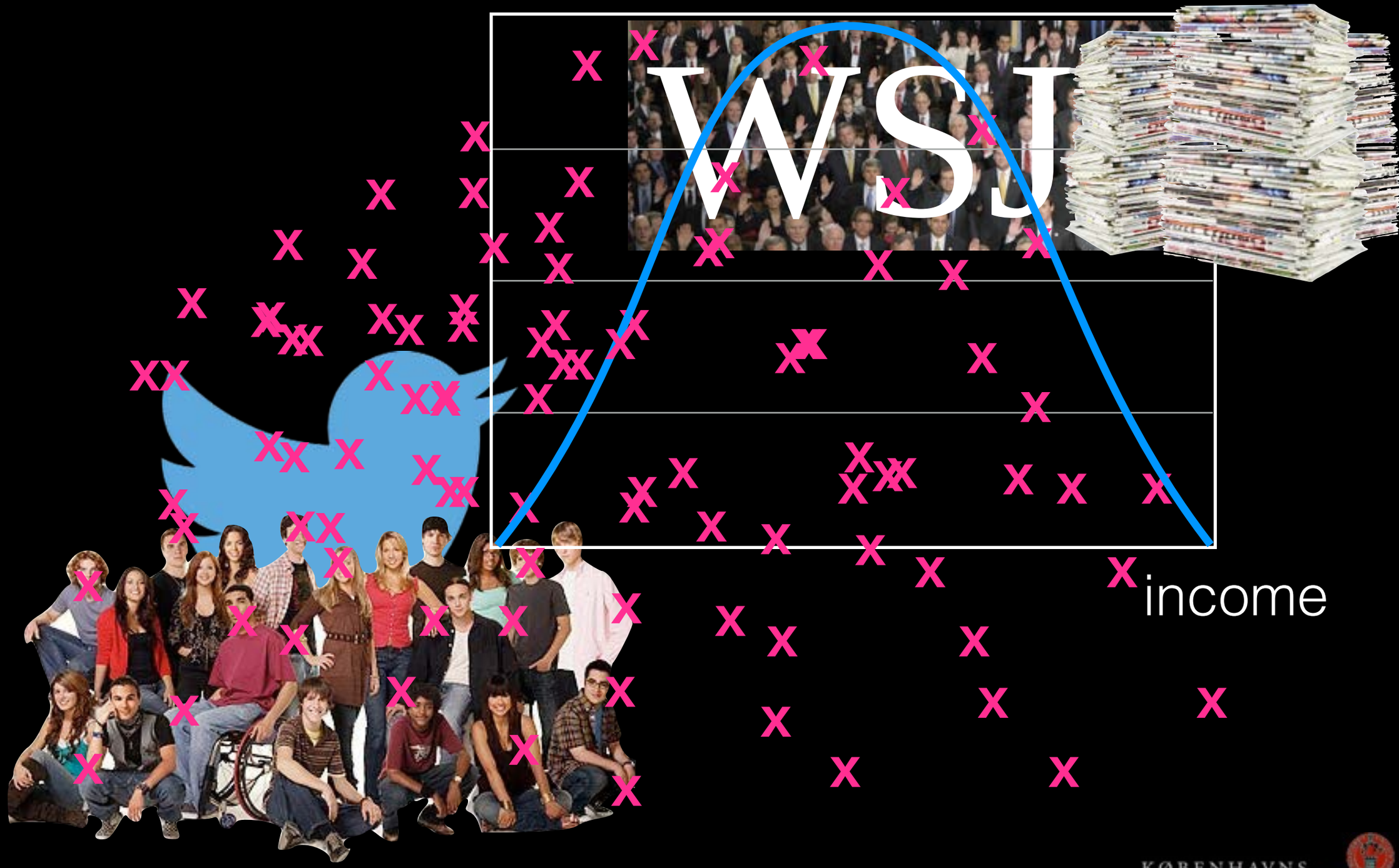
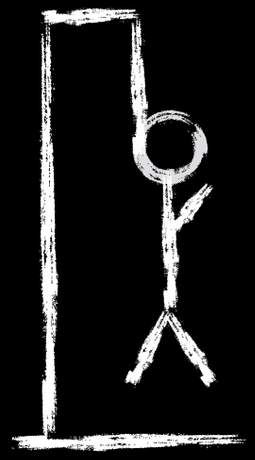
Language Distributions

age





Shannon Game

WHAT'S THE NEXT WORD?

The	house				
A	friend				
Then	dog				
If	car				
When	water			with	water
My	**hovercraft**			**of**	**eels**
He	pants			to	air
You	God			…	…
I	word				
…	…				

HOW MUCH LONGER?

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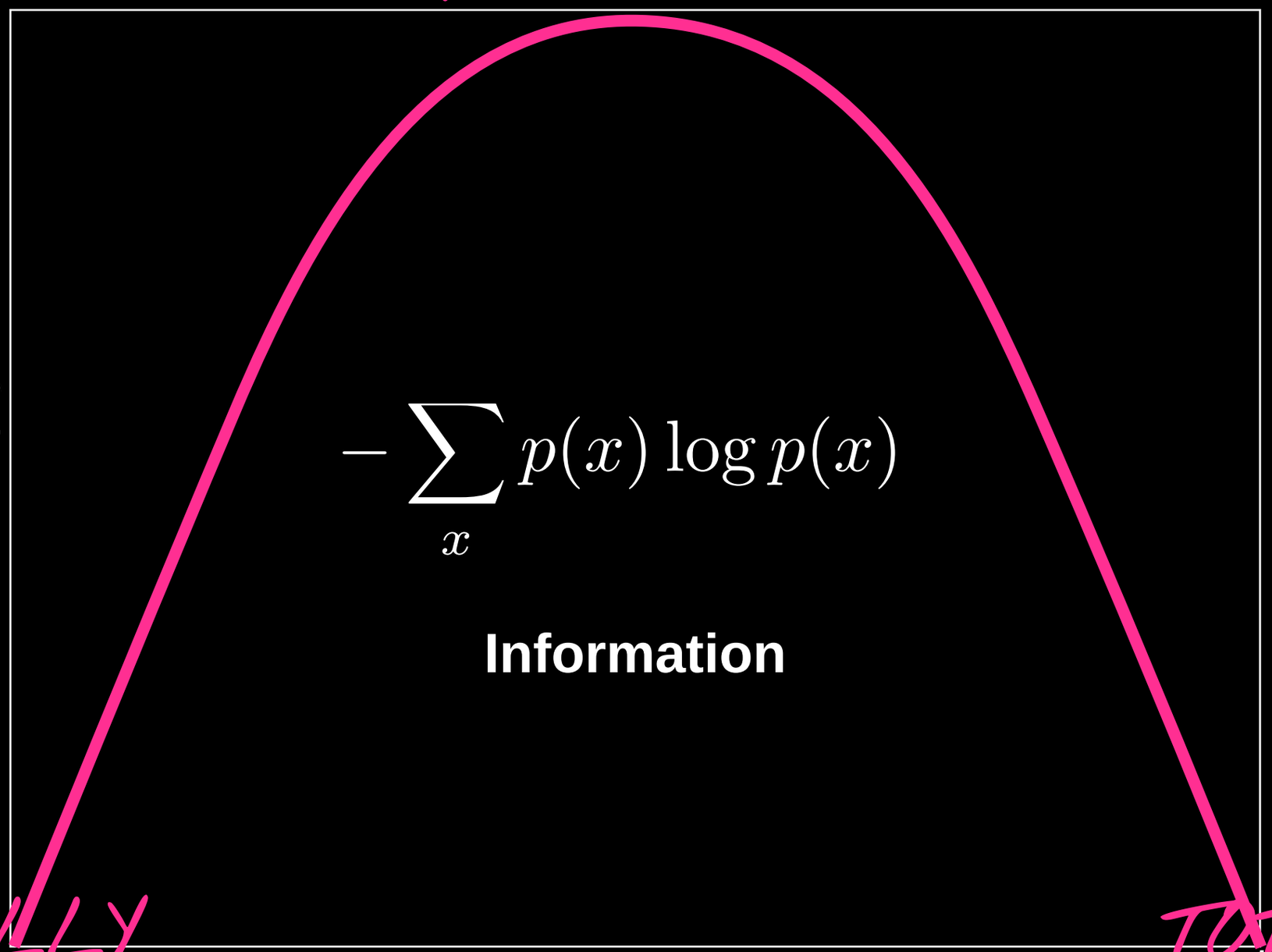
Shannon Game

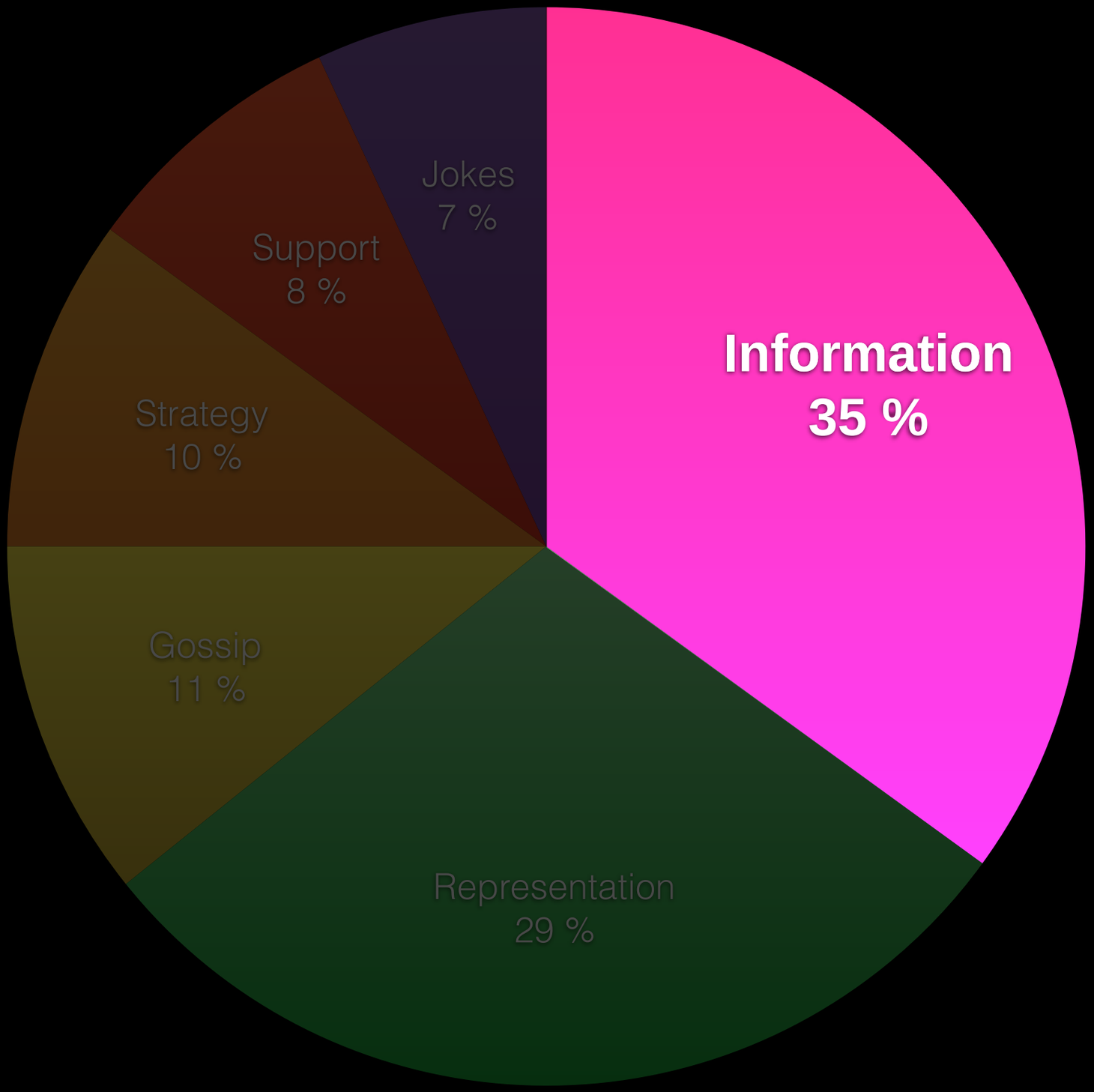
VERY SURPRISING



TOTALLY PREDICTABLE

TOTALLY PREDICTABLE

Language



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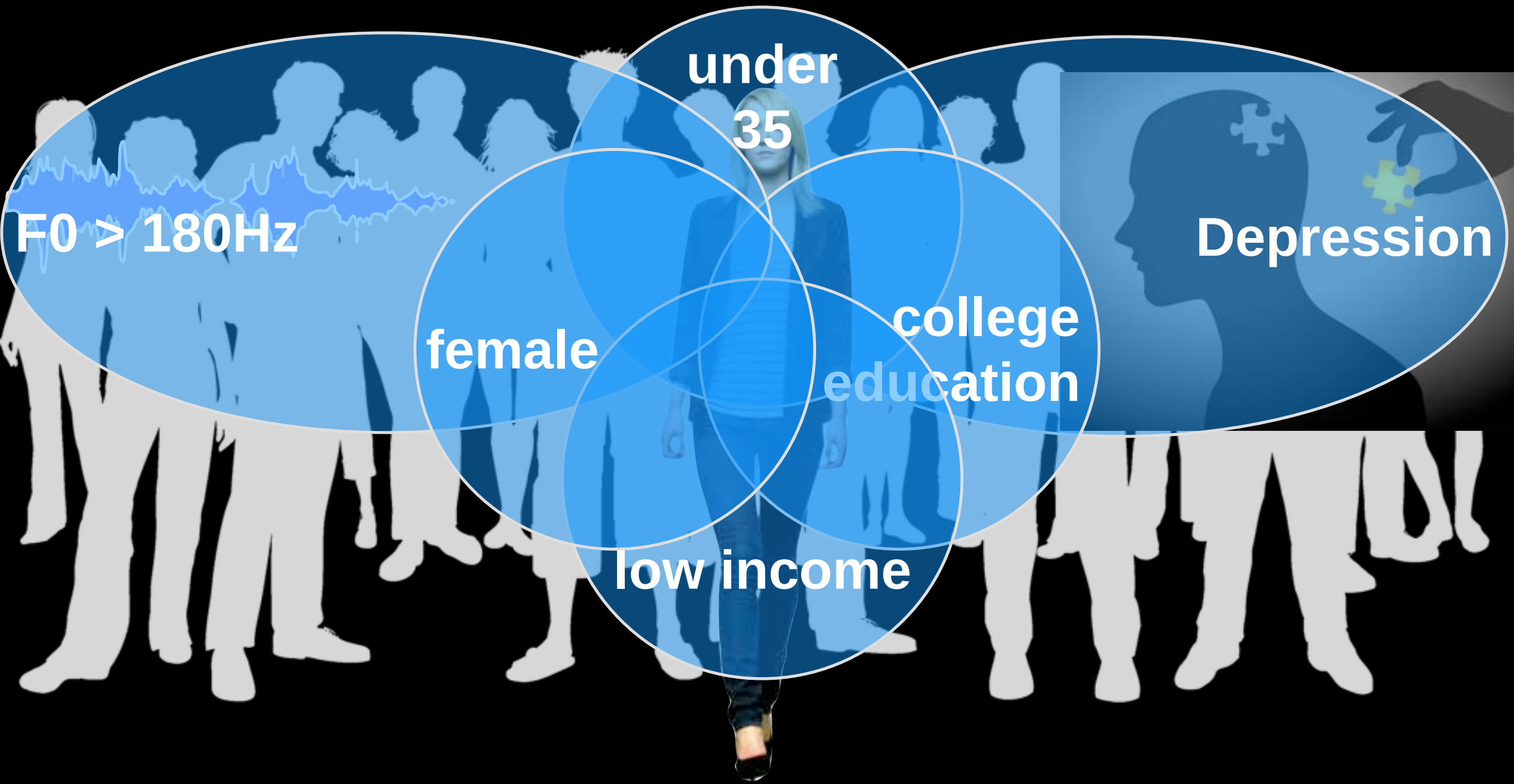
Nguyen et al., 2011; Alowibdi et al., 2013; Ciot et al., 2013; Liu and Ruths, 2013; Volkova et al., 2014; Volkova et al., 2015; Plank and Hovy, 2015; Preotiuc-Pietro et al., 2015a/b

Demographics



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Jørgensen/Hovy/Søgaard, 2015
Hovy & Søgaard, 2015

The Problem

NLP performance

ADV ADV ADJ ADV

Not definitely sure yet

ADV NOUN X ADV

Not deffo sho yet

correlates w/ demographics

distance from “standard”

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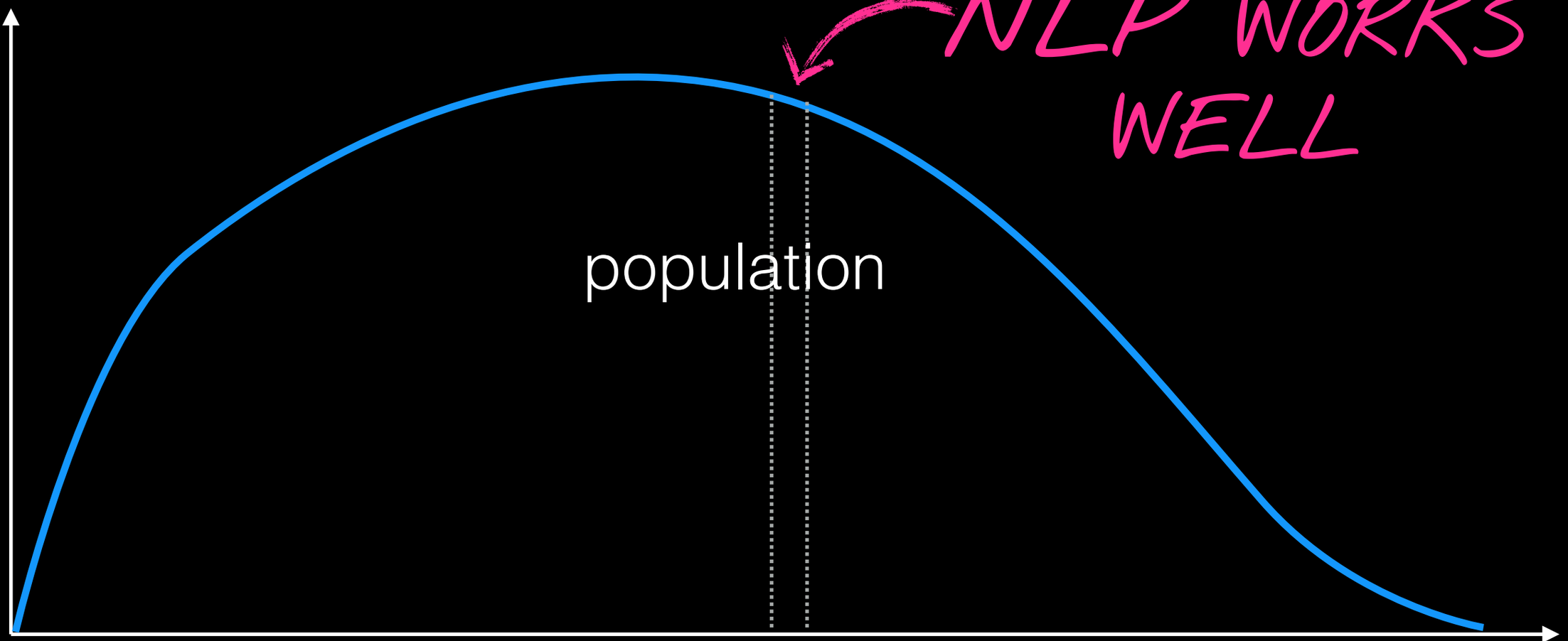
The Consequences



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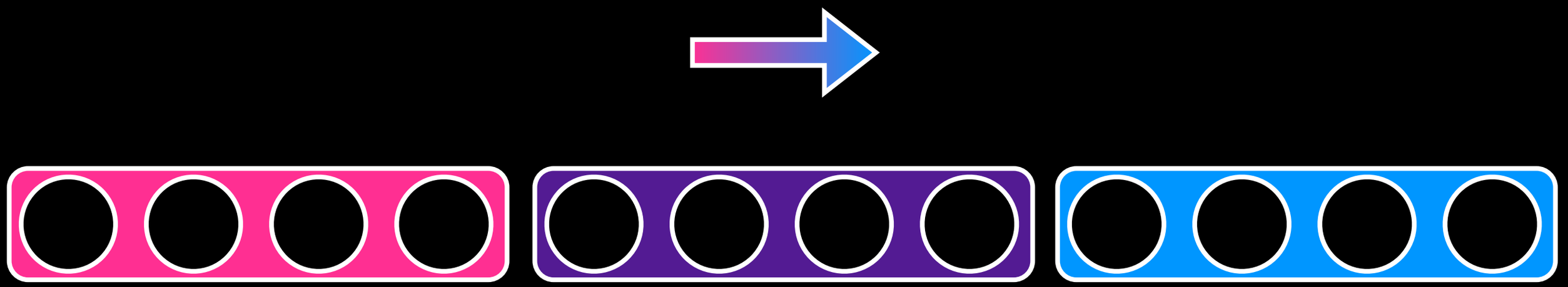
More D

HOW CAN WE ADD EXTRA-LINGUISTIC INFO TO NLP MODELS?

Hovy (ACL 2015)

Improving NLP with Demographic Information



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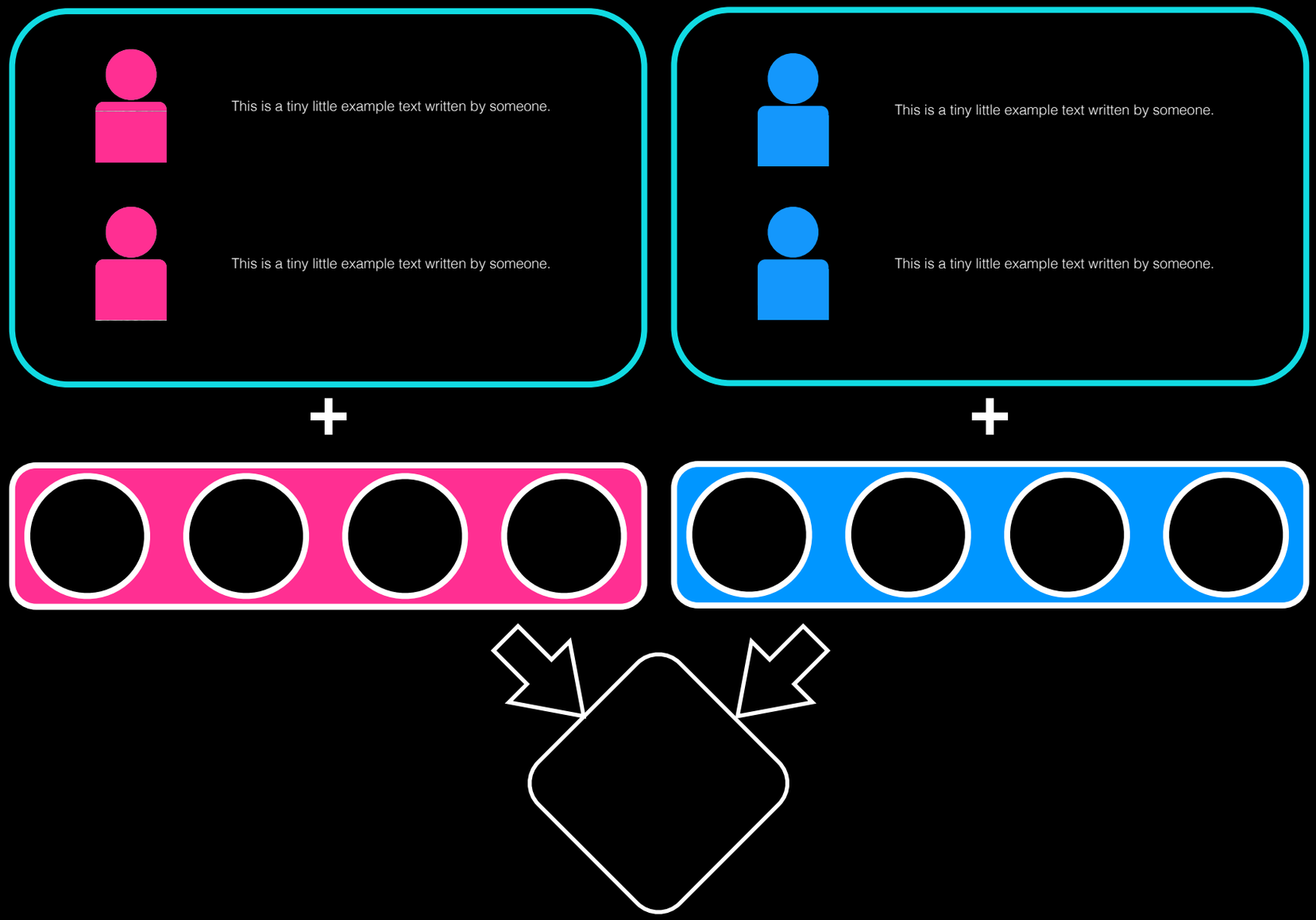
Example 1:

Text Classification



Data

, 2 genders, 2 age groups

task	labels	train	test
topic classification	5	739k 126k	493k 84k
sentiment analysis	3	345k 72k	230k 48k
age/gender classification	2	301k 301k	201k 201k

Hovy (2015)

Embeddings

This is a tiny little example text written by someone.

This is a tiny little example text written by someone.

This is a tiny little example text written by someone.

This is a tiny little example text written by someone.

This is a tiny little example text written by someone.

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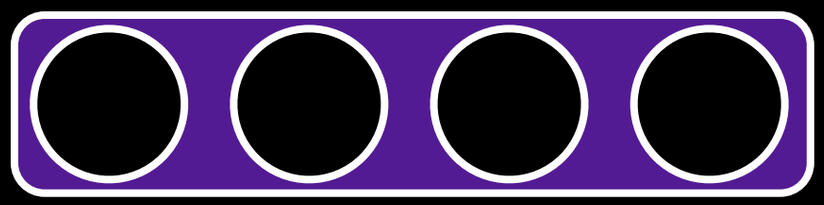
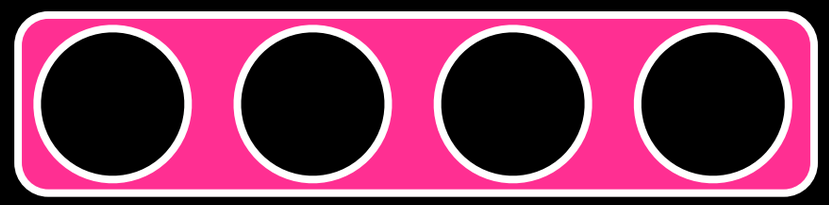
Hovy (2015)

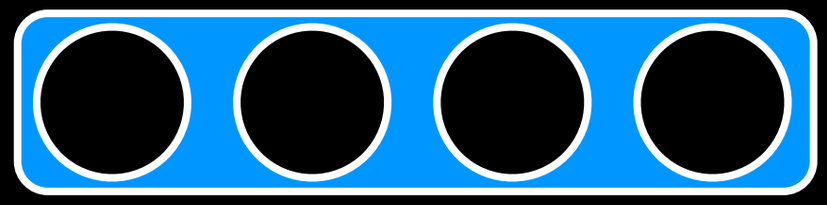
Systems

AGNOSTIC



INFORMED





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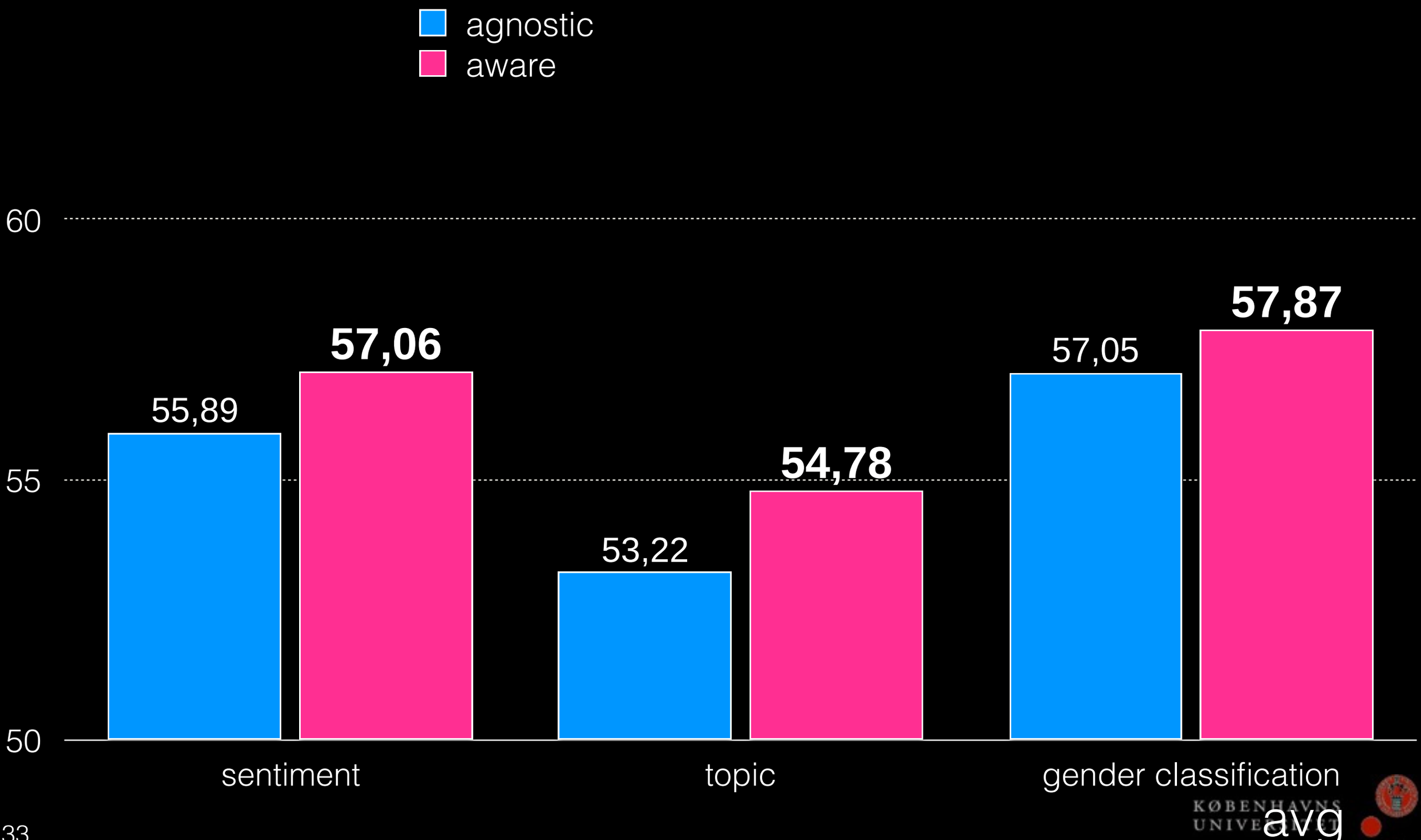
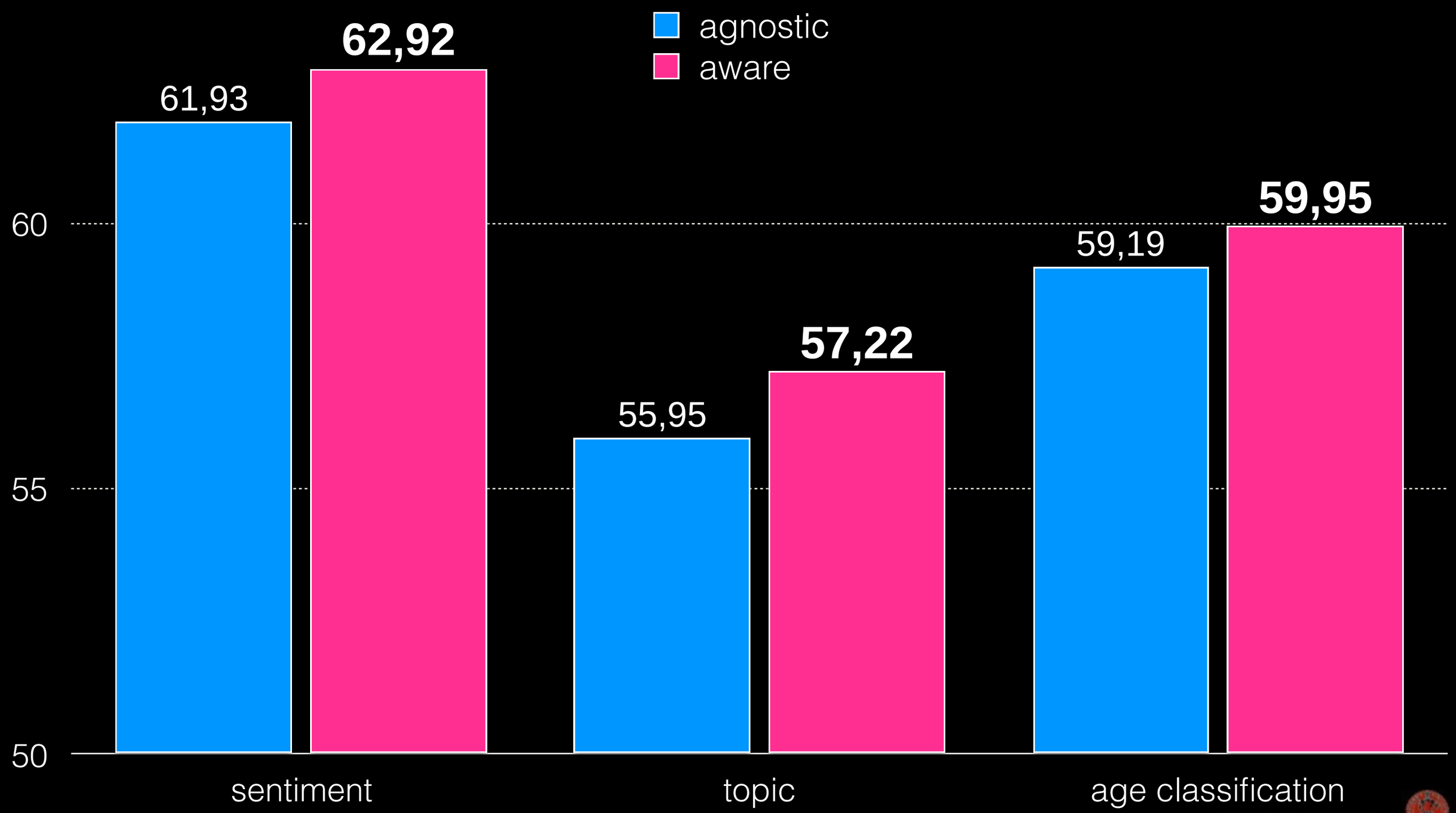
Results for Age (avg)



Hovy (2015)

Results for Gender (avg)



avg

Benton, Mitchell & Hovy (EACL 2017)

Example 2:

Multitask Learning for Mental Health Conditions

Mental Health Risk Prediction

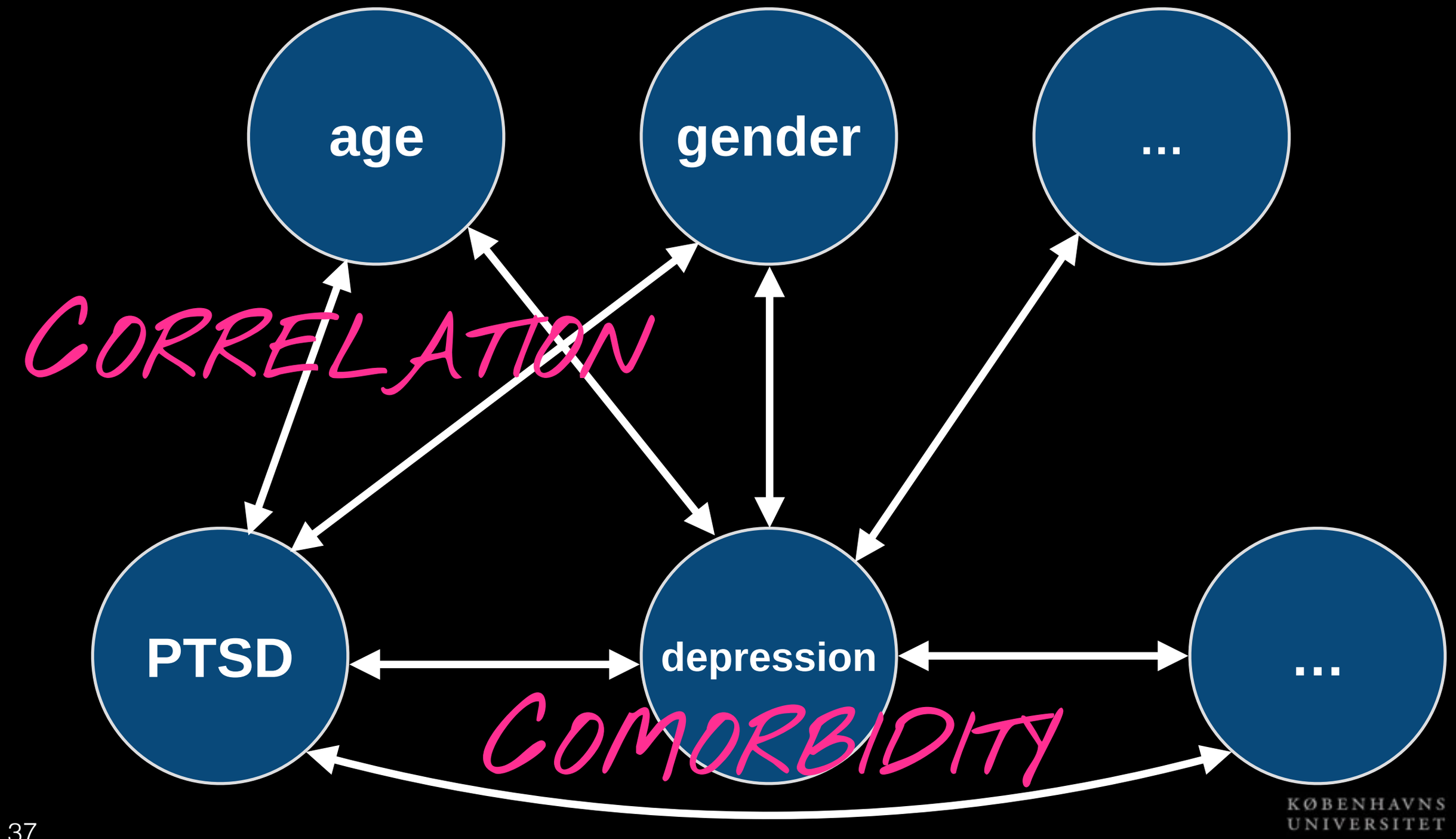
NLP

PSYCHOLOGISTS

stigma
availability
accuracy/FN

suicide?

Comorbidity and Correlation



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Motivation from “The Karate Kid”

Single-task Learners (STL)

Multitask Learner (MTL)

Data

Task	N
Neurotypicality	4791
Anxiety	2407
Depression	1400
Suicide attempt	1208
Eating disorder	749
Schizophrenia	349
Panic disorder	263
PTSD	248
Bipolar disorder	191
All	**9611**

+GENDER

1101

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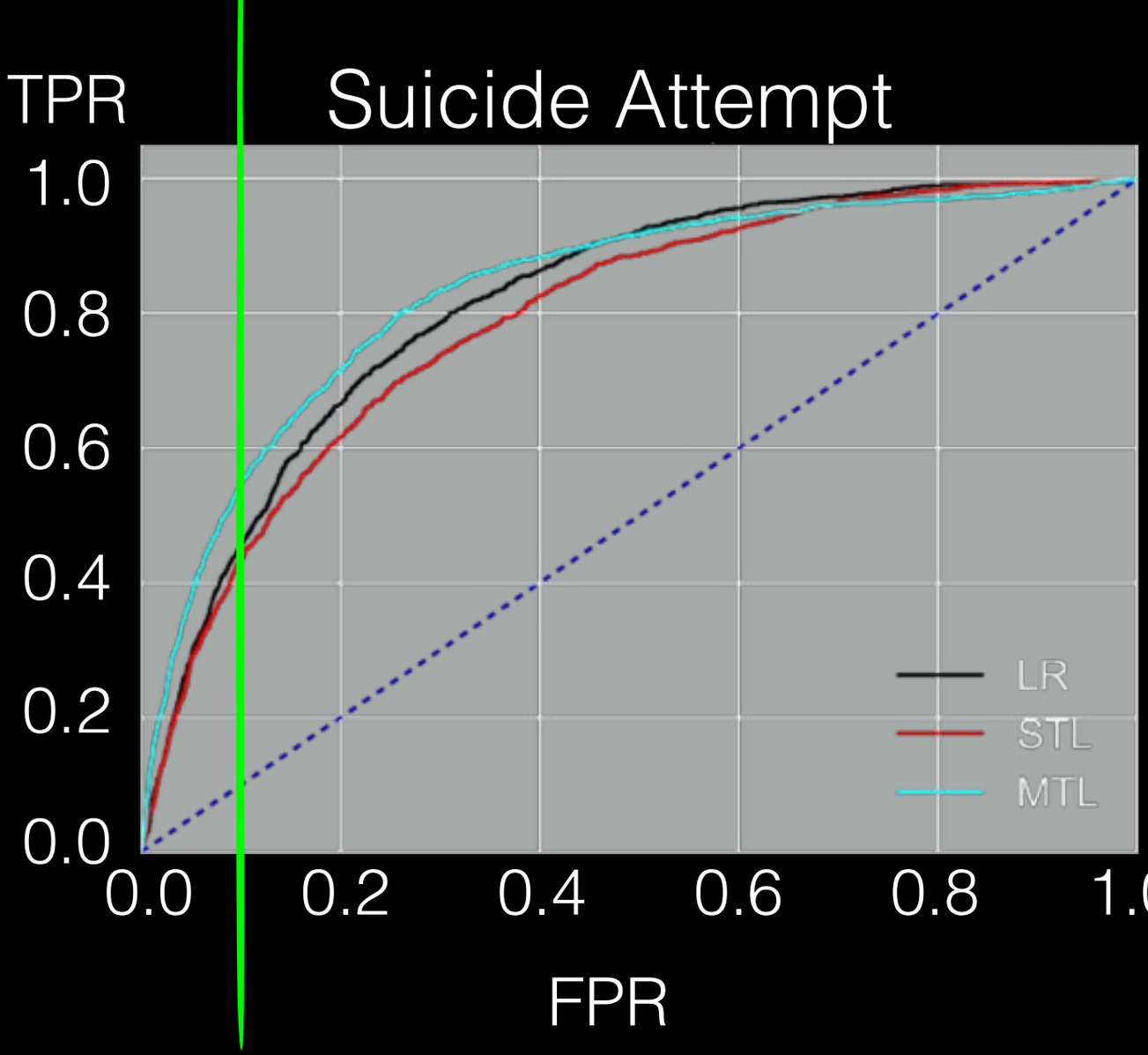
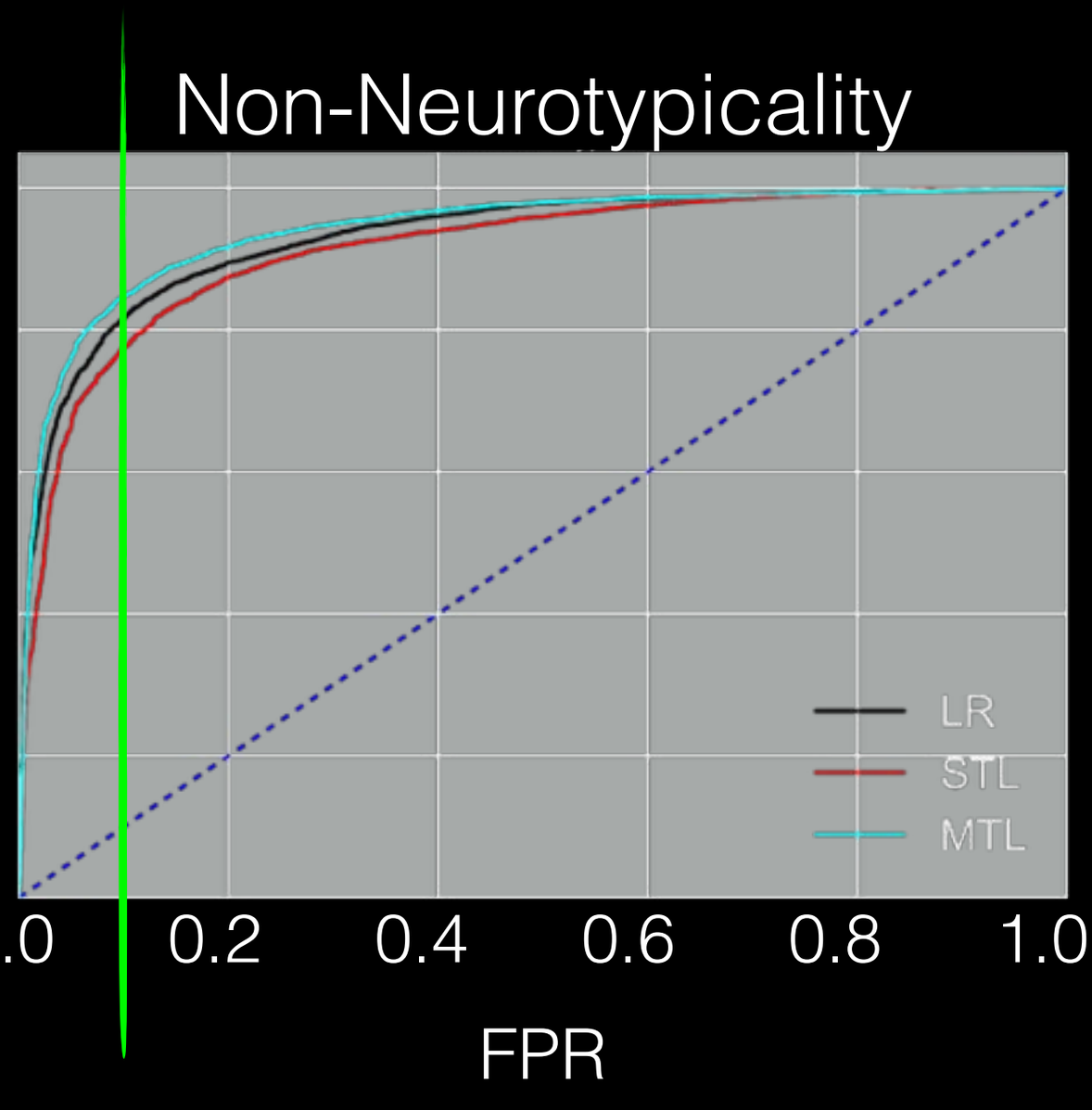
Results ROC





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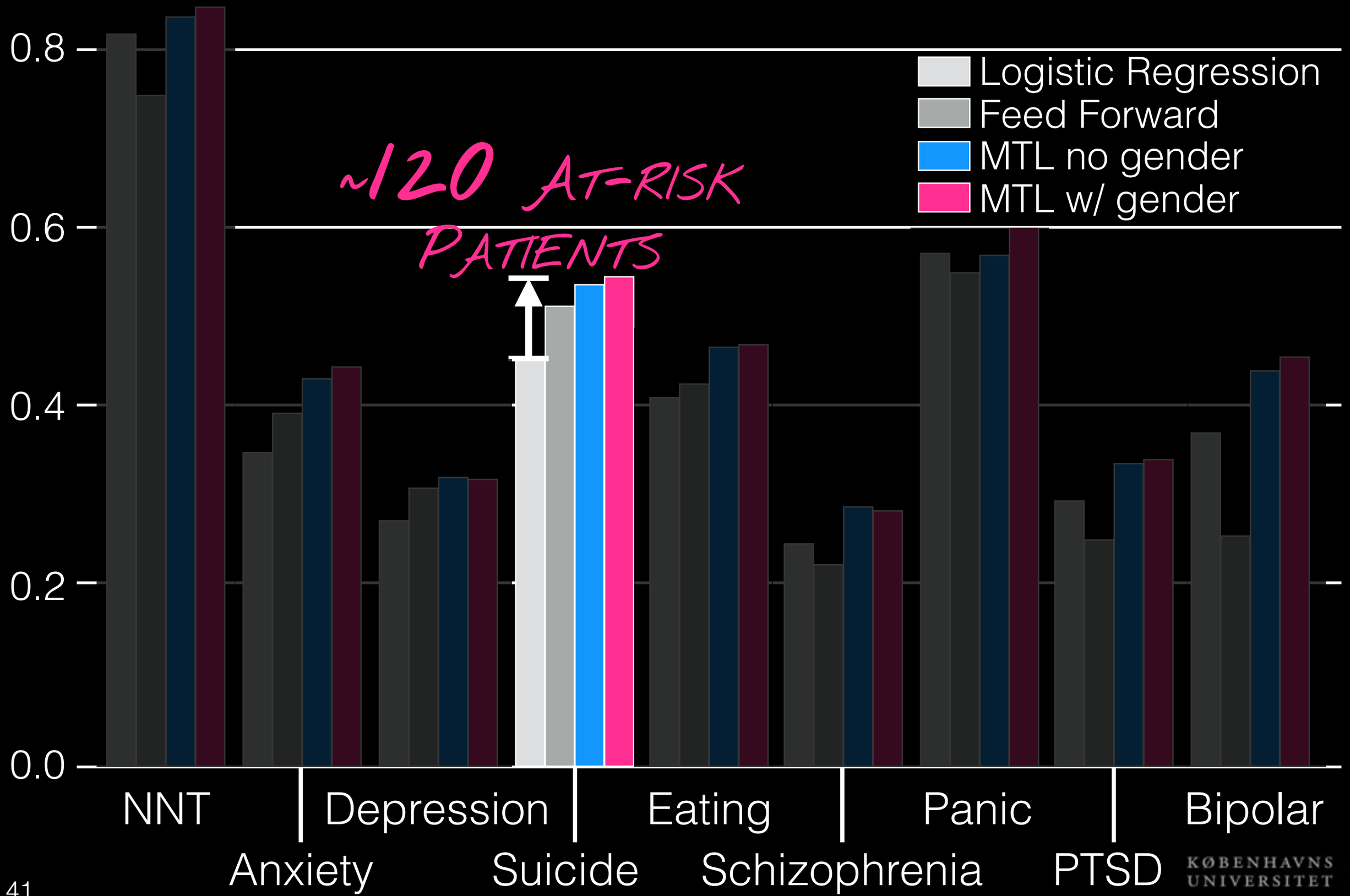
Results: TPR@FPR=0.1



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So then all is good, right?

...right?

Challenges

Hovy & Spruit (ACL 2016)

Ethics and NLP

35 male German college education ??????????

Exclusion

Exposure

Overgeneralization

Dual Use

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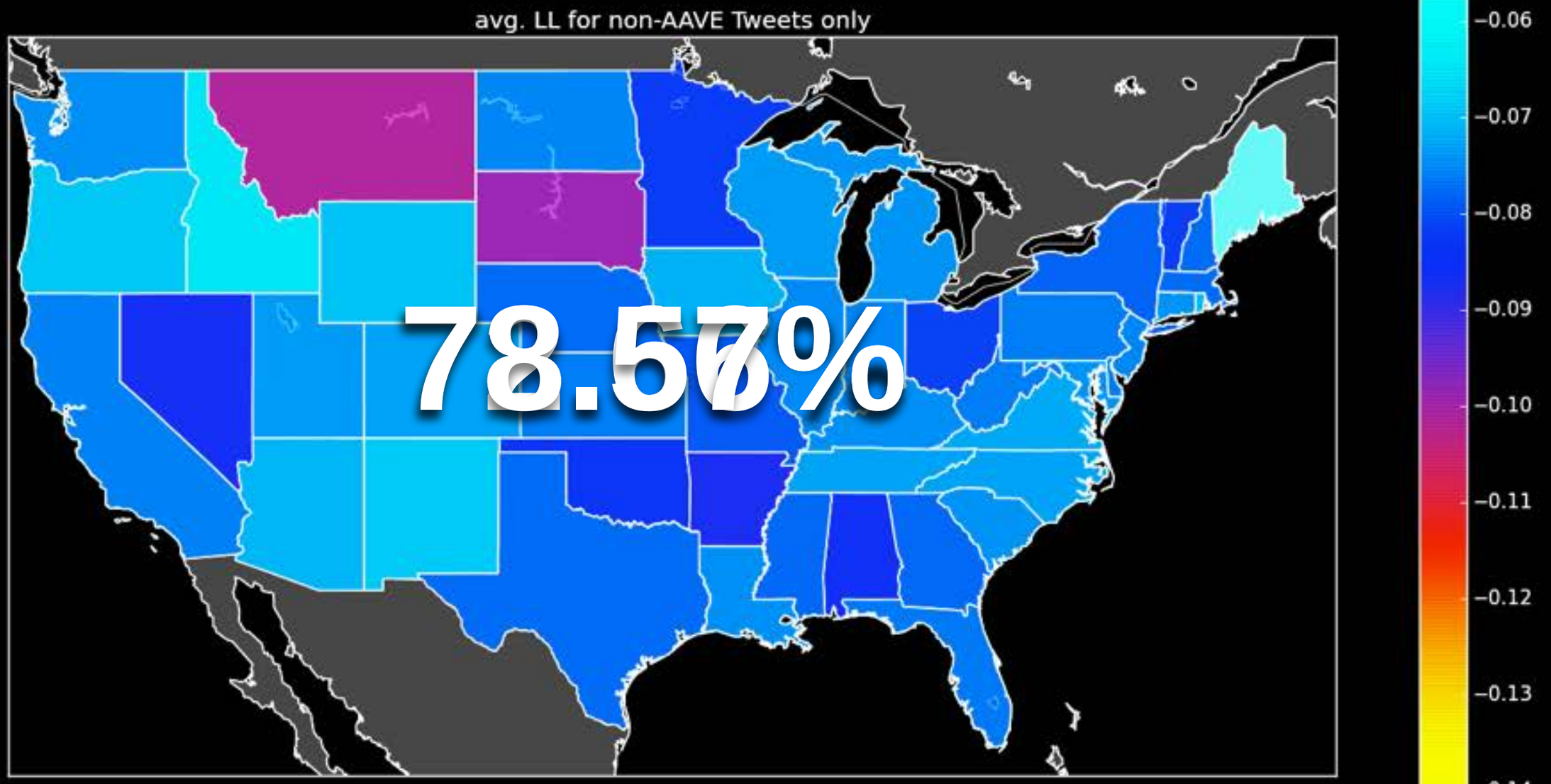
Exclusion

street -> skreet
brother -> brotha



Hovy/Søgaard (ACL 2015)

Exclusion

accuracy

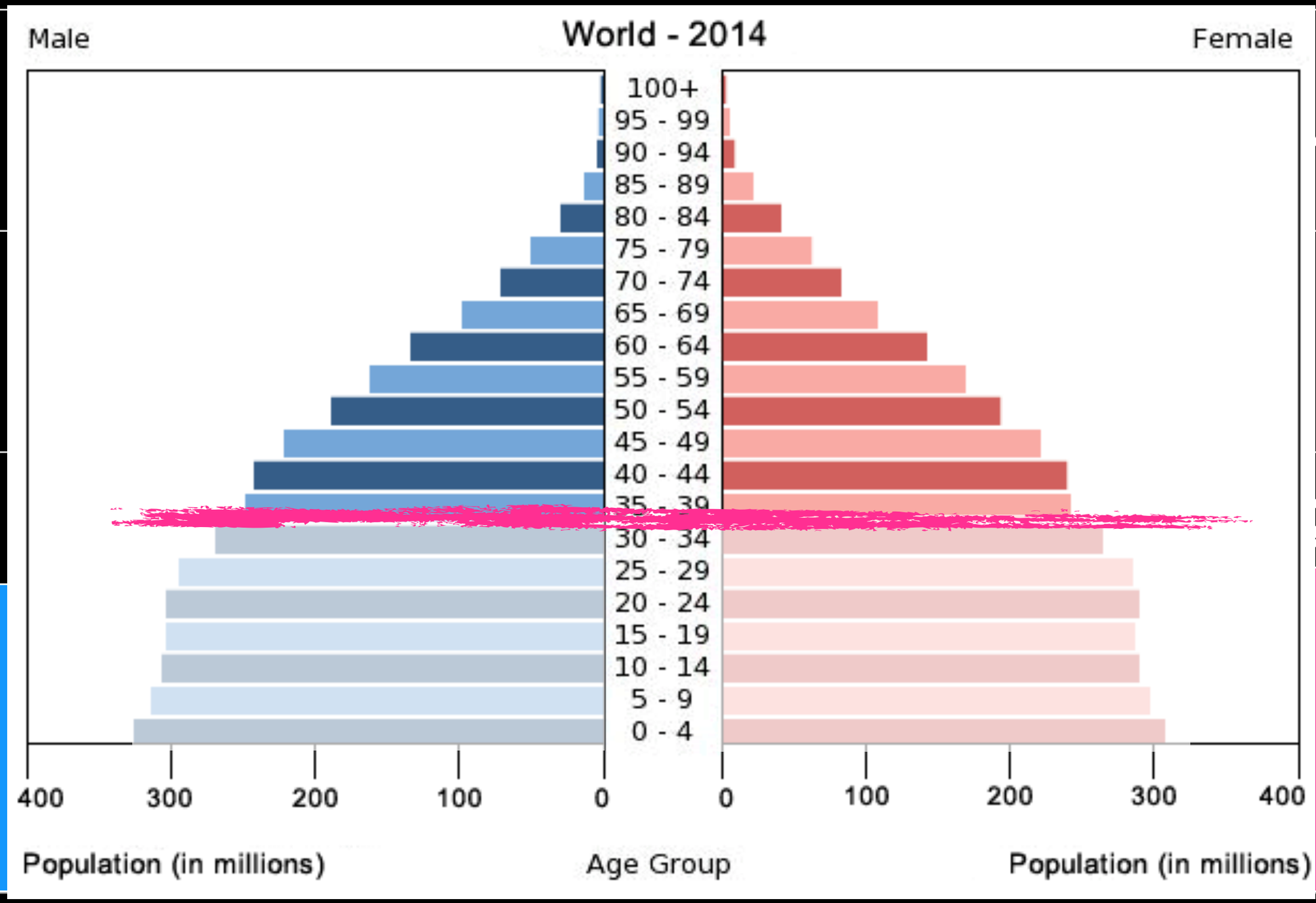
100

95

90

85

80



ing

views

ned

2

O45

U35

O45

U35

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Hovy/Spruit, 2016

Overgeneralization

False Positives

Aug 6 2016

Dear Ms Hovy,

Congratulations on reaching retirement age!

Also, you're on a no-fly list because of your political views and religious beliefs.

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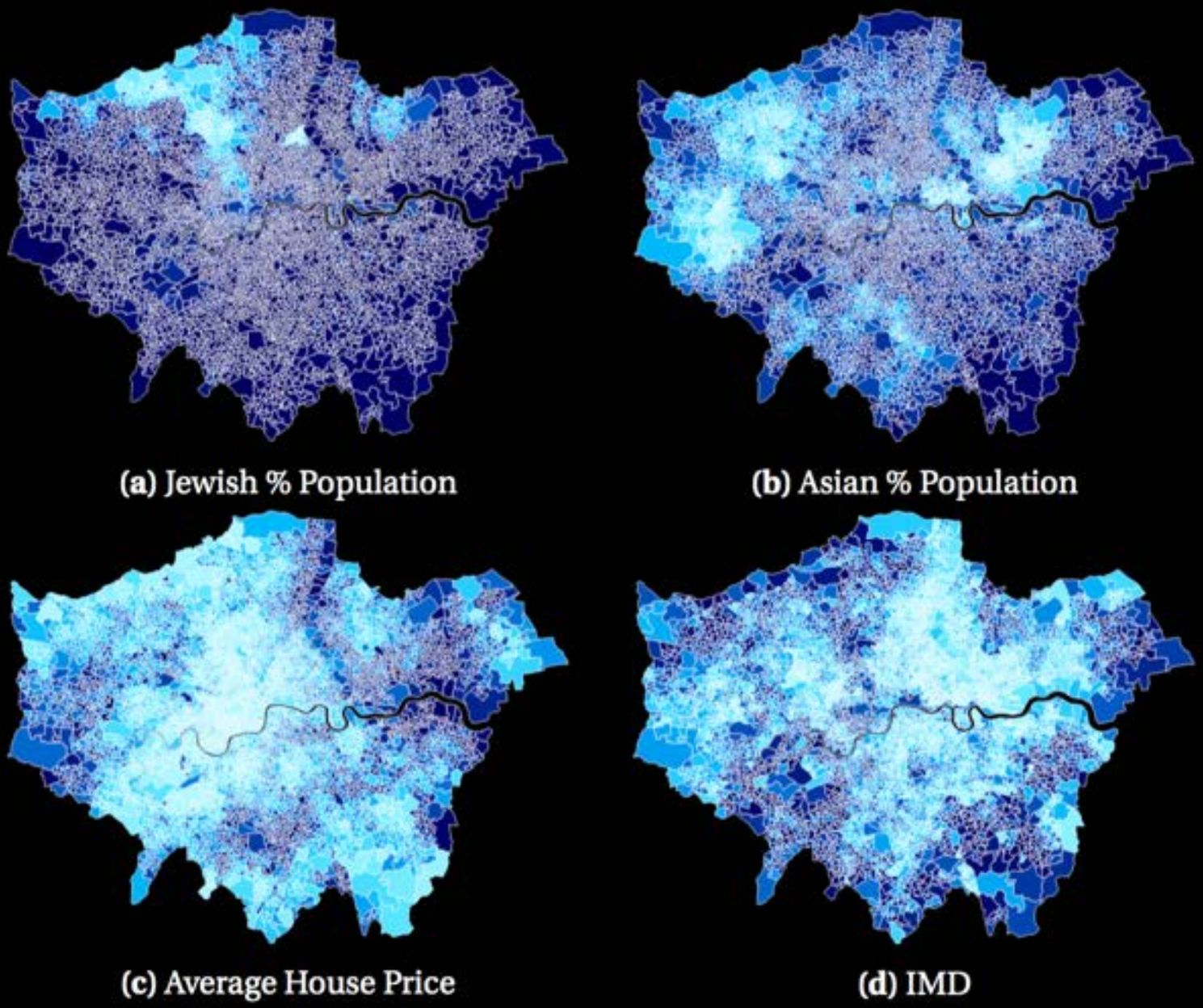
Saeidi et al., 2017

The Signal and the Noise



violent	0.44
gang	0.43
drug	0.42
rob	0.4
danger	0.39
knife	0.39
integration	0.38
black	0.38
boy	0.38
evenly	0.38
dangerous	0.37
stab	0.37

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Waseem/Hovy, 2016

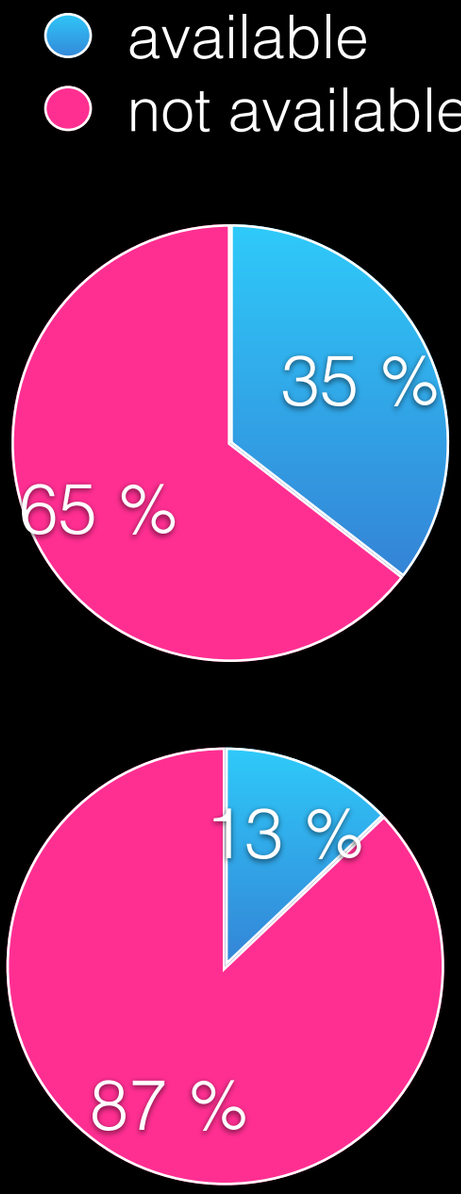
Hate Speech Detection

Abusive Language Workshop
ACL Vancouver, *Aug 4 2017*

Hovy/Spruit, 2016

Exposure

Underexposure

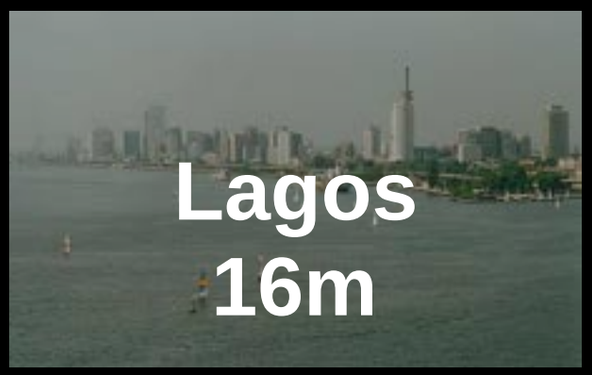


treebanks

semantic resources

evaluation

Overexposure



sentiment analysis

discourse parsing

bias

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Hovy/Spruit, 2016

Dual Use

	Pro	**Con**
authorship attribution	historical documents	dissenter anonymity
text classification	sentiment analysis	censorship
personalization	better user experience	tailored ads

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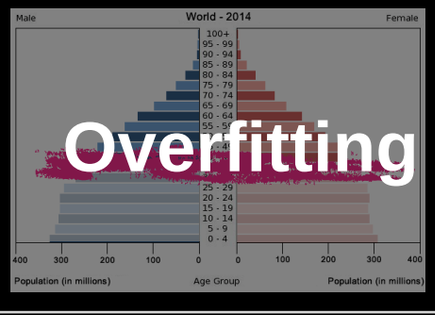
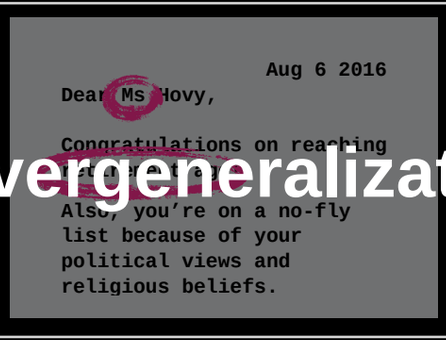
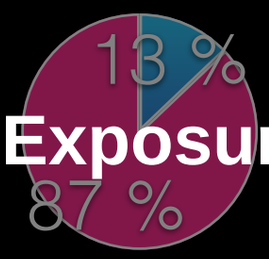
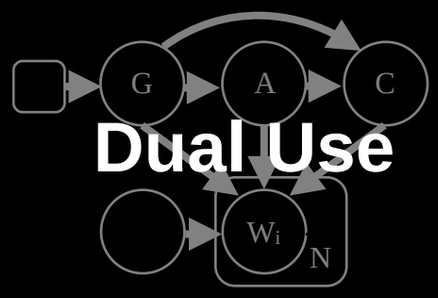
Hovy/Spruit, 2016

What can we do?

Problem	Source	Countermeasures
 **Overfitting**	data selection	regularization, priors, sampling
 **Overgeneralization**	models	dummy labels, error weighting, confidence thresholds
 **Exposure**	research design	consider possible impact
 **Dual Use**	community goals	educate users, keep discussion going

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Slow internet, fast access version is here: http://www.ethicsinnlp.org/workshop/program.html

Twitter Hashtag:
#EthNLP

Ethics
in Natural Language Processing

A Workshop at EACL 2017

4.April.2017
Valencia, Spain

Previous
Updates

http://www.ethicsinnlp.org/

Wrapping up

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Conclusion

- social media + NLP = new methods for CSS
- but: NLP is more than engineering
  - language ≥ information, reflects demographics
  - accounting for demographics affects performance
- Work on social media has social impact and responsibility

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Open questions

- how do we reflect ever-changing language?
- how do we account for demographic variation?
- how do we ensure fairness?

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Thanks!

Questions?

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Workshop on NLP and Computational Social Sciences

@ACL

Aug 3, 2017

Vancouver, Canada

https://sites.google.com/site/nlpandcss/

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