GenderQuant:
Quantifying Mention-Level Genderedness

Ananya

Nitya Parthasarthi

Sameer Singh

What is Gendered Language?

Are these stereotypes?

John plays soccer every day. ✔

Ananya loves raising kids. ✔

Alexis said, "This is a nice day". ✘

Bob wants to accompany lovely *Gauri.* ✘ ✔

Gendered*ness*

If the gender of a mention can be correctly guessed from context, then the context is gendered.

For example:

████ looked untidier than ever, wearing a slatterny wrapper, hair thrust unbrushed into its net ..

FBI-agent ███ becomes an unwitting pawn of the white hand drug cartel.

In order to stifle their theatrical aspirations, ███████ arranges a screen test

Forms of Genered*ness*

Words

- Mailman, Cooking, Handsome, Ladylike, King-size, Maiden
- Women are homemakers, men are programmers.

Phrases

- He befriended a billionaire computer mogul Alex, and flight attendant Mary.

Sentences

- *Gauri* looked untidier than ever, wearing a slatterny wrapper, hair thrust unbrushed into its net …

Objectives

- Mention-level genderedness
- Capture subtle context cues

Bob wants to accompany lovely *Gauri*.

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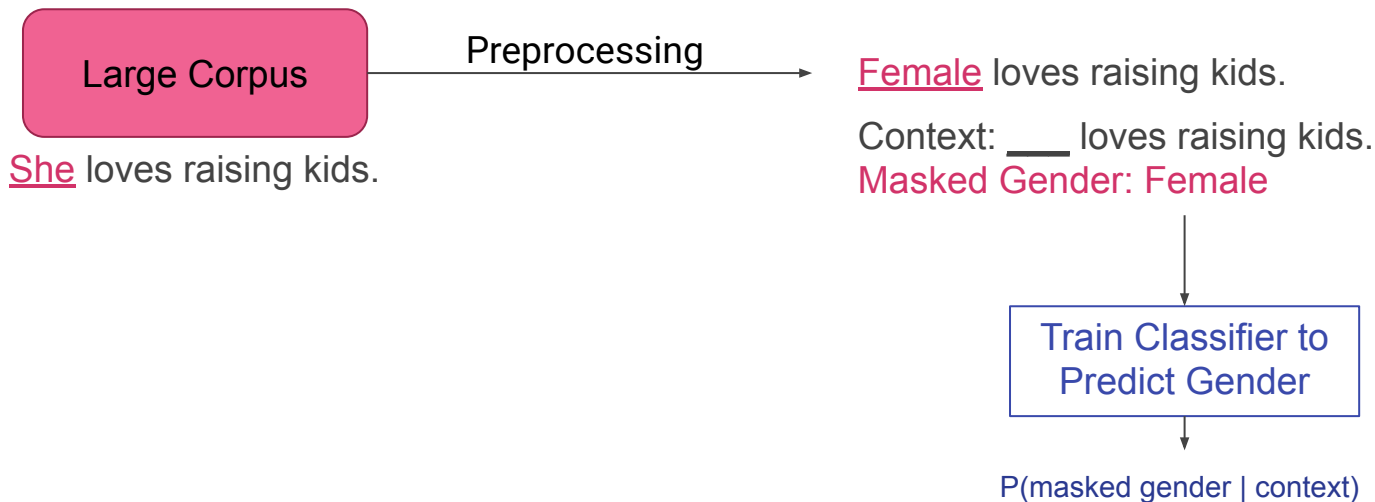- And do it without any human-annotated data!

Framework to detect genderedness

How typical is context for a gender?
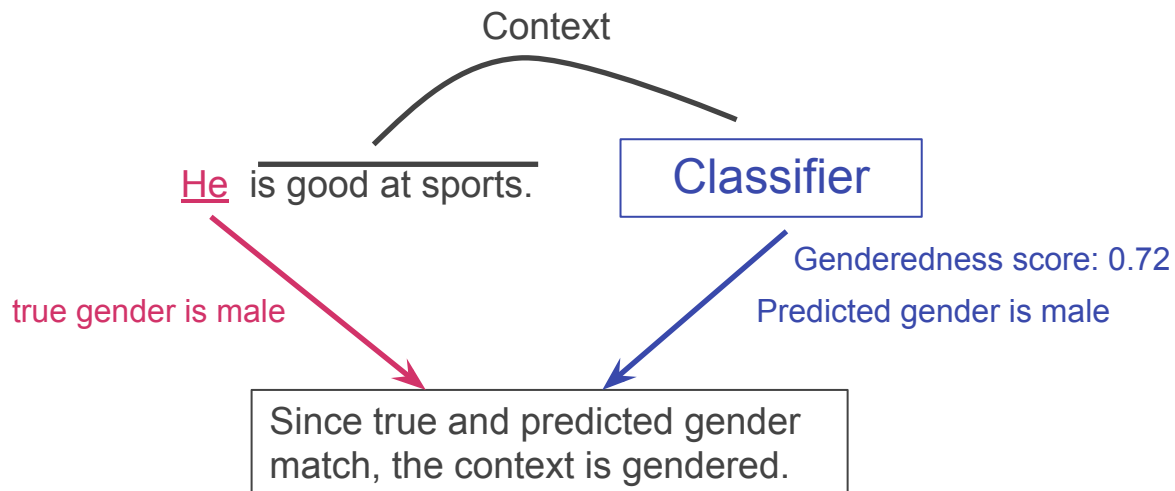
___ plays soccer every day.

___ loves raising kids.

Learning about *Typical* Contexts via Masking

Large Corpus

She loves raising kids.

Preprocessing

Female loves raising kids.

Context: ___ loves raising kids.
Masked Gender: Female

Train Classifier to Predict Gender

P(masked gender | context)

After training, the model should *know* which context is typical for which gender

Scoring Genderedness

Context

He is good at sports.

Classifier

true gender is male

Genderedness score: 0.72

Predicted gender is male

Since true and predicted gender match, the context is gendered.

Scoring Genderedness

Context

He said, 'This is a lovely day.'

Classifier

true gender is male

Genderedness score: 0.32

Predicted gender is female

Since true and predicted gender don't match, the context isn't gendered.
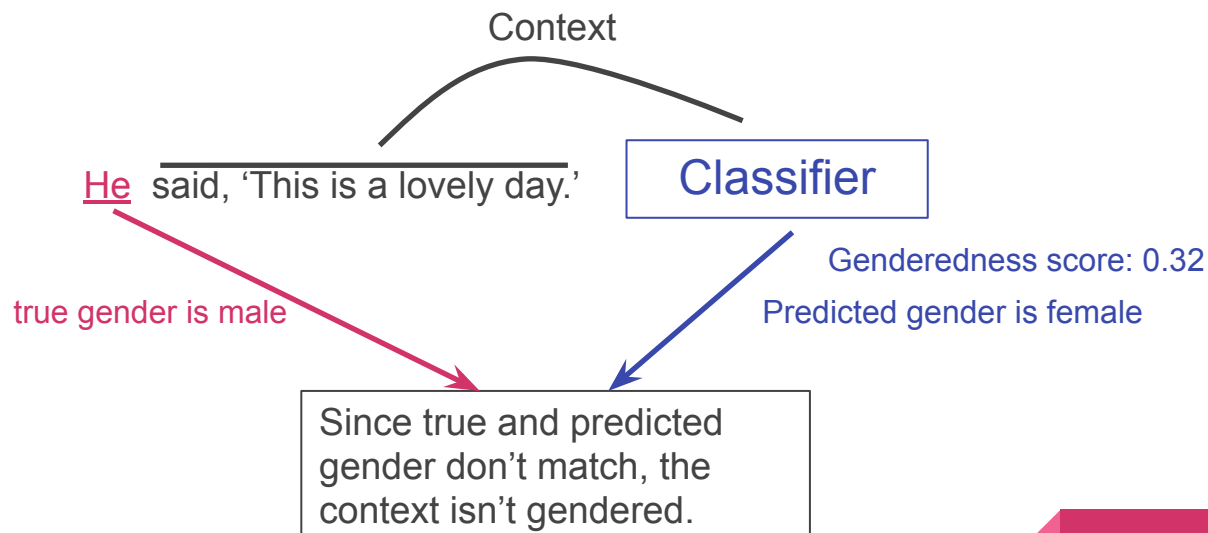
Training Details

Dataset Details

Dataset	Male Mentions	Female Mentions
Movie Reviews (IMDB)	298, 580	104, 632
Movie Summaries (CMU Dataset)	405, 368	186, 626
News Articles (NYT-Gigaword)	19, 012, 473	3, 902, 510
Novels (Gutenberg)	18, 433, 400	6, 982, 348

Masking Gender

NER identifies this as mention

1. Miss Mary Briganza will go to Korea with her parents.

Mention -> Gender

2. Miss *<female>* will go to Korea with her parents.

Remove gender information

3. *<Title> <female>* will go to Korea with *<their>* parents.

Mask gender before model

4. *<Title>* _____ will go to Korea with *<their>* parents.

How well does the classifier unmask gender?

AUC-ROC	Reviews	Summaries	News	Novels
Bag-of-ngrams	0.64	0.62	**0.70**	**0.71**
Bag-of-word	0.63	0.62	**0.70**	**0.71**
2-way LSTM	**0.67**	**0.66**	0.68	**0.67**
2-way LSTM + ELMo	0.65	0.65	**0.70**	0.69
CNN	0.66	0.64	0.68	0.64

How well do humans do?

Human Predictions

Legend: Female (magenta), Male (blue)

Bar chart showing human predictions across categories:
- Extremely male: ~100 (mostly male/blue)
- Likely male: ~420 (male ~270, female ~150)
- Neutral: ~510 (male ~240, female ~270)
- Likely female: ~140 (male ~50, female ~90)
- Extremely female: ~20

Y-axis: 0, 200, 400, 600
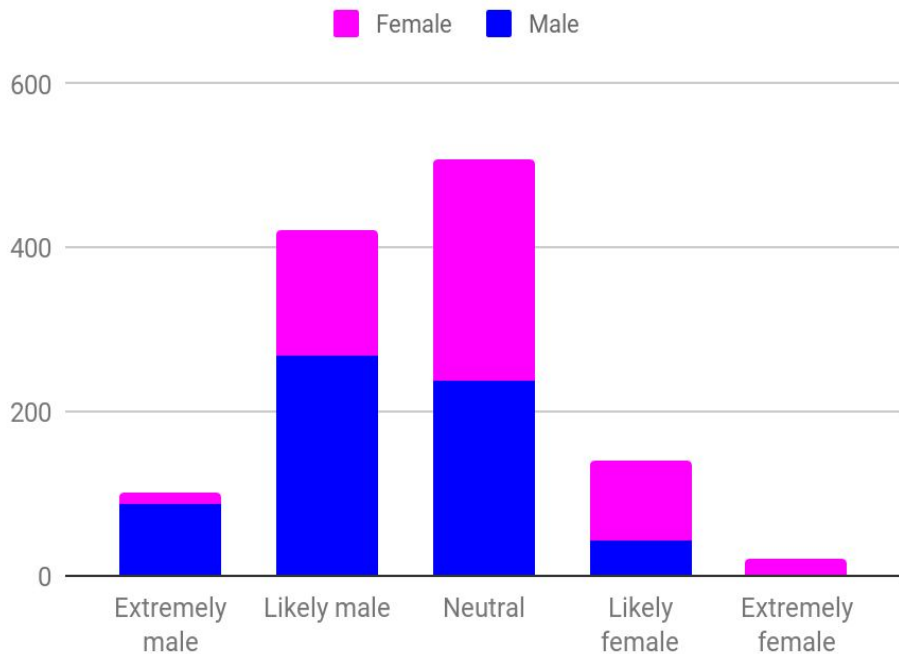
42% of the examples are predicted "**Neutral**" by humans.

Pairwise inter-annotator agreement for binary gender guessing is around **0.6-0.65**

What do we discover?

(for novels)

Highly Gendered Nouns

godmother, melvina, skirt, girlhood, lucile, womanly, eyebright, womanhood, shawl, dressmaker, demurely

disciples, yussuf, rifle, jr, pepe, cigar, colleague, followers, erasmus, judas, opponents

Highly Gendered Verbs

sobbed, sew, blushed, wailed, pouted, scream, moaned, giggled, weeping, blushing, shrieked, faltered

preached, elected, growled, states, yelled, roared, nominated, voted, grinned, slew, fire, attack

Highly Gendered Phrases

suffrage association

clasped *their* hands

glass eye

corresponding secretary

dressing room

lieut col

little chap

partnership with

old fellow

jimmy skunk

Highly Gendered Sentences

– *Person* looked untidier than ever; ▮▮ wore a slatternly wrapper, and *their* hair was thrust unbrushed into its net.

–"What is it?" asked *Person*, as ▮▮ folded and smoothed *their* best gown.

– If the collector will remember that, though ▮▮ is the present owner of *their* prints...

– *Person* is not an orator; *person* is not a writer; ▮▮ is not a thinker.

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Challenges

Gender Identities

Binary Gender

Sex vs Gender

Facts vs Stereotypes

In 2016, there was a torrid debate over President-elect **Obama**'s $1.3 trillion tax cut proposal.

As a farmer, **he** has to take care of the land.

Pitfalls in Extensibility to Other Domains

- Multilingual: how to mask gender from nouns/verbs? (e.g. Spanish)

- NLP pipeline

- Names to Gender

GenderQuant

Detect Genderedess in Language!

1. *Flexibility*: In application to different domains with minimal manual intervention
2. *Mention-level Analysis*: More granular analysis
3. *Quantitative Measure of Bias*: Allows large-scale and detailed analyses and comparison (across documents, corpora etc.)

Thank you!

Models, code and demo: ucinlp.github.io/GenderQuant/

Contact: Sameer Singh sameer@uci.edu, Ananya aananya@uci.edu