Expressively Vulgar

The socio-dynamics of vulgarity and its effects on sentiment analysis in social media

Isabel Cachola, Eric Holgate, Daniel Preotiuc-Pietro, Junyi Jessy Li
Eric Holgate
@eholgate

Can't wait to hear more kickass talks today at #coling2018 in beautiful #santafe! #expressivelyvulgar

7:07 AM - 23 Aug 2018
Motivation

1. Vulgarity is prevalent in daily communication
2. Vulgarity is employed purposefully
3. Vulgarity is used for different goals
Motivation

today is a good ass day

Luicious is gonna get his ass handed to him tonight

[URL] volunteering at the big ass indie art craft fair
Research Questions

1. Do demographic factors impact the expression of vulgarity?
2. Does vulgarity impact perception of sentiment?
3. Does modeling vulgarity explicitly help sentiment prediction?
Agenda

• Data
• Demographic Analysis
• Perception of Vulgarity
• Modeling
Data

• We introduce a corpus of 6,800 vulgar tweets annotated for sentiment
  – Sourced from 4,132 users with demographic info
    (Preotiuc-Pietro et al., 2017)
    • Gender, age, education, income level, faith, political ideology
  – Vulgarity defined with a list from www.noswearing.com
    • Regular expressions include spelling variation and self-censorship
      e.g., damnnnnn or a$$
Data

- Annotated for sentiment
  - MTurk: each tweet rated by 9 annotators
  - 5 point scale + Not Applicable
  - Annotators with agreement < 0.3 excluded
  - Tweets with < 5 annotations excluded

- Available at: https://github.com/ericholgate/vulgartwitter
Sentiment Distribution

- Negative, 46.62%
- Very Negative, 10.14%
- Very Positive, 1.94%
- Positive, 14.57%
- Neutral, 26.51%
Research Questions

1. Do demographic factors impact the expression of vulgarity?
2. Does vulgarity impact perception of sentiment?
3. Does modeling vulgarity explicitly help sentiment prediction?
Partial Pearson correlation

- Dependent variable: vulgar frequency (per user)
- Control for age & gender (e.g., Schwartz et al., 2013)

<table>
<thead>
<tr>
<th>Demographic Trait</th>
<th>Pearson r</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>-0.077</td>
<td>$1.61^{-4}$</td>
</tr>
<tr>
<td>Age</td>
<td>-0.233</td>
<td>$6.64^{-31}$</td>
</tr>
<tr>
<td>Education</td>
<td>-0.100</td>
<td>$7.62^{-7}$</td>
</tr>
<tr>
<td>Income</td>
<td>-0.087</td>
<td>$1.73^{-5}$</td>
</tr>
<tr>
<td>Faith</td>
<td>-0.187</td>
<td>$2.74^{-20}$</td>
</tr>
<tr>
<td>Political Ideology</td>
<td>0.124</td>
<td>$8.69^{-10}$</td>
</tr>
</tbody>
</table>
Demographic Analysis

Results

- Females are less likely to post vulgar tweets than males
- Younger users and political liberals are more likely to post vulgar tweets
- Higher education, income, and faith are anti-correlated with usage of vulgarity

<table>
<thead>
<tr>
<th>Demographic Trait</th>
<th>Pearson r</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>-0.077</td>
<td>1.61e-4</td>
</tr>
<tr>
<td>Age</td>
<td>-0.233</td>
<td>6.64e-31</td>
</tr>
<tr>
<td>Education</td>
<td>-0.100</td>
<td>7.62e-07</td>
</tr>
<tr>
<td>Income</td>
<td>-0.087</td>
<td>1.73e-05</td>
</tr>
<tr>
<td>Faith</td>
<td>-0.187</td>
<td>2.74e-20</td>
</tr>
<tr>
<td>Political Ideology</td>
<td>0.124</td>
<td>8.69e-10</td>
</tr>
</tbody>
</table>
Research Questions

Do demographic factors impact the expression of vulgarity?

Yes!
Research Questions

1. Do demographic factors impact the expression of vulgarity?

2. Does vulgarity impact perception of sentiment?

3. Does modeling vulgarity explicitly help sentiment prediction?
Perception of Vulgarity

- Subset of 5,681 tweets were censored and re-annotated for sentiment along the same guidelines.
- Example
  - Original: mixing all the flavors together at the drink fountain was a good idea when i was 8 now it just makes a shitty drink
  - Censored: mixing all the flavors together at the drink fountain was a good idea when i was 8 now it just makes a _____ drink
Perception of Vulgarity

![Bar chart showing the percent of tweets for different sentiment changes.]

- **Positive**: 17.36%
- **Negative**: 50.18%
- **Neutral**: 13.15%

Legend:
- **Intensify**
- **Weaken**
- **Flip**
Research Questions

Does vulgarity impact perception of sentiment?

Yes!
Research Questions

Do demographic factors impact the expression of vulgarity?

Does vulgarity impact perception of sentiment?

Does modeling vulgarity explicitly help sentiment prediction?
Modeling

Baseline Architecture: Bidirectional LSTM

I like puppies
Modeling

1. **Masking:** This is the <VG>.

2. **Insertion:** This is the shit <VG>.

3. **Concatenation:** This is the shit → 1
Modeling: Vulgar Twitter Results

<table>
<thead>
<tr>
<th>Model</th>
<th>Bi-LSTM</th>
<th>Insertion</th>
<th>Concatenation</th>
<th>Masking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error</td>
<td>0.791</td>
<td>0.759</td>
<td>0.761</td>
<td>0.898</td>
</tr>
</tbody>
</table>

Lower is better.
# Modeling Examples

<table>
<thead>
<tr>
<th>Text</th>
<th>True Label</th>
<th>Baseline Prediction</th>
<th>Insertion Prediction</th>
<th>Concat Prediction</th>
</tr>
</thead>
<tbody>
<tr>
<td>welcome to my personal hell</td>
<td><strong>Negative</strong></td>
<td>Neutral</td>
<td><strong>Negative</strong></td>
<td><strong>Negative</strong></td>
</tr>
<tr>
<td>so fucking excited</td>
<td><strong>Very Positive</strong></td>
<td>Neutral</td>
<td>Negative</td>
<td>Negative</td>
</tr>
</tbody>
</table>
# Modeling: SemEval 2017 Task 4 Results

<table>
<thead>
<tr>
<th>Model</th>
<th>Bi-LSTM</th>
<th>Insertion</th>
<th>Concatenation</th>
<th>Masking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error</td>
<td>1.320</td>
<td>1.068</td>
<td>1.148</td>
<td>1.666</td>
</tr>
</tbody>
</table>

Lower is better.
Research Questions

Does modeling vulgarity explicitly help sentiment prediction?

Yes!
Take Aways

• Vulgarity is intentional
  – It serves many pragmatic functions
  – The use of vulgarity impacts sentiment perception

• Vulgar frequency correlates with sociodemographic factors

• Modeling vulgarity is useful for NLP
Future Work

• Can we explicitly categorize and model pragmatic functions of vulgar words?
Spoiler Alert: Yes!

• EMNLP 2018:
  Why Swear? Analyzing and Inferring the Intentions of Vulgar Expressions
  Eric Holgate, Isabel Cachola, Daniel Preotiuc-Pietro, Junyi Jessy Li

• Categorize, annotate, and predict vulgar functions
  – Aggression
  – Emotion
  – Emphasis
  – Auxiliary
  – Signal Group Identity
  – Non-Vulgar Use

• Vulgar functions are useful downstream
Thank You!

Contact:

Isabel Cachola: isabelcachola@utexas.edu
Eric Holgate: holgate@utexas.edu