An Analysis of Twitter Discourse During the Tokyo 2020 and Beijing 2022 Olympics

Jordan Rodrigues & Naman Bhargava
Georgia Institute of Technology

**Story**
Diverse Twitter discourse is not always beneficial (hate speech against athletes, nations and identity)

Are certain topics inherently toxic?
Do regions vary in sentiment and toxicity?
Is there variance across Olympic years?

**Methods**
Modeling Pipeline

395K Tweets
Unigram and bigram decomposition
Outlier removal
Topic Modeling with LDA*

*Tuned to minimize UMass Coherence Score

**Statistical Pipelines** (Non-parametric α = 0.001)

Event
Popularity
Nation
Topic

Kruskal Wallis Test (median difference)
Standard error
Kruskal Wallis Tests

**Key Findings**
Sentiment polarization increases in 2022 compared to 2020

People are generally positive with low toxicity, and toxicity is unattractive to broader followings

Countries have different sentiment and toxicity with some correlated with event performance

Topics can have significantly different toxicity associations

Results and modeling pipeline can inform future moderation to control toxicity in global events

**Event Analysis**

![Graph showing toxicity and sentiment across events and years]

- 2022 has stat sig greater toxicity than 2020
- 2022 has stat sig more polar sentiment than 2020

**Popularity Analysis**

![Graph showing sentiment and toxicity vs user popularity]

- Toxicity decreases with user popularity (stat sig)
- Positivity increases with popularity (stat sig)
- Extremely popular users use more neutral sentiment
- Avg. users have positive sentiment and low toxicity

**Data**

<table>
<thead>
<tr>
<th>Dataset #1</th>
<th>Dataset #2</th>
<th>Dataset #3</th>
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<tbody>
<tr>
<td>Source</td>
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<tr>
<td>Rows</td>
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</table>

**Common Attributes**
- User - Username, location, description, creation date, followers, followees/friends, Tweet - Retweets, favorites, text contents

**Followers**
- Mean: 97K
- STD: 1.2M
- Min: 0
- Max: 78M
- 395K Tweets

**Friends**
- Mean: 1.4K
- STD: 7K
- Min: 0
- Max: 773K

**Toxicity**
- Mean: 0.05
- STD: 0.18
- Min: 0
- Max: 1

**Sentiment**
- Mean: 0.16
- STD: 0.43
- Min: -1
- Max: 1

**Char**
- Mean: 114
- STD: 62
- Min: 8
- Max: 955

**Topic Analysis**

![Graph showing toxicity density across years]

- Topic_name
  - Low Toxicity
  - Moderate Toxicity
  - High Toxicity

- U_Mass Coherence Score: -3.3

- Kamila Valieva - figure_skating, win_gold, kamila_valieva
- China - Taiwan, Propaganda, Sovereignty, rebuked_china
- FrozenFin - frozen_penis, finnish, skier_suffers
- Ceremony - ceremony, closing, yuzu, dwen, eileen_gu

**Region Tone**
Diverse Twitter discourse is not always beneficial (hate speech against athletes, nations and identity)

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Why now?

Account Action
Increase
Government sponsored bot accounts
COVID-19 induced Xenophobia