

# Modeling Stress with Social Media Around Incidents of Gun Violence on College Campuses

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Saha, K., & De Choudhury, M. (2017). Modeling stress with social media around incidents of gun violence on college campuses. *Proceedings of the ACM on Human-Computer Interaction*, 1(CSCW), 92., <https://dl.acm.org/citation.cfm?id=3134727>



## *Situated Communities*



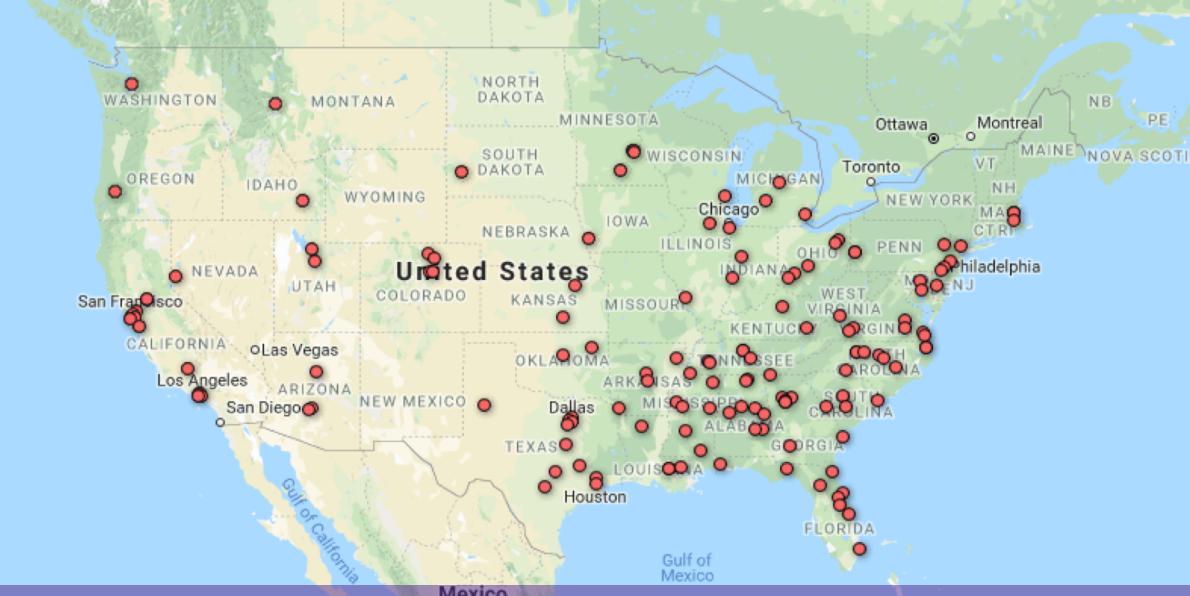
Mental Health Crisis Affects both individual and collective wellbeing

A photograph of a person's hand holding a red pen over an open book. The book has white text on its pages. The background is dark.

*“3 out of 4 college students say they’re stressed!”*

Liu, Wong, Yasui, Chen (2018)

*Academic  
Personal  
Relationships  
Social  
Crisis Events*



## *Crisis on College Campus: Gun Violence*

*175+ gun violence incidents on U.S. college campuses (2007-)  
300+ casualties*

Affects the psychological wellbeing of college students

# Assessing Mental Health on College Campuses

## Survey Instruments

## Mental Health Care Statistics

### Limitations:

- Scalability
- Biases (eg. retrospective recall)
- Stigma about availing mental healthcare
- Reactive
- Implementational difficulty

### Advantages (Social Media Data):

- Large-scale and Longitudinal
- Self-recorded in the present
- Requires no active intervention

*Social Media bridges some of these gaps*

# Our Work

*We leverage **social media** data to study the evolution of  
stress around **gun violence** incidents on **college campuses***

## Research Questions

Identify stress expressions in social media

*Temporal* changes in stress expressions after gun violence on college campuses

*Linguistic* changes in stress expressions after gun violence on college campuses



/r/gatech

HOT

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Congrats! You just got in! 2018 Regular Decision Megathread

Submitted 1 month ago by [REDACTED] CS - 0x7E3 M - announcement

224 comments share save hide report crosspost

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67

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Phase One Megathread: Summer/Fall 2018 Edition

Submitted 12 days ago by [REDACTED] ME - 2019? M - announcement

244 comments share save hide report crosspost

↑

24

↓



What do i do about a professor who threatened me?

Submitted 6 hours ago by [deleted]

32 comments share save hide report crosspost

↑

30

↓



Are there any body fat percentage monitors on campus?

self.gatech

Submitted an hour ago by [REDACTED] E - 2018

comment share save hide report crosspost

↑

•

↓



Question for cyclists on campus

self.gatech

Submitted 3 hours ago by [REDACTED]

4 comments share save hide report crosspost

↑

7

↓



Do you think you would have missed out going to your state school instead of GT?

self.gatech

Submitted 37 minutes ago [REDACTED]

1 comment share save hide report crosspost

↑

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↓



Changing Threads in CS

self.gatech

Submitted 3 hours ago by [REDACTED]

2 comments share save hide report crosspost

↑

0

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Submit new content



gatech

14,196 readers, 272 here

(edit flair)

Hey there Techies, join the rally for procrastination. Long live reddit.

#### Useful Links

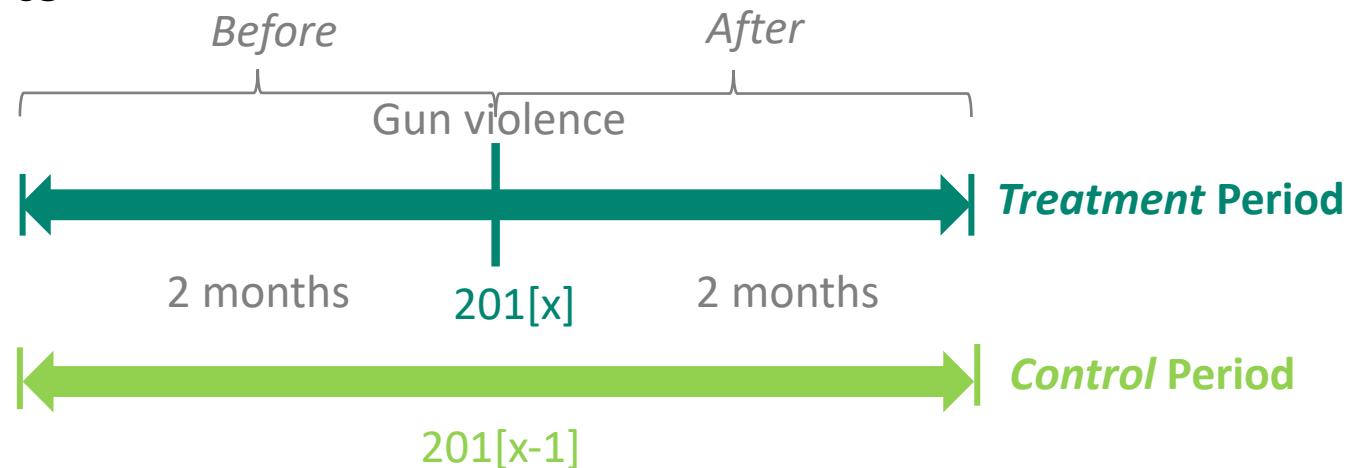
- GT FAQ
- Official GT iOS App
- GT IRC
- GT Buses for iOS for Android
- GT Homepage
- GT Protips
- /r/Atlanta
- /r/ACC
- /r/RamblinWreck for GT Sports

#### Subreddit Rules:

- Don't be a jerk.
- Don't troll or flame
- In order to avoid redundant posts:

# Data

- 12 subreddits of colleges where gun violence occurred between 2012 and 2017
- *Treatment Period*: 2mo. *before* and 2mo. *after* each event
- *Control Period*: Similar period in the previous year
- Google BigQuery to collect the dataset
- Net dataset: 113,337 posts



# Research Question 1

## Inferring Stress Expression

### Stress Classifier (High and Low Stress)

- + *r/stress*
- Non-Mental Health subreddits (*r/movies, r/music, r/aww, r/Jokes, etc.*)

COMMUNITY DETAILS

|  |          |
|--|----------|
|  r/Stress               |          |
| 4.0k Subscribers   | 3 Online |
| r/stress is a subreddit dedicated to discussion of the causes of stress and stress management techniques |          |

*"Feel like I am burning out (again...) Help: what do I do?"*

*"I have been way too lax, and unfocused, taking way too long for basic assignments or just not finishing them, which evolves into not submitting them."*

# Stress Classifier

- 5000  $n$ -gram & 3 sentiment Features
- SVM Classifier
- Accuracy: 0.82  $k$ -fold cross-validation ( $k=5$ )
- Machine labeled stress in college dataset

## Top Features

|                |                   |                 |
|----------------|-------------------|-----------------|
| <i>stress</i>  | <i>luck</i>       | <i>meet</i>     |
| <i>try</i>     | <i>breathing</i>  | <i>life</i>     |
| <i>work</i>    | <i>techniques</i> | <i>sleep</i>    |
| <i>anxiety</i> | <i>exercise</i>   | <i>problems</i> |
| <i>focus</i>   | <i>meditation</i> | <i>control</i>  |
| <i>help</i>    | <i>body</i>       | <i>job</i>      |

Validated on college subreddit dataset: 82% accuracy

## Research Question 2

Temporal Dynamics of Stress Expression

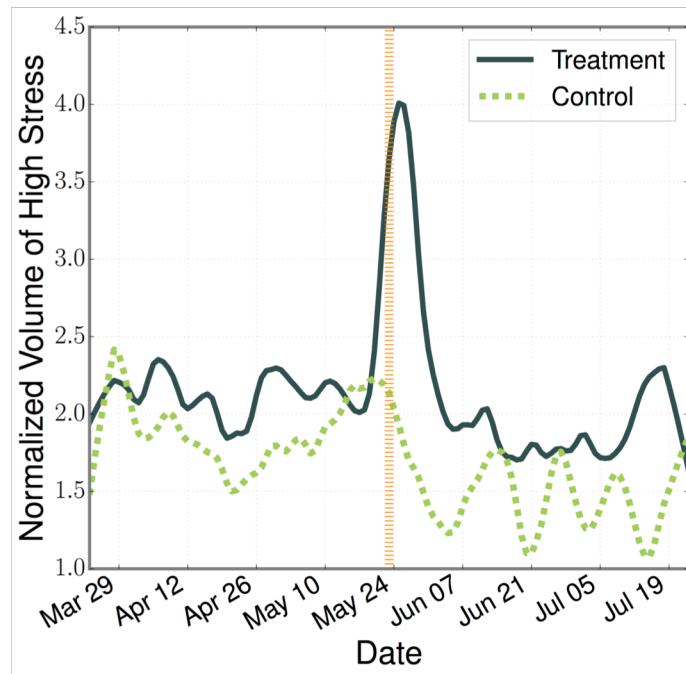
### High stress posts as a Time Series

- Time domain
  - Compare *Treatment vs. Control*  
Controls for academic calendar, local, seasonal etc. factors.
  - Compare *Before vs. After*  
Relative changes as trends.
- Frequency domain  
Disruption in the periodicities

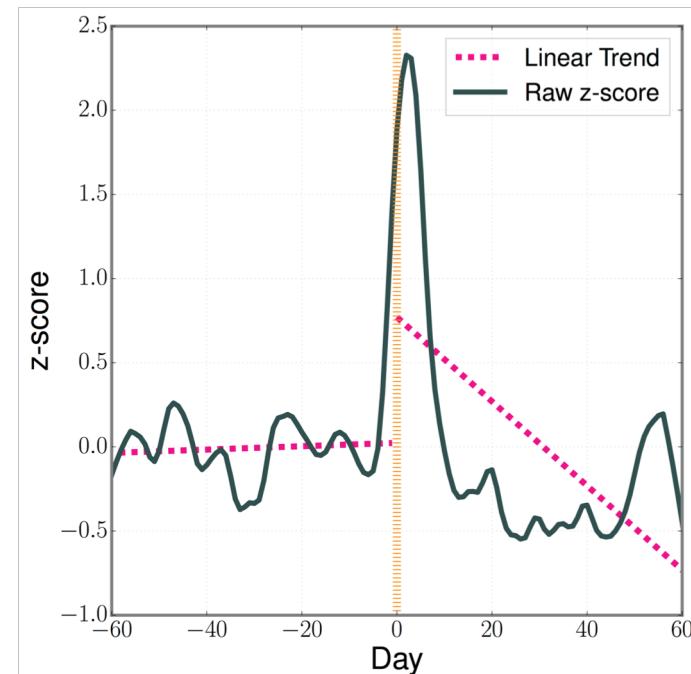


# Time Domain Analysis of Stress Expressions

Treatment vs. Control



Before-After Change Analysis



Stress experiences throughout the year, but sudden increase after gun-violence

## Research Question 3

Linguistic Dynamics of  
Stress Expression

- Psycholinguistic characterization
- Incident-specific lexical analysis

# Psycholinguistic Characterization

## INCREASE

Anger  
N. Affect  
Sadness  
Swear  
Feel  
Bio  
Health  
Death  
Health  
Home  
Family  
Friends

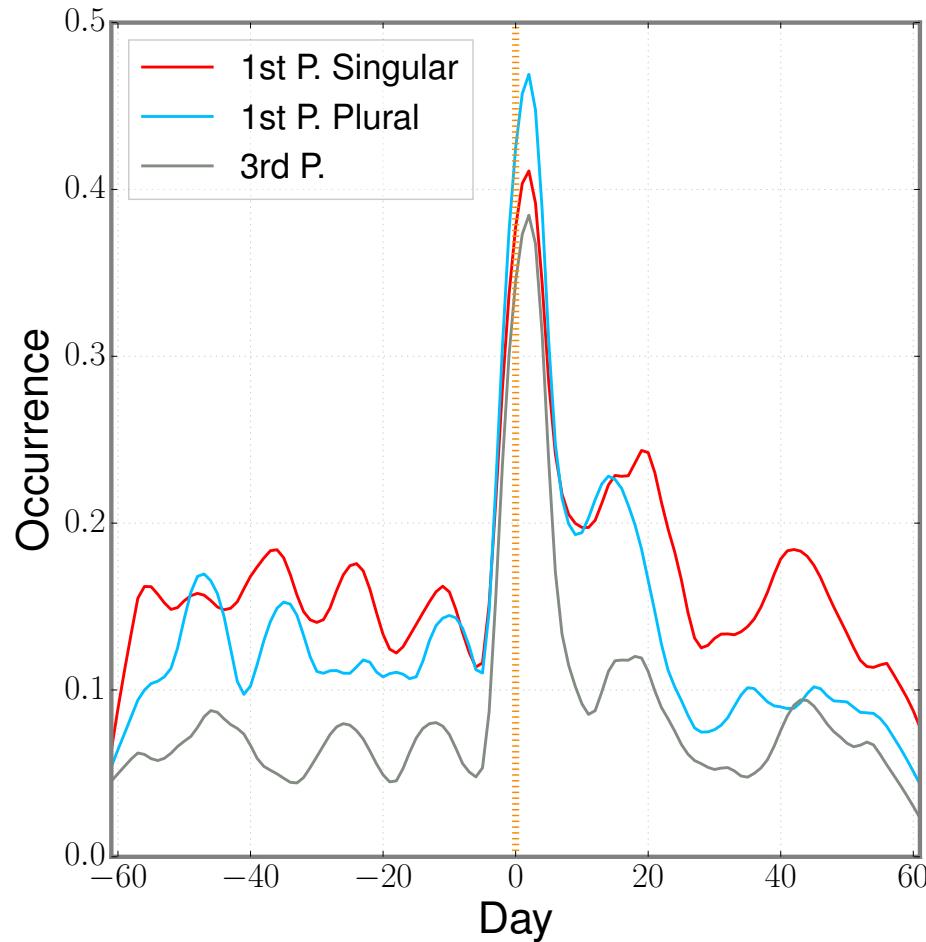
## DECREASE

P. Affect  
Causation  
Inhibition  
Hear  
Insight  
See  
Preposition  
Future Tense  
Present Tense  
Money  
Achievement

*"I guess since campus is a gun free zone  
we are all f\*ked."*

*"I hope that no one is seriously killed or  
is injured."*

# Psycholinguistic Characterization: Temporal

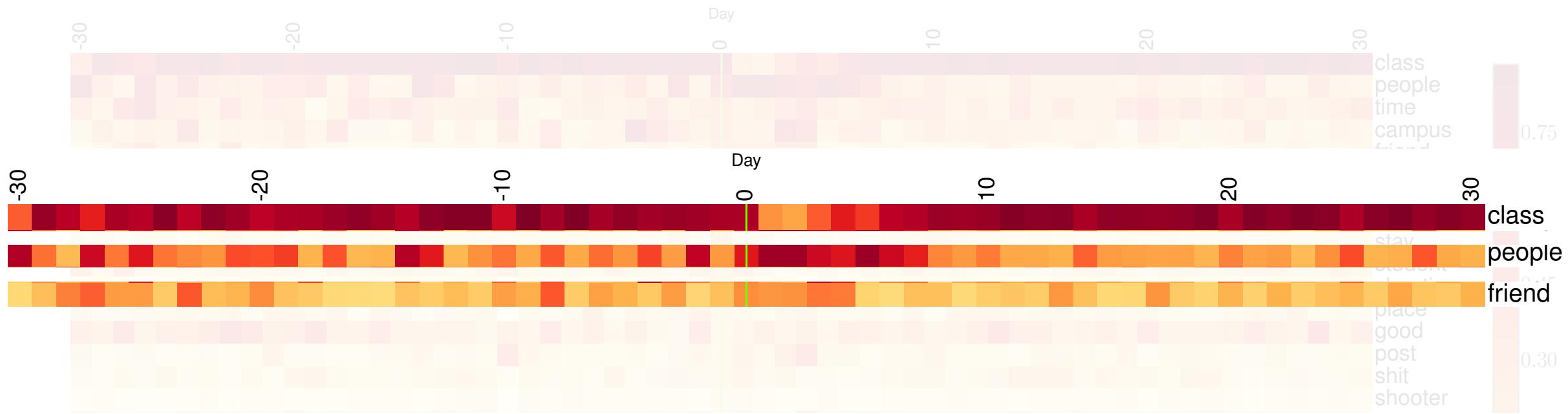


## Pronoun usage

- Depressed-or-dealing with crisis
- Increased concern at traumatic event
- Collective Identity
- Sense-of-community

Cohn et al. (2004), Pennebaker et al. (2003)

# Lexical Analysis



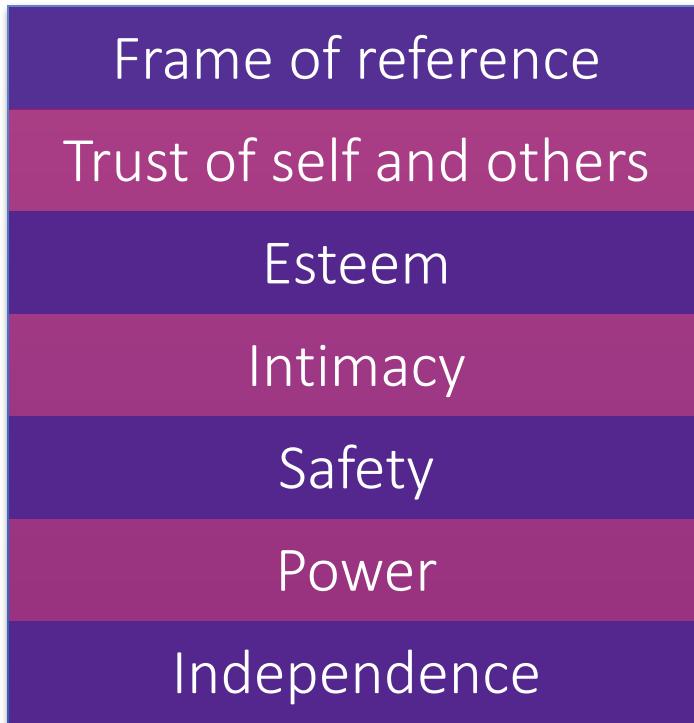
**Incident Specific Keywords: r/fsu: safe, shooting, strozier, news, library, shooter, friends, victims, stay, post, time, people, information**

# Summary of Findings

- Built a Stress Classifier on social media
- Examined *Temporal* and *Linguistic* dynamics of stress around gun violence on college campuses
- Immediate rise in the volume of High Stress posts
- Emergence of collective identity, and seeking solidarity in friends
- Decreased *cognitive processing*, and *academic- & career-* related conversations
- Increased *self-attention, social orientation, death- & family- related* conversations

Students experience chronic stress throughout, but acute stress after gun violence on college campuses

# Evidence of Impact on the Community



## Constructivist Self Developmental Theory

Psychological need areas that can be affected and disrupted by crises.

\*McCann and Pearlman (1993)

# Implications

- No clinical assessment
- Socio-psychological response after crises
- Quantify impacts and severity of crises
- Population-centric tracking tools
- Informed policy-making on campuses



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Thank You!

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