Utilizing Temporal Psycholinguistic Cues for Suicidal Intent Estimation

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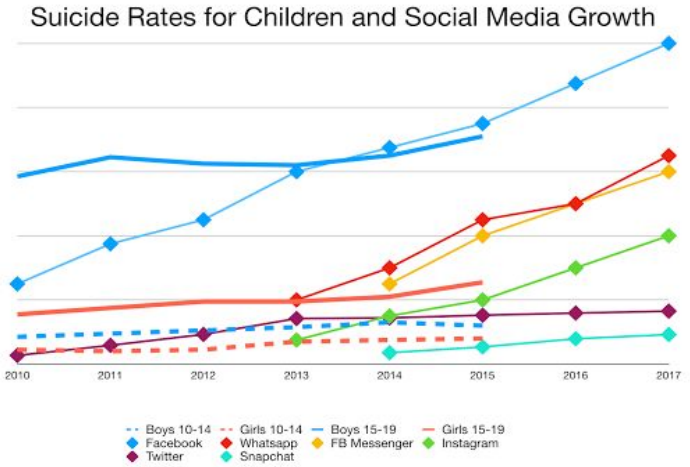
Context & Objective

Identification of suicidal ideation in Tweets using the contextual information embedded in social media engagement, historical activities of users and homophily networks formed between like-minded individuals in Twitter.

Motivation

- One million people die from suicide each year
- 20 times more people attempt suicide
- Existing work and social media websites focus on linguistic aspects only
- Psychological studies reveal the effectiveness of flagging at risk individuals on social media



Contributions

- Achieve state-of-the-art performance using a stacked ensemble architecture trained on text, historical activity and social graph of inter-user interactions

- Conduct a qualitative analysis to show the effectiveness of taking into account the historical tweeting activities of users and social networks between them for accurately identifying and studying suicidality in Twitter.

Annotation and Examples

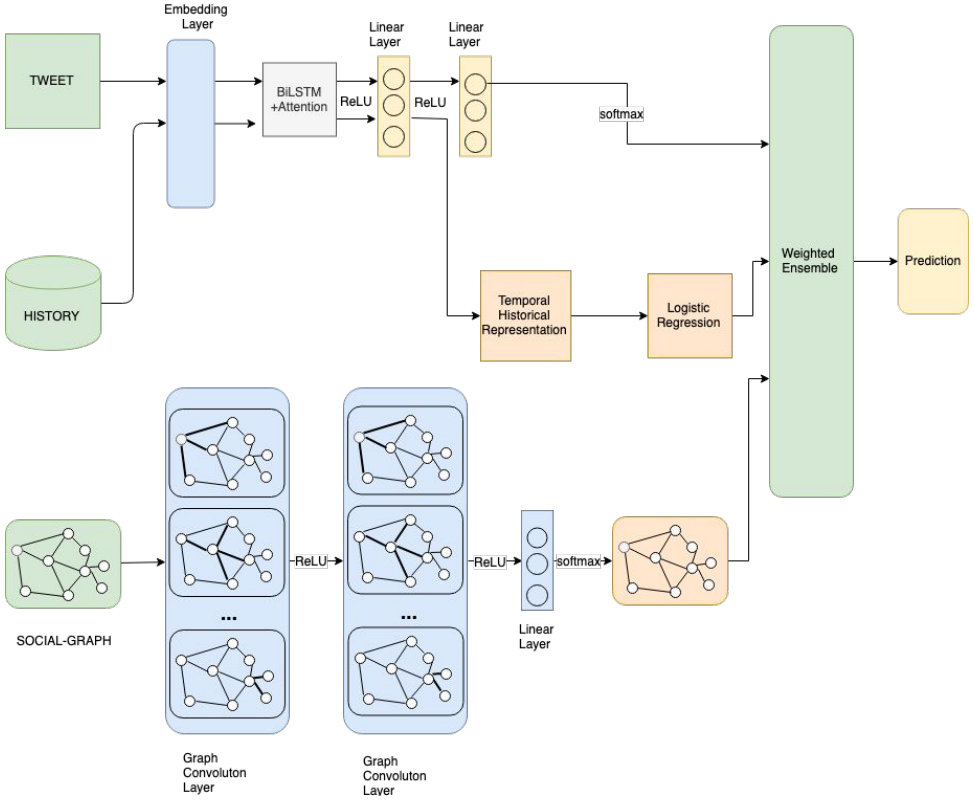
Suicidal Intent Present

- Clear indication of suicidal tendency.
- 11.61% of the dataset.

Suicidal Intent Absent

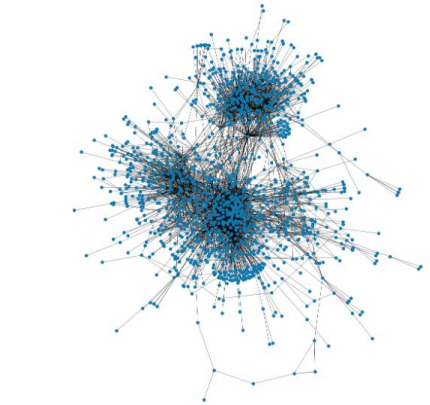
- Flippant reference.
- Default category.

Architecture



Linguistic Homophily and Graph-based Author Profiling

- Tightly coupled communities have high influence on offensive behaviour.
- Incorporating this homophily using GCN.
- Significant performance enhancement observed.



Modelling the Social Graph

$G_{Mentions}$ A mentioned B in a tweet

G_{Quotes} A quotes B's tweet

$G_{repliedTo}$ A replied to B's tweet

Gathered from the tweets from the dataset and the historical tweets of users

Historical Activity Modelling

- For each user, previous 3,200 (or as many available) tweets were scraped.
- A temporal weighting scheme where the importance assigned to a historical tweet varies inversely with its distance in time from the current tweet.

- Let Δt_i be the time offset from the original tweet in seconds. Then, the temporal representation function z is given as:

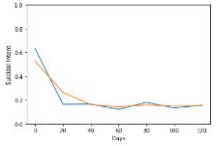
$$z(u, H) = \sum_{h_i \in H} \phi_i(\Delta t) f(h_i)$$

Results

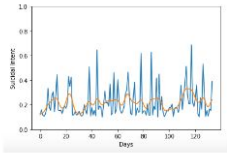
Model	F1	P	R
SNAP-BATNET [14]	92.60	72.20	93.52
BiLSTM + Attention (Text) [11]	91.26	70.02	91.23
Text + Temporal Modeling	92.75*	91.98*	93.70*
Temporal GCN	**93.89***	88.73	**94.54***

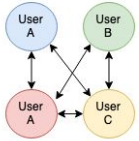
Qualitative Analysis

Historical and Current Tweets	Suicidal Intent
I do not want to be alive. I just want to die today	0.63
That is a lot of grief is not it	0.46
In front of me is homework. That is great ha that is great	0.17
Too many people died in the disaster. We can do nothing about it. Yes we are powerless...	0.20

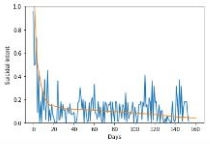


Historical and Current Tweets	Suicidal Intent
It was a good day that turned bad. Nothing to do with the raptors loosing Proud of them what a battle they put	0.14
Not that i am going to die anytime soon but i was recently reborn and i still need to be nurtured not mistreated.	0.52
I am a recovering catholic and a recovering alcoholic funny they both end with a lic is alcoholic some kind of cult	0.36
I really want to get back into playing lots of guitar	0.10

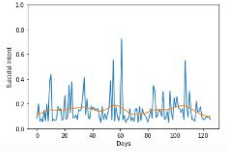




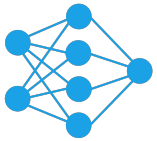
Historical and Current Tweets	Suicidal Intent
I cry myself to sleep... I feel replaced I feel so forgotten...I feel so alone	0.95
Hi humi i miss you. May i spend some time with you cause I feel so alone.	0.77
Do you collect anything. If so what is it? Mmories hahahahaha...	0.20
Haiiii belated merry christmas and advance happy new year buddy.	0.08



Historical and Current Tweets	Suicidal Intent
Awww well happy new year to you and my little nieces three.	0.06
Is the thought of trying to keep going depressing then this thread is for you	0.67
Emotions things evoke have all been repeated multiple times before. How long can you go on living stuck in a loop	0.53
Jesus christ i was half asleep at one hundred and fifteen am and this shook me to my very core.	0.10



Conclusion



Developed a robust classifier for Suicidal Ideation Identification

Incorporated user history and past activity to improve robustness

Utilized social network graphs for author profiling to enrich the classification model

Thank You