Towards Suicide Ideation Detection Through Online Conversational Context

Ramit Sawhney*, Shivam Agarwal*, Atula Tejaswi Neerkaje*, Nikolaos Aletras, Preslav Nakov, Lucie Flek

CAISA Lab, Philipps Universität Marburg · The University Of Sheffield. · QCRI Qatar Computing Research Institute · University of Illinois Urbana-Champaign · Georgia Tech

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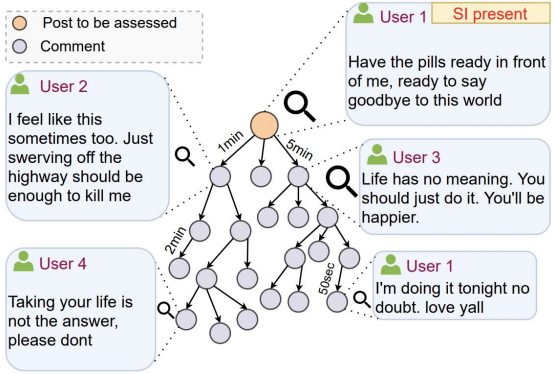
Code At

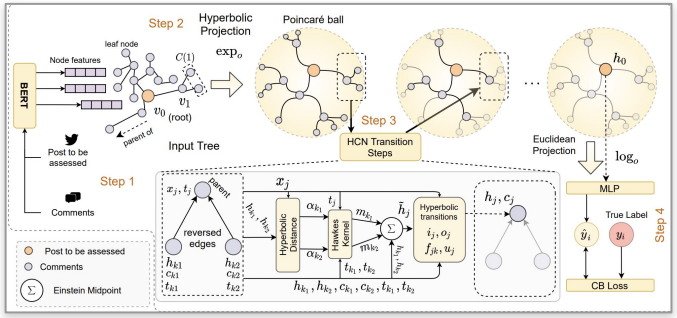
Introduction

- Online conversations heavily influence the mental state of online users.
- Irregular temporal patterns, bursts of conversations, where each reply can influence the nature and the time of release of newer replies.
- Nature of the comments and the rate of response is non-uniform and diverse.



HCN: Methodology

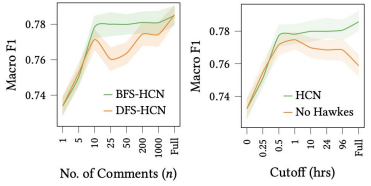
- Hyperbolic distance based Hawkes attention - to capture diverse influence and temporal bursts of comments in each sub-thread



- Hyperbolic transitions - to learn optimal bottom-up representations of each sub-thread. Root node represents full tree.

Results

- Comments are useful, so is structural information.
- Hyperbolic space works best!
- Early responders & comment hubs influence most.
- HCN is computationally efficient.

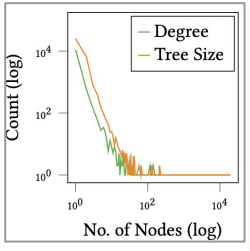


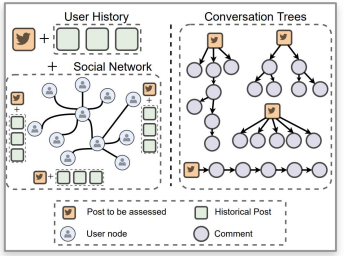
Context	Model	M. F1↑
No comments	CurrentPost	0.71±5e-3
Comments linearized as a stream	AvgComments	0.71±1e-2
	FlatLSTM [67]	0.72±9e-3
	LSTM-CNN [64]	0.71±8e-3
Conversation tree	GAT [102]	0.73±1e-3
	HGAT [112]	*0.74*±5e-3
	TreeLSTM [98]	0.73±5e-3
	AttnTreeLSTM [1]	*0.74*±4e-3
	HCN (Ours)	**0.78***±6e-3

Context	Model	#Model Params ↓	Model Size ↓	Convergence (secs) ↓	CO_2 Footprint ↓
User History	SDM [12]	3M	1.5 MB	3,123 s	0.13 kg eq.
	DC-BERT [69]	3M	1.8 MB	3,402 s	0.14 kg eq.
	STATEnet [90]	4M	2.0 MB	4,361 s	0.17 kg eq.
Social Graph +History	Hyper-SOS [91]	400K	2.3 MB	1,260 s	0.05 kg eq.
Conversation Tree	HCN (ours)	255K	0.1 MB	408 s	0.02 kg eq.
All	Ensemble	5M	4.4 MB	5,727 s	0.27 kg eq.

Nature of Online Comments

- Less intrusive compared to other sources of contextual information.
- Number of posts and edges per user - significantly lower compared to user history and social network.
- Hierarchical structure - certain nodes may have a high number of replies - scale free.
- Scale-free graphs are well represented in hyperbolic space.





Context	# Total Posts	# Posts per User	Avg. Edges per User
User History	2.3M	70.6	-
+ Social Graph	2.3M	70.6	3.42
Conversation Tree	111K	1.15	3.02