Exploring Echo Chamber effect on r/depression subreddit

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Motivation

- Echo Chamber refers to an environment where people are exposed only to opinions that reinforce their own, filtering out opposing views.
- Previous studies on echo chamber are primarily focused on controversial topics like COVID-19, abortion, Russia - Ukraine war, election.
- Limited research exists on echo chamber on mental health focused communities.
- This project explores whether users in r/depression are exposed to diverse perspectives or are stuck in echo chambers

Research Questions

RQ1: Can mental health focused online communities form Echo Chambers?

RQ2: Do different mental health topics (e.g., depression, anxiety, ADHD) lead to more homogeneous discussions?

RQ3: How does the level of semantic similarity vary across different mental health topics?

Data Collection

Collected data from Reddit's Pushshift API spanning April 1, 2024 to April 1, 2025. No. of Posts = 154027, No. of Comments = 428174

id	link_id	body	parent_id	author	created_utc	score
kxh16tp	t3_1bsouvx	I don‚Äôt have any advice but I feel like this too. I feel like everyone I grew up with fell into a life and career and marriage	t3_1bsouvx	ccl48	1711929631	1
kxh170j	t3_1bsl68y	Aint no way the anti pedophile community pushed you into CHRISTIANITY the wrong way፧ûíÁ፧ûíÁ፧ûíÁ	t3_1bsl68y	ozushikunoti	1711929632	-10
kxh19sa	t3_1bsiq2d	I‚Äôm 30 and I feel the same way	t3_1bsiq2d	Pure_Zucchii	1711929662	1
kxh1qve	t3_1bsohwg	Rest of your life is ahead of you. Make right choices from now on and move on.	t3_1bsohwg	Thugsi123	1711929847	1
kxh1rng	t3_1bsgee9	You're saying you're sick of waiting for things to change; what do you want to change?	t3_1bsgee9	ubtf	1711929855	4
kxh2iqr	t3_1bsgee9	All you are doing is trying to find a permanent solution for a temporary problem.	t3_1bsgee9	itisbrito	1711930150	5
kxh2mbv	t3_1bsktj4	Yep well not specifically this but in the same context. Since you're underage I rather not share to much because it is an	t1_kxh023c	Magic_Man2	1711930189	2
kxh2mqr	t3_1bsmxf0	It hasn't gotten better in 5 years. It'll be okay when I'm gone.	t3_1bsmxf0	Lou_Diamon	1711930194	4
kxh2rmm	t3_1bsicr0	i have something similar with extreme degradation also violence and i feel like a piece of shit after and i know that it ha	t3_1bsicr0	ren590	1711930249	1
kxh2rqh	t3_1bsk7nu	Well, you're still here, you survived, you're fighting, you're stronger. All that bad shit happened in the past and it's not	t3_1bsk7nu	Sterrss	1711930250	3
kxh2syo	t3_1bsmxf0	This has always been my issue with therapists/psychiatrists. Many of them have never been suicidally depressed befor	t1_kxgq4xy	Superunknow	1711930263	2
kxh2z29	t3_1bsl68y	You're a 17 Y/o male. You're not disgusting.	t3_1bsl68y	PineTreePete	1711930330	17
kxh32wl	t3_1bsgee9	Attention	t1_kxg6h56	Moosetopher	1711930372	0
kxh3i5u	t3_1bsktj4	For me, it's a form of punishment, and because I wanna hit *someone* but don't wanna harm others	t3_1bsktj4	coconfetti	1711930540	1
kxh3kx2	t3_1bsktj4	It isn't for attention, they do this to feel relief from their mental pain	t1_kxh0hm4	im_better_th	1711930569	4
kxh3qfz	t3_1bsg952	Same. If things keep up this way Im dipping. I keep trying my best to tell myself that things get better but I know they don	t3_1bsg952	KnotsThotsAr	1711930629	2
kxh3qnb	t3_1bsktj4	"the pain in the body quiets the pain in the mind"	t3_1bsktj4	_sadanddesp	1711930632	1
kxh3qou	t3_1bsp8q2	You have to let go of the anger. That said, anger is the only thing I've ever been able to rely on to overcome any sense of	t3_1bsp8q2	ImplementFe	1711930632	3

Methodology

- Applying Semantic Similarity across Reddit posts for specific keywords like 'depression', 'anxiety', 'ADHD', 'stress', 'debt', 'suicide', 'self-harm', 'medication', 'poverty'.
- Creating threads from the post and comment datasets and applying semantic similarity within threads.
- Sentiment Analysis of posts and comments across time.
- Using 'all-MiniLM-L6-v2' model from Sentence Transformer library to apply cosine similarity.

Semantic Similarity

What is Semantic Similarity?

- Measures how close in meaning two pieces of text are.

$$Cosine\ Similarity = \frac{A.B}{||A||*||B||}$$

- A and B = vector representations of texts (e.g., embeddings). High semantic similarity between posts and comments suggests idea reinforcement.
- High Semantic Similarity indicates similar ideas.
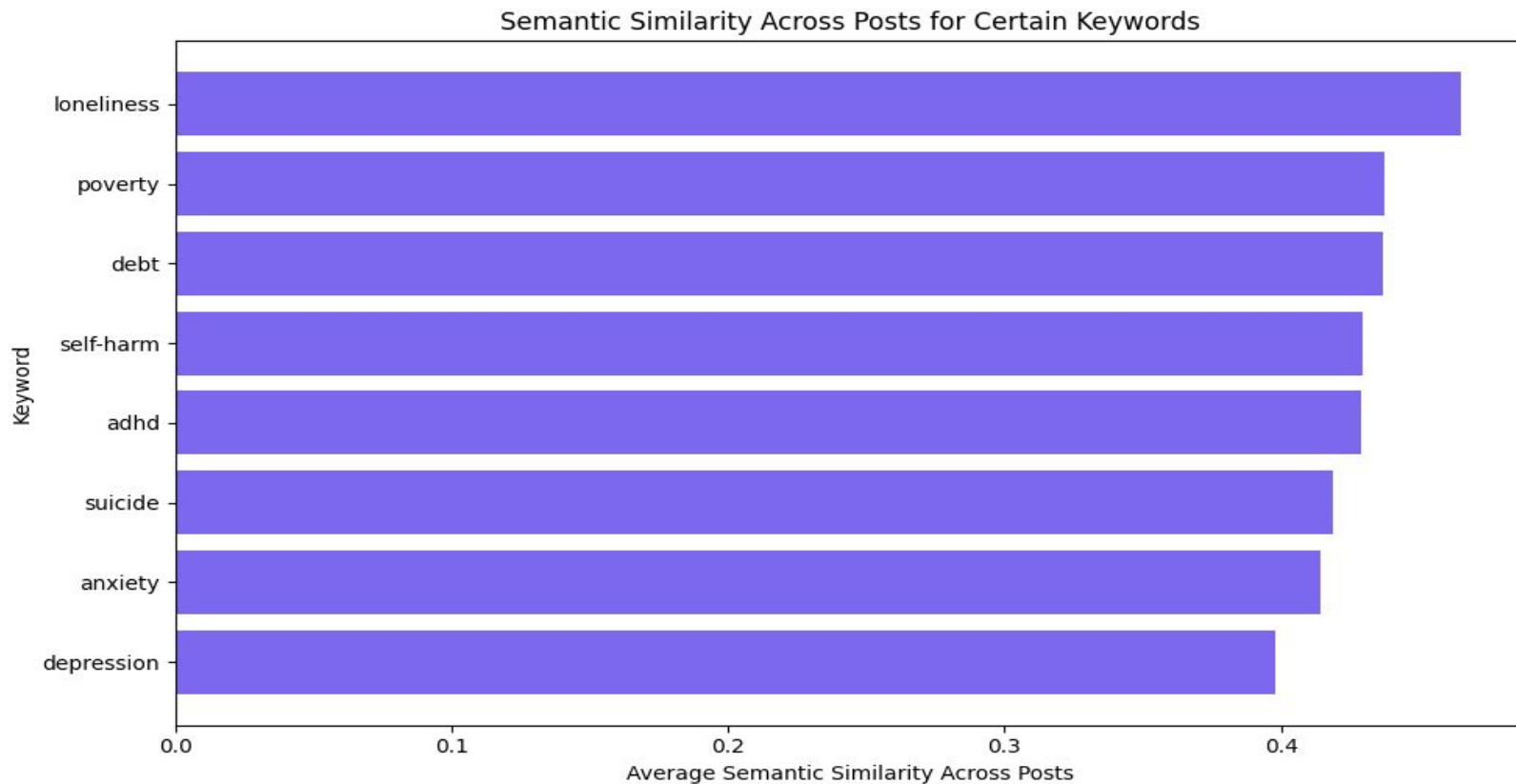- Low diversity in texts can indicate potential echo chamber.

Results

	post_id	avg_comment_similarity	title	post_type	matched_topic
0	1bsp8q2	0.360301	Depression ➡️ Anger	venting	Depression
1	1bspru3	0.218337	Neurological disease: this is my final attempt...	venting	None
2	1bspwas	1.000000	Encouragment.	venting	None
3	1bsq2nh	0.129501	feeling guilty about taking time off due to de...	venting	Depression
4	1bsq6bk	0.161459	I thought I was alone in wanting to die.	venting	alone
5	1bsqnlu	0.199541	Death in 5 years	venting	None
6	1bsqplq	0.112244	I want to leave this world.	venting	None
7	1bsqwpa	0.185744	I am so fucking tired of always feeling so much	venting	None
8	1bsr2uo	0.166221	Low libido cause of depression	venting	Depression
9	1bss030	0.361125	I need help	venting	None

Results

Top 20 Most Homogeneous Threads

Semantic Similarity across posts for certain keywords
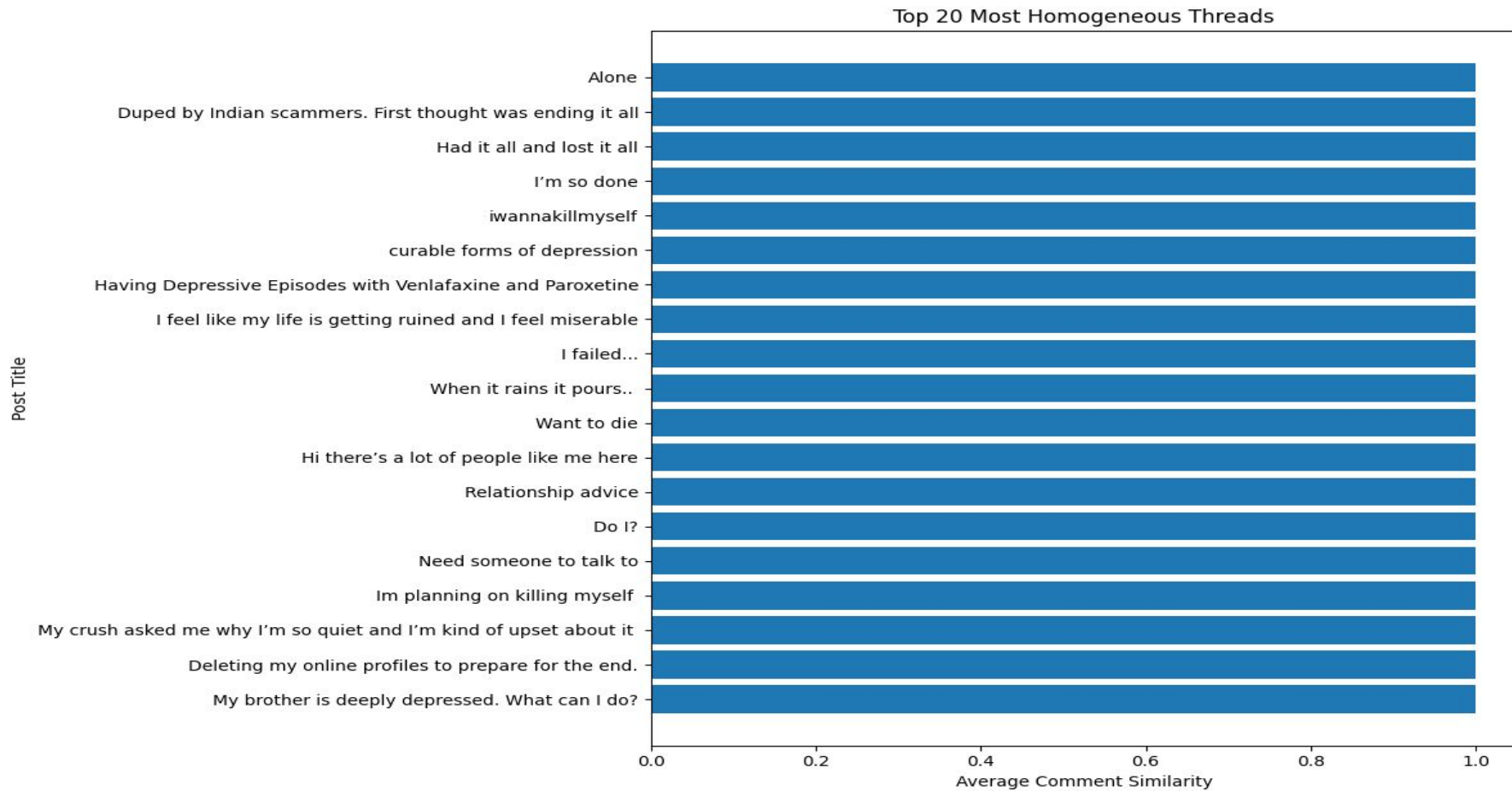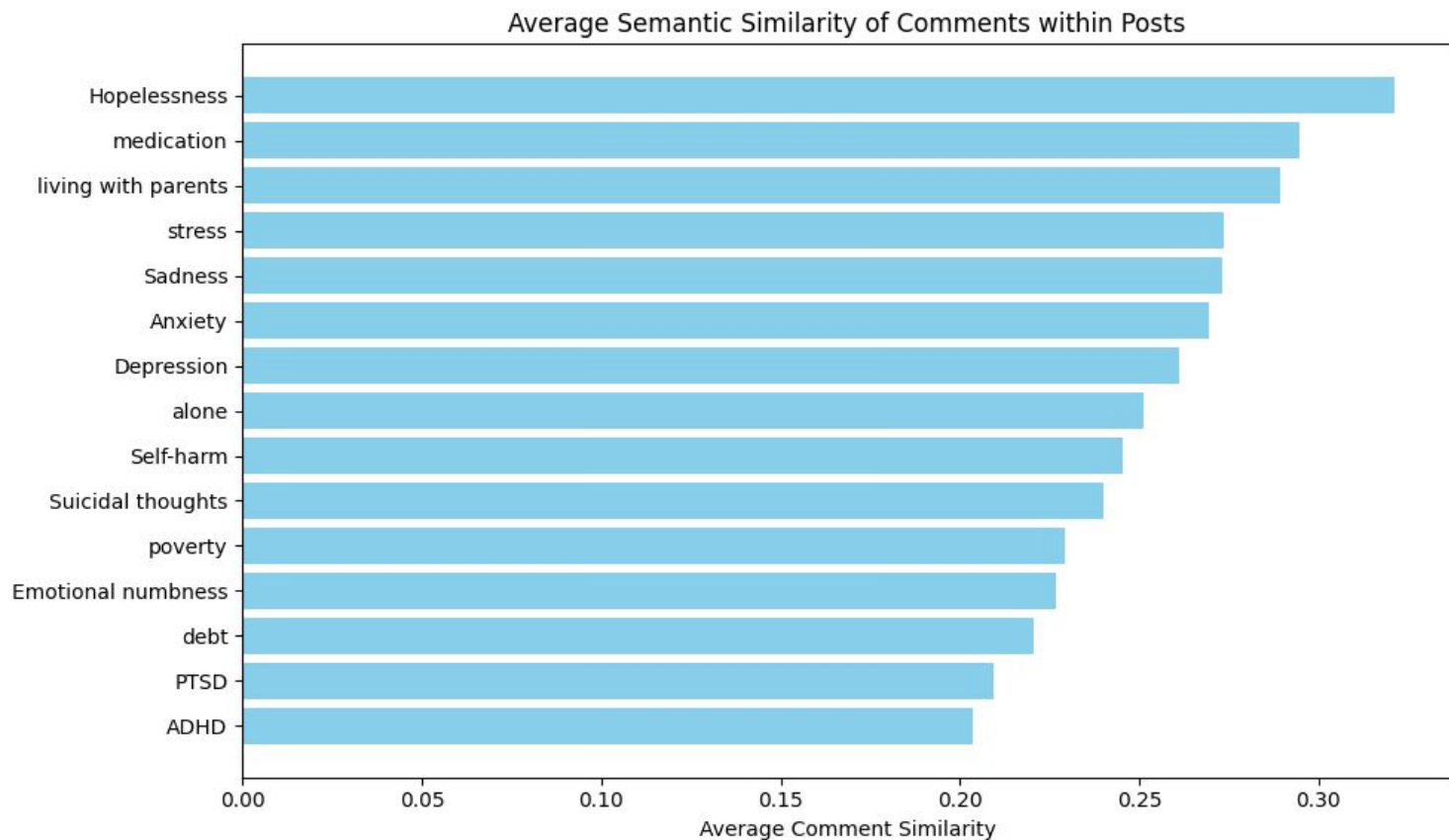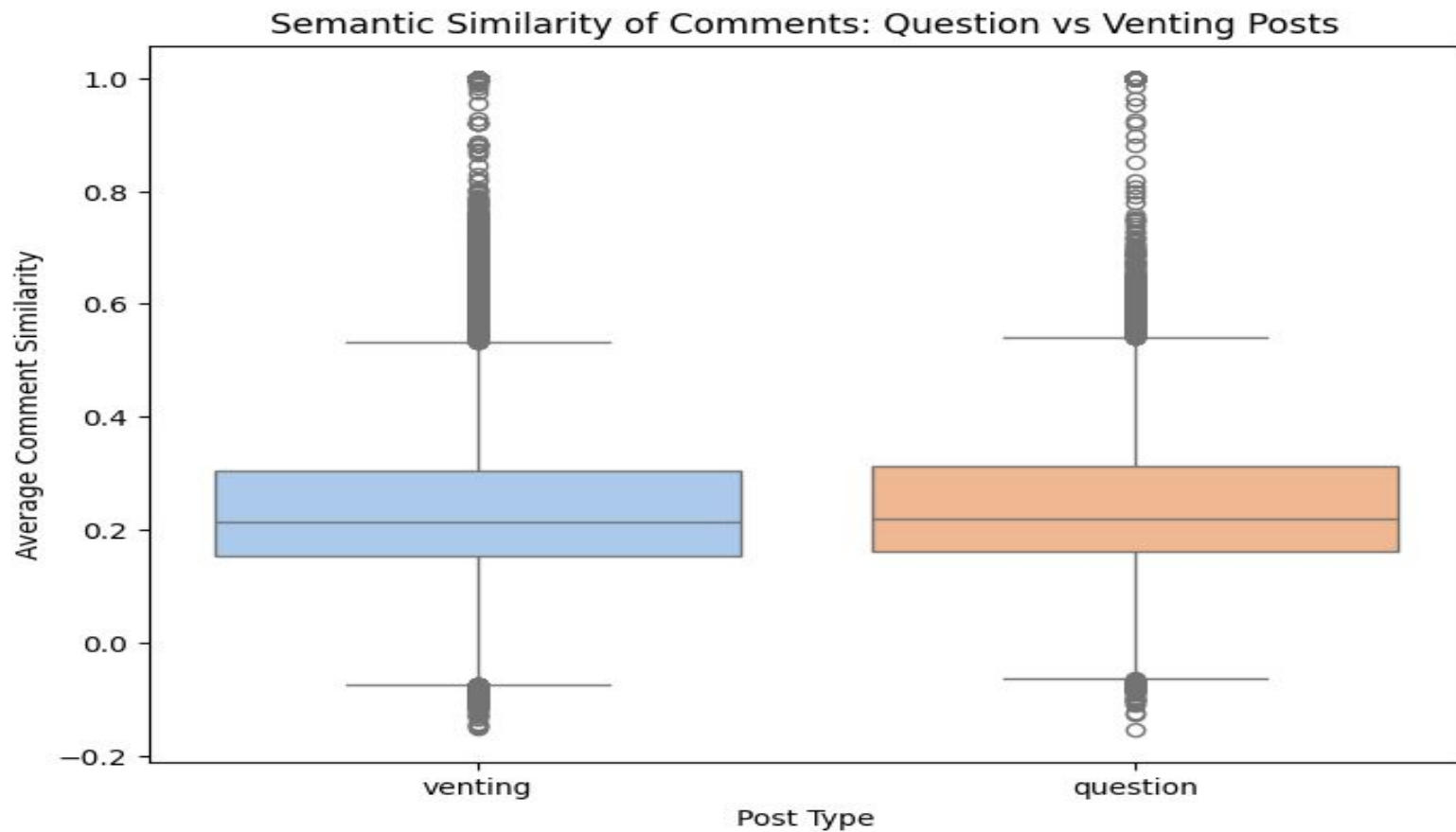

Semantic Similarity Across Posts for Certain Keywords

Semantic Similarity within posts for certain keywords

Average Semantic Similarity of Comments within Posts

Results

Semantic Similarity of Comments: Question vs Venting Posts

Sentiment Analysis over time

Sentiment of Reddit Posts Over Time (Using RoBERTa Sentiment)
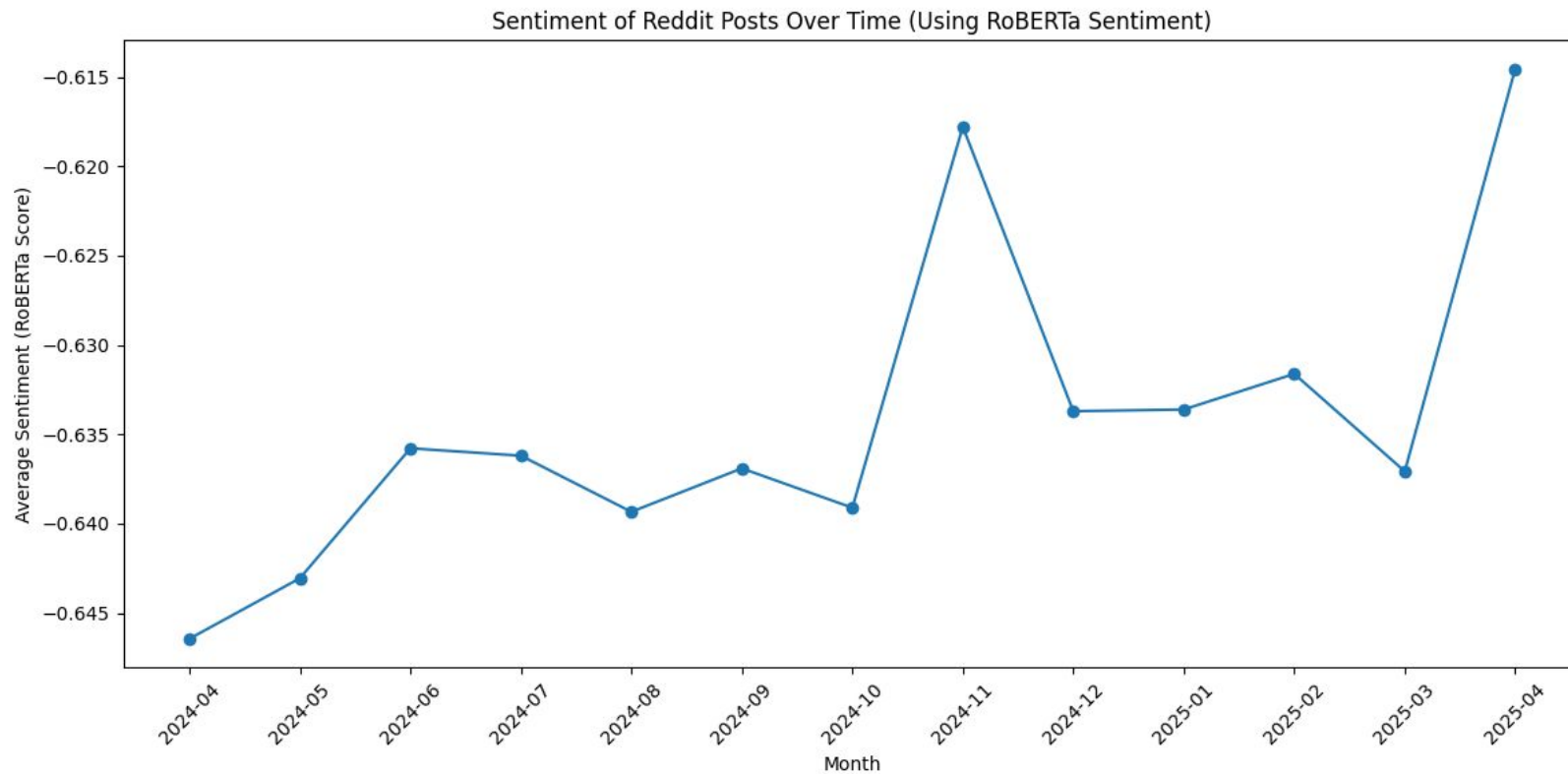
Implication

- Posts with high semantic similarity across topics indicates they are similar to each other. Users may experience similar feelings or ideas.

- High semantic similarity in a single thread means comments are echoing each other.

- The average sentiment score of posts stays consistently negative throughout the year, indicating a bleak emotional tone in the subreddit.

Limitations

- **Topic Sensitivity:** Mental health discussions are inherently personal and repetition sometimes may reflect support, not echo chamber effects.
- **Text-Only Limitation:** Non-verbal cues, emojis, or upvote behavior are ignored because of the scale of the study.
- **Reddit User Base:** Results may not generalize to other online communities.

Questions?