Temporal graph analysis of the far-right social network Gab

Naomi Arnold, Ben Steer, Imane Hafnaoui, Hugo Parada, Raul Mondragon, Felix Cuadrado, Richard Clegg

What is Gab?

"A social network that champions free speech, individual liberty and the free flow of information online." — gab.ai front page

BBC Trending

Gab: Free speech haven or alt-right safe space?

Gab Is the Alt-Right Social Network Racists Are Moving to

Gab, the social media platform favored by the alleged Pittsburgh shooter, explained *Vox*

Technology

Pittsburgh shooting: Gab drops offline after attack

🕐 29 October 2018

What is already known about Gab?

**What is Gab? A Bastion of Free Speech or
an Alt-Right Echo Chamber?**

Savvas Zannettou*, Barry Bradlyn[#], Emiliano De Cristofaro[†],
Haewoon Kwak[+], Michael Sirivianos*, Gianluca Stringhini[†], Jeremy Blackburn[‡]

**Profile of userbase and commonly
discussed topics** Aa

**Elites and foreign actors among the alt-right:
The Gab social media platform**
by **Yuchen Zhou, Mark Dredze,
David A. Broniatowski, and William D. Adler**

**Hierarchical structure of follower/
repost distribution** Aa

**From "Welcome New Gabbers" to the Pittsburgh Synagogue Shooting:
The Evolution of Gab**

Reid McIlroy-Young, Ashton Anderson

**Evolution of hateful language in
post content** Aa 🕐

**Our work: studying the
Gab social graph over time**

Dataset

- All posts between Aug 2016 and May 2018 via Gab REST API

- Users can interact via post replies and post reshares

Property	Quantity
Number of users	169,745
% of users that never reply	48.5 %
Number of posts	19,091,476
% as original posts	62.5 %
% as replies	37.5 %
% as self-replies	1.53 %

Interaction distributions

Interaction degree a different concept to degree

Edge weights are heavy tailed
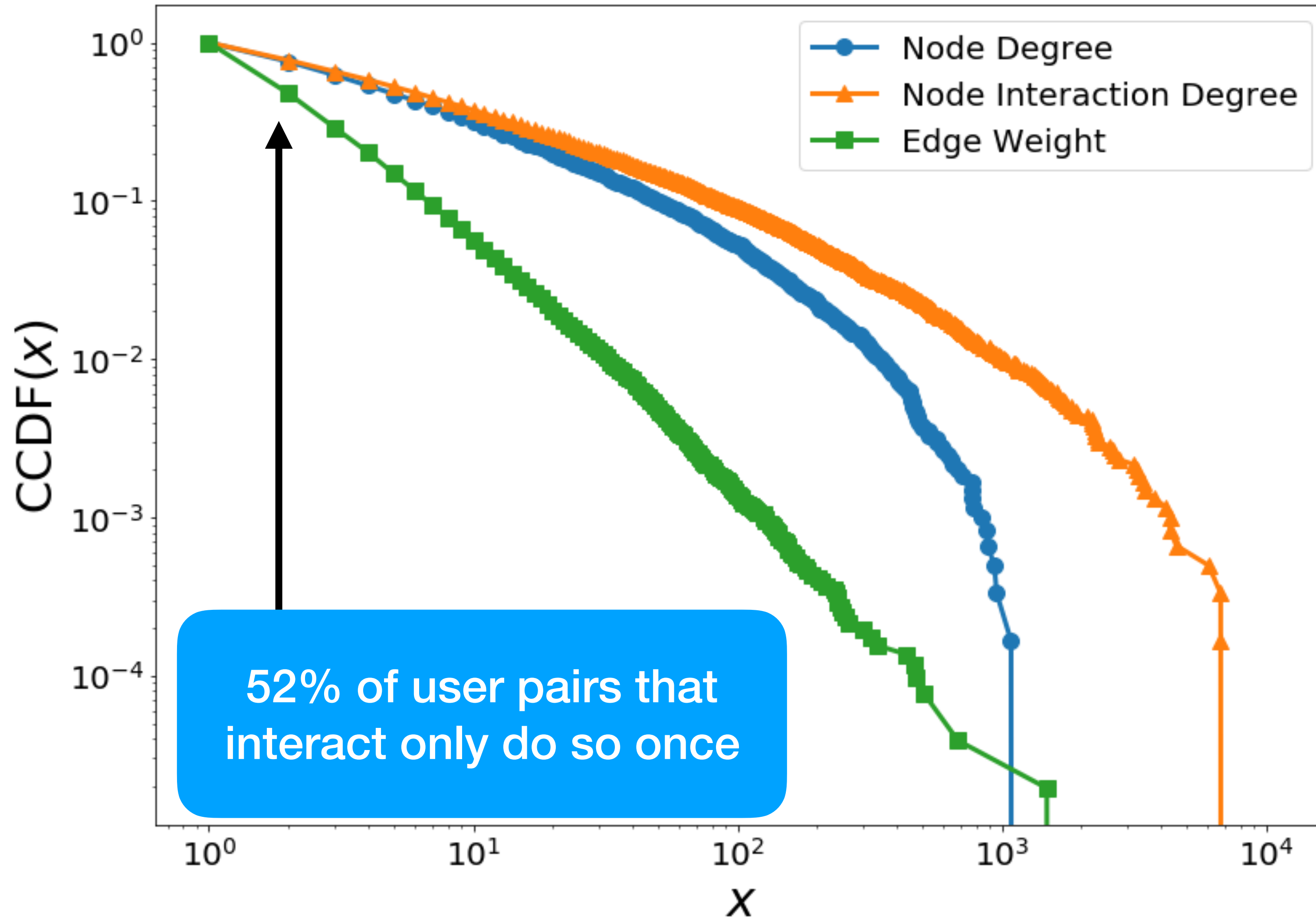
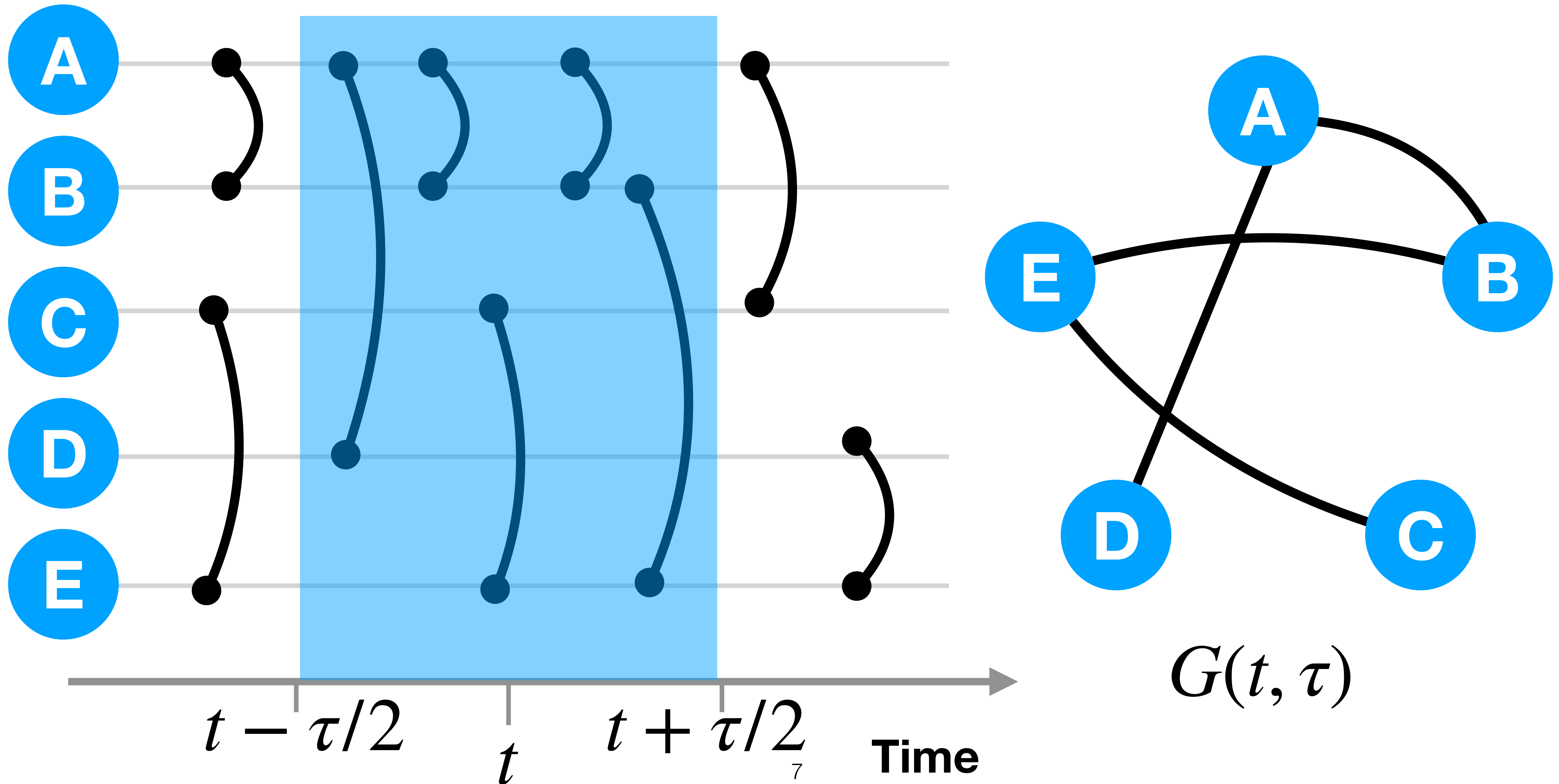52% of user pairs that interact only do so once

Our research questions

1. **Growth.** To what extent is Gab growing in its userbase and interactions, and what drives growth on the site?

2. **Cohesion**. Can Gab be considered a single community or disparate groups?

3. **Influence.** Is Gab consistently dominated by the same users or do these change over time?

   Investigate using temporal interaction graphs
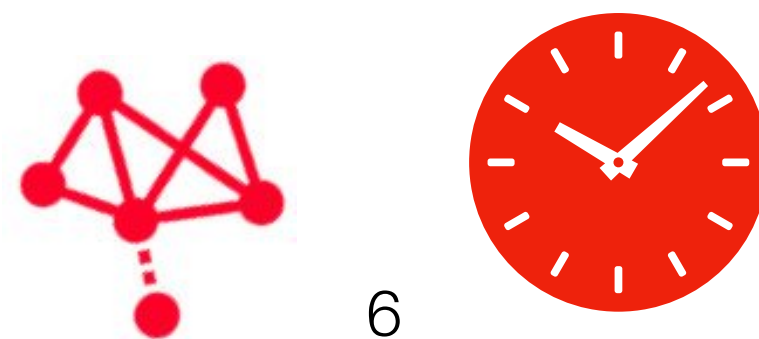
Temporal graph construction

$$t - \tau/2 \qquad t \qquad t + \tau/2$$

Time

$G(t, \tau)$

Methodology

- Look at evolution of **different graph metrics** using varying timescales (window sizes): 1hr, 1 day, 1 week, 1 month…

- Also compare to the aggregate graph (aggregating all interactions up to time t)

- Intuition: larger windows show stable evolution, finer windows reveal the network's response to events

1. **Growth.** To what extent is Gab growing in its userbase and interactions, and what drives growth on the site?
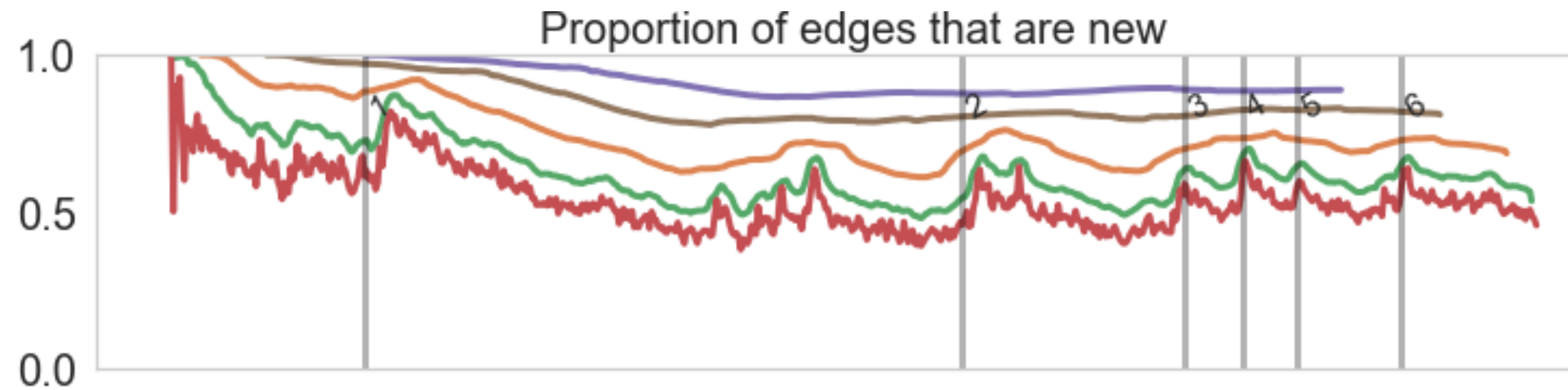
Number of users
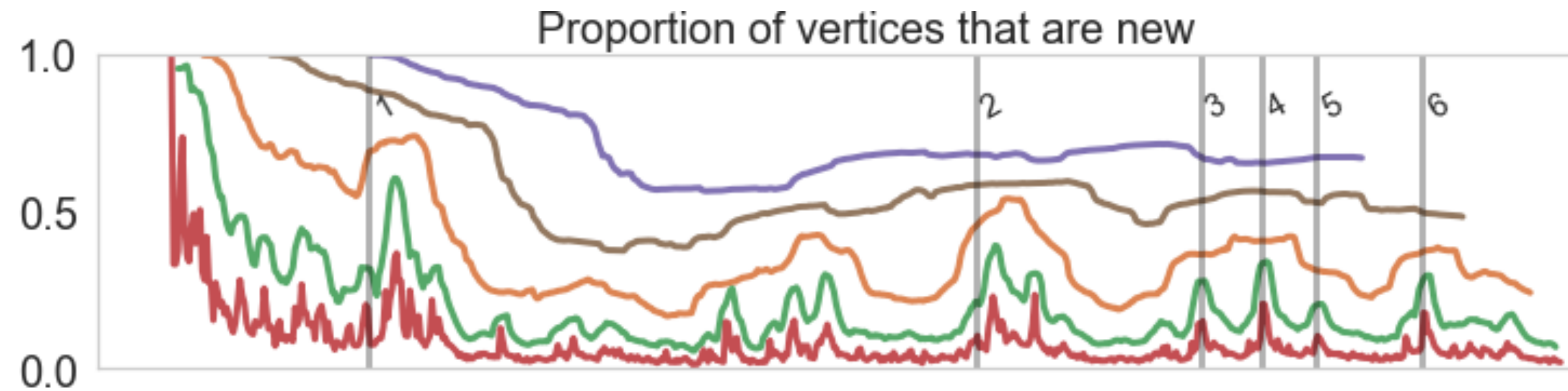
| Label	Date	Event
1	09/11/16	Trump wins election
2	11/08/17	Unite the Right rally
3	21/11/17	Plan to repeal neutrality announced
4	18/12/17	Twitter suspends white nationalists
5	12/01/18	Trump 'sh*thole countries' comment
6	01/03/18	Gilmore lawsuit against Alex Jones
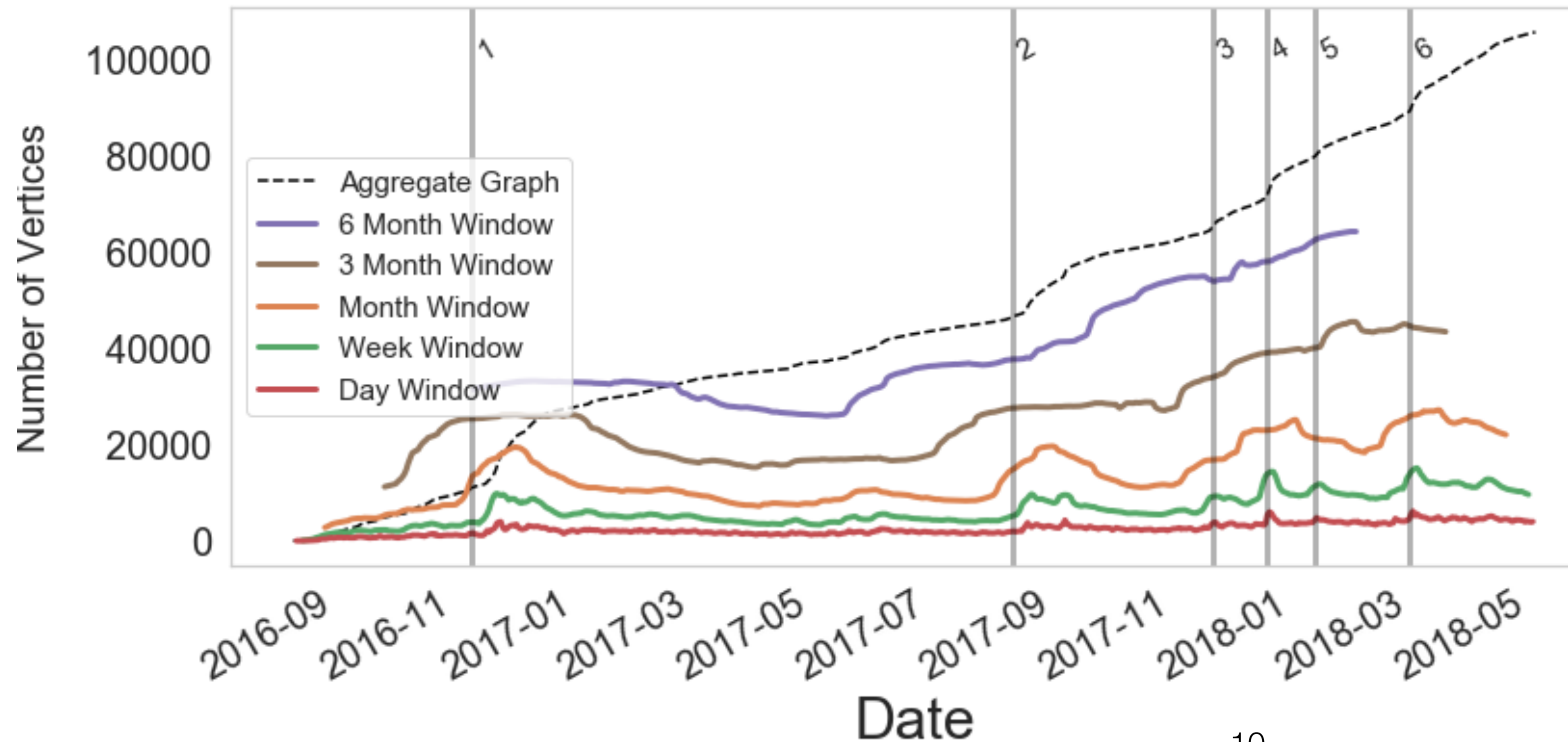
19% of monthly users active on any given day (compared to 44% for Twitter)

Fairly transient — about a quarter of users in any given month are new

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Number of edges

Proportion of edges that are new

| Label	Date	Event
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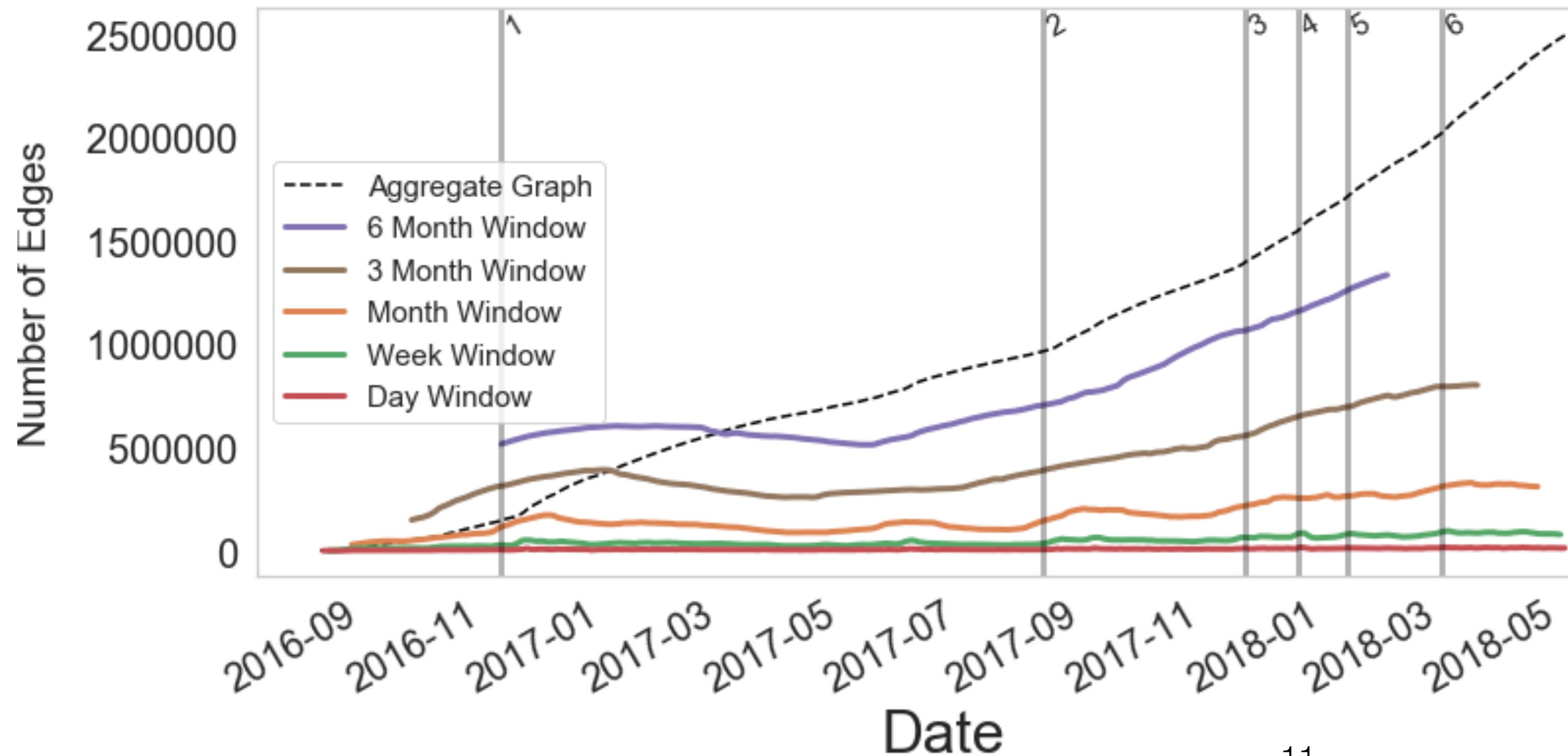
Over half of the edges on all timescales between users who have never previously interacted

Spikes in new edges associated with right-wing events of interest

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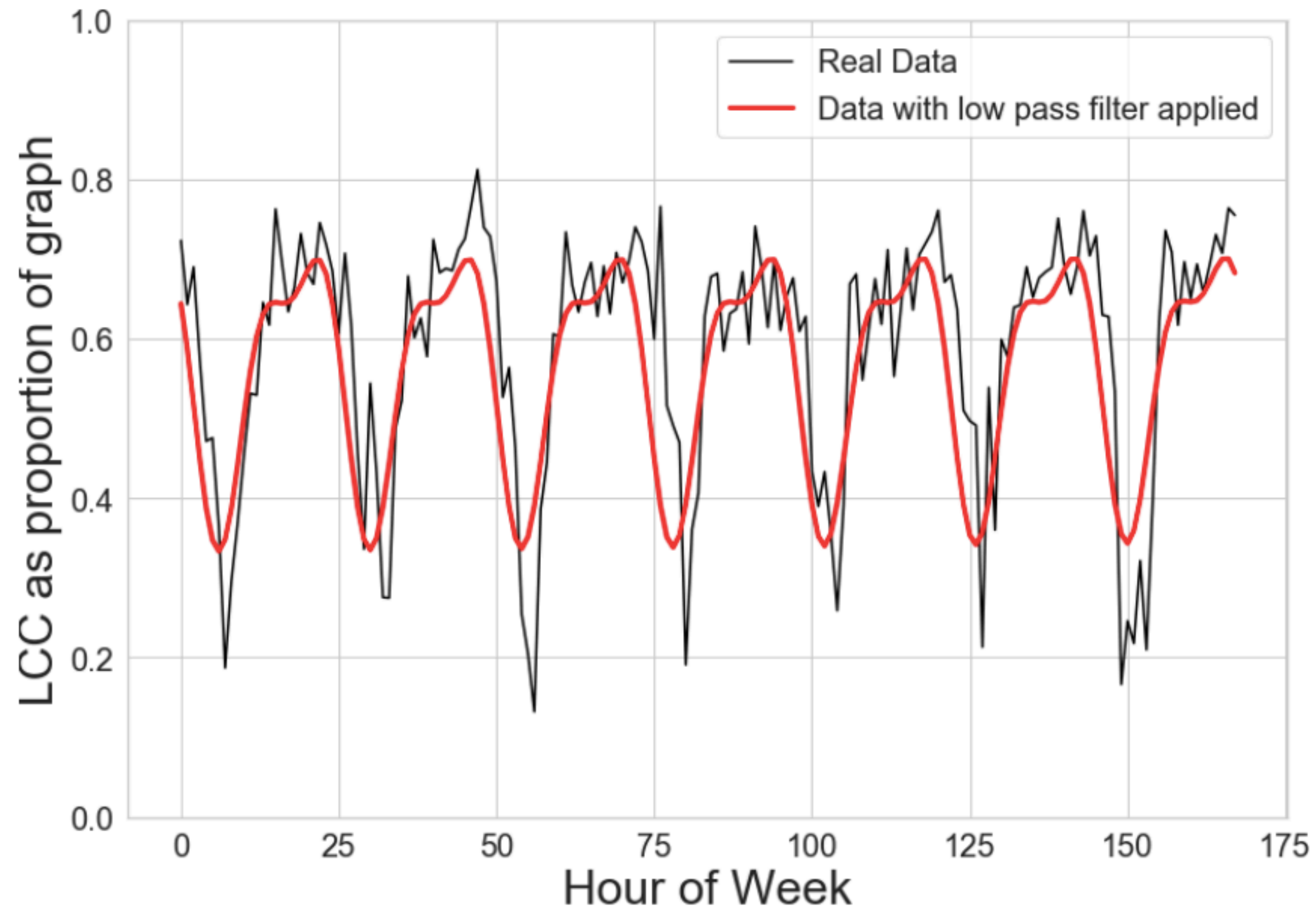**2. Cohesion.** Can Gab be considered a single community or disparate groups?

Relative size of largest connected component
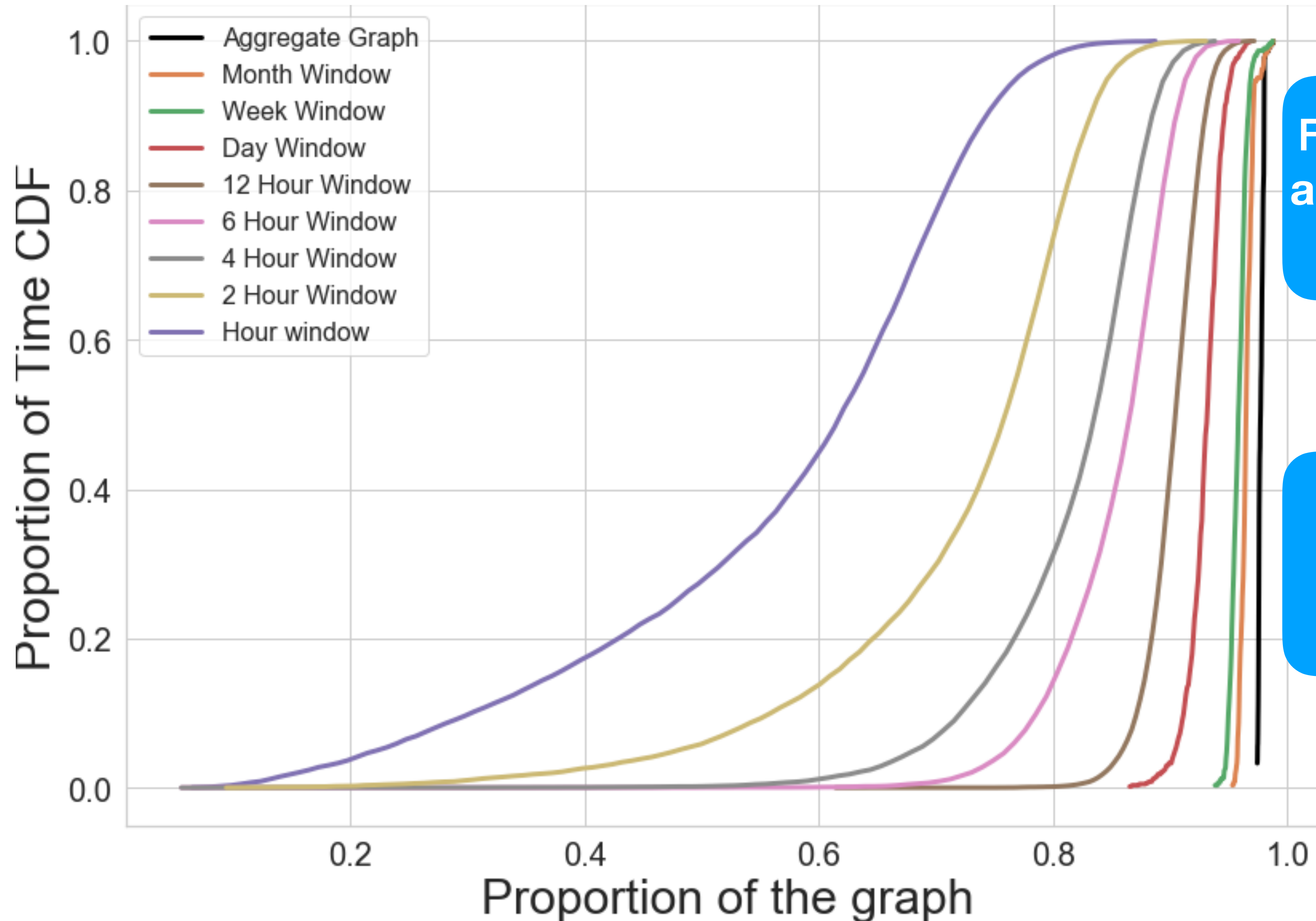
For windows over a day size, there is always a giant component (LCC over 90% of the graph)
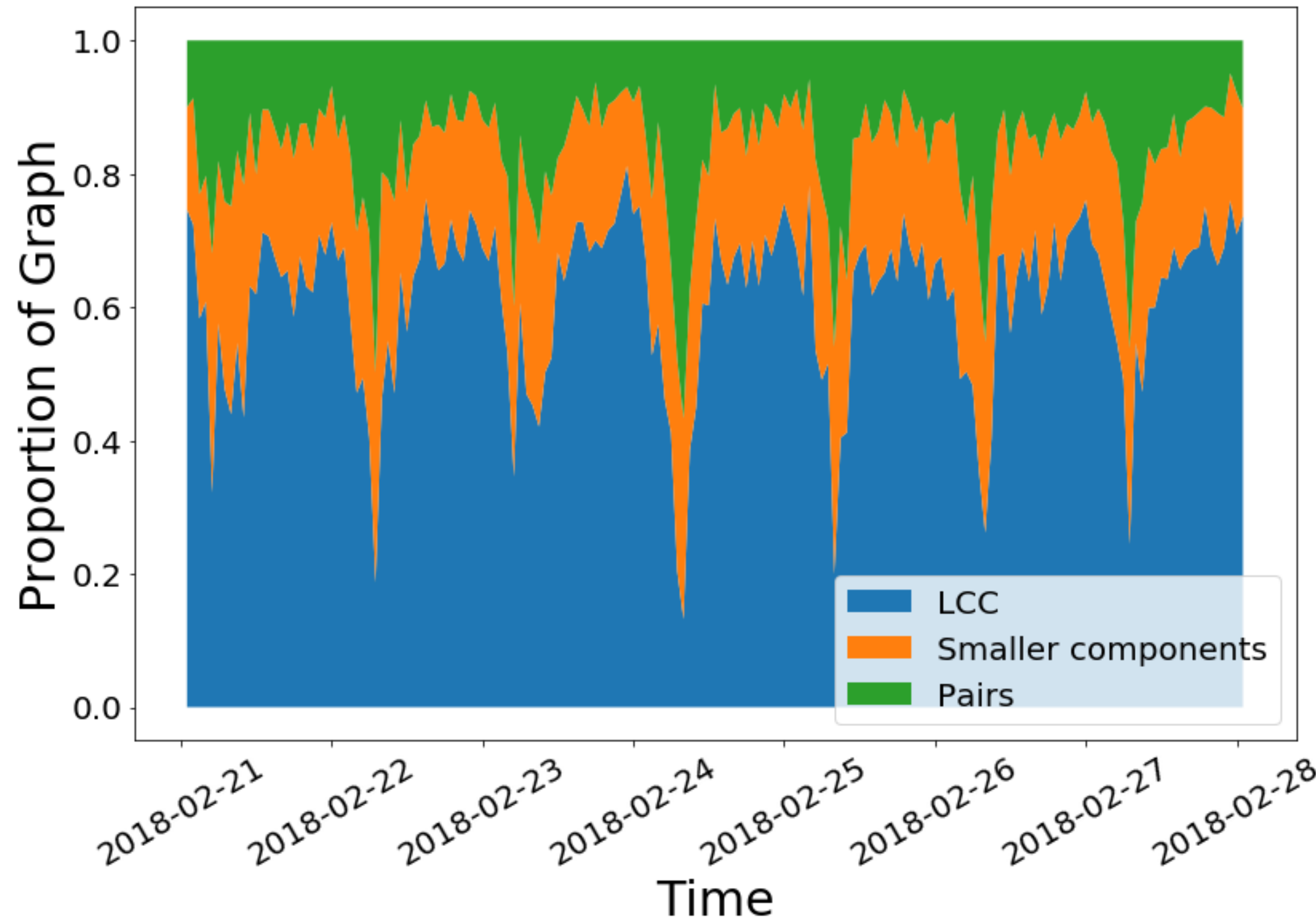
For hour-sized window, much more variation

Hourly behaviour of the LCC

Forming and shattering of the largest component not before observed in online social networks

Two peaks with around 6hr gap, corresponding with EU and US userbase

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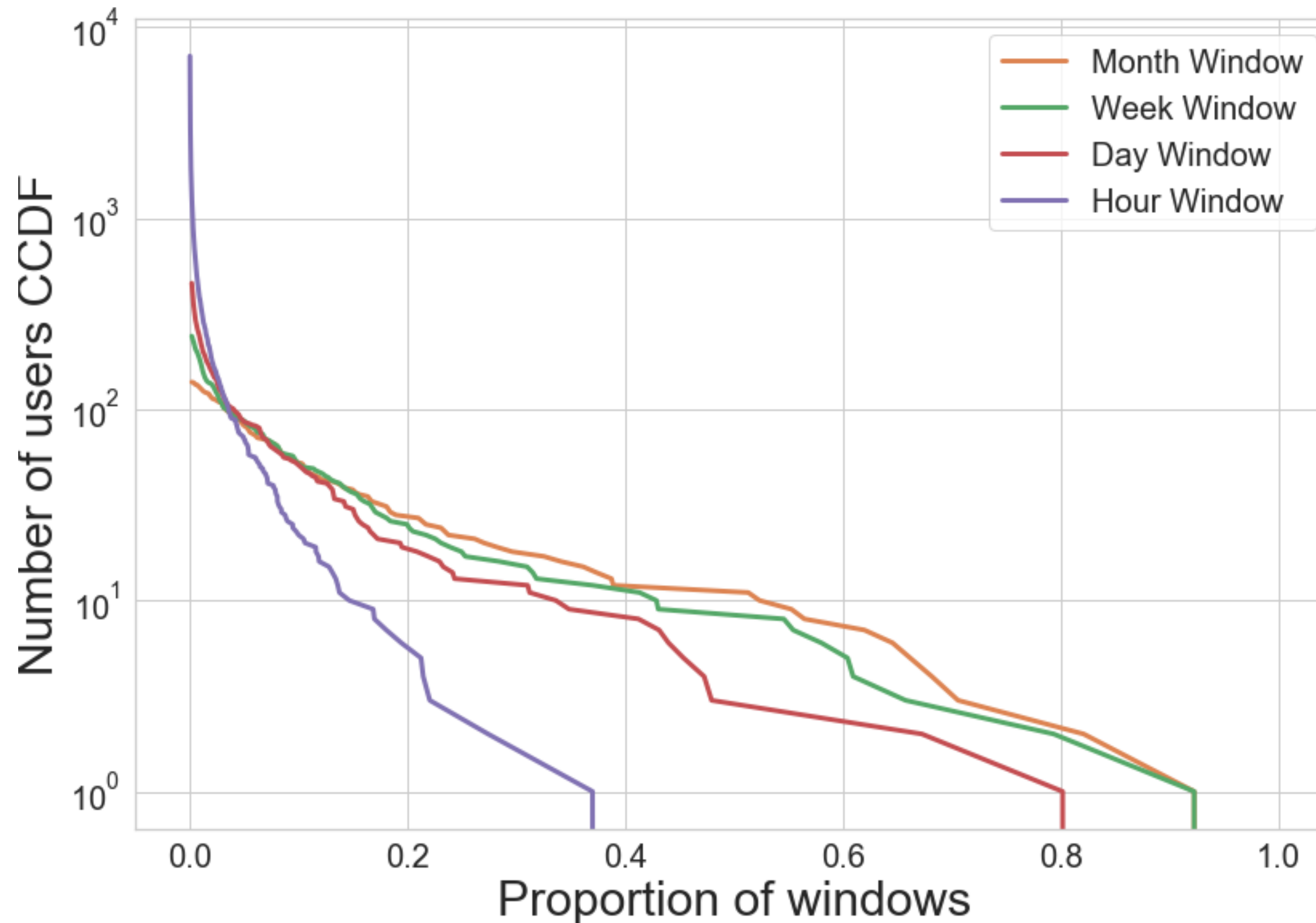
Other component interactions

At off-peak hours the network breaks down into pairs

Intermediate sized groups comprising only a small part of the graph

3. Influence. Is Gab consistently dominated by the same users or do these change over time?
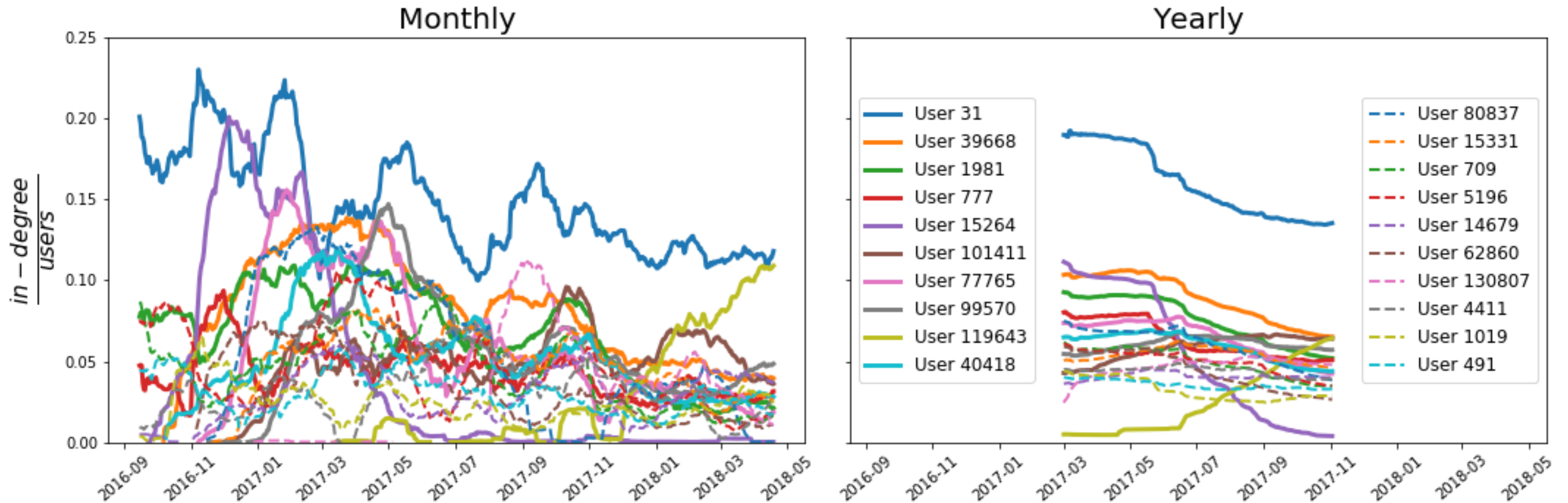
How long do users spend in the top ranks?

Ranking is by in-degree in terms of interactions with distinct users

Most users who enter the top 20 do so very fleetingly (800 who enter the daily top 20 once and never again)

Trajectories of all time top 20 users

Some users hold huge share of attention on Gab (> 20% of users)

More stable trend across year windows with users rarely overtaking each other

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Findings so far

- Gab active userbase is slowly growing but can be **transient**, with **high proportions** of users and edges that are **new.**

- Connected component size varies greatly on an **hourly basis**, with an EU and US userbase.

- **Small core** of users who are dominant a large proportion of the time, with much **larger pool of users** who gain influence fleetingly.

- Lots of insights to be gained by using **window-based** graph analysis!

Thanks for listening! What are your questions?

Moving with the Times: Investigating the Alt-Right Network Gab with Temporal Interaction Graphs

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Link to paper: https://arxiv.org/abs/2009.08322
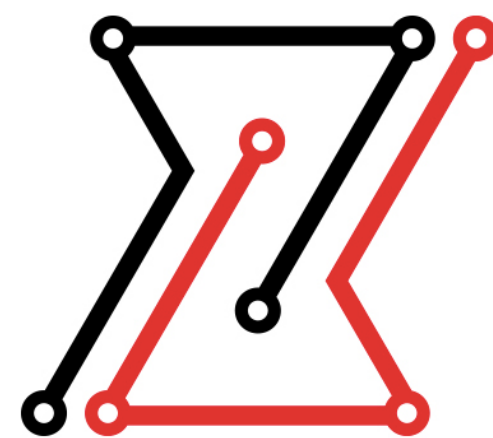
Raphtory - A practical system for the analysis of temporal graphs

Raphtory is an open source Distributed Real-Time Temporal Graph Analytics Platforms funded by The Alan Turing Institute. This page follows the developement of Raphtory posting about how the tool may be used, recent changes and improvments, the implemented algorithms and example usecases for temporal graphs.

Link to Raphtory: https://raphtory.github.io