The spread of true and false news online

Soroush Vosoughi, Deb Roy, Sinan Aral

Enis Ceyhun Alp - 23042021


The Associated Press
@AP
Following
Breaking: Two Explosions in the White House and Barack Obama is injured
Reply
Retweet
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More
3,242
RETWEETS
153
FAVORITES
12:07 PM - 23 Apr 13


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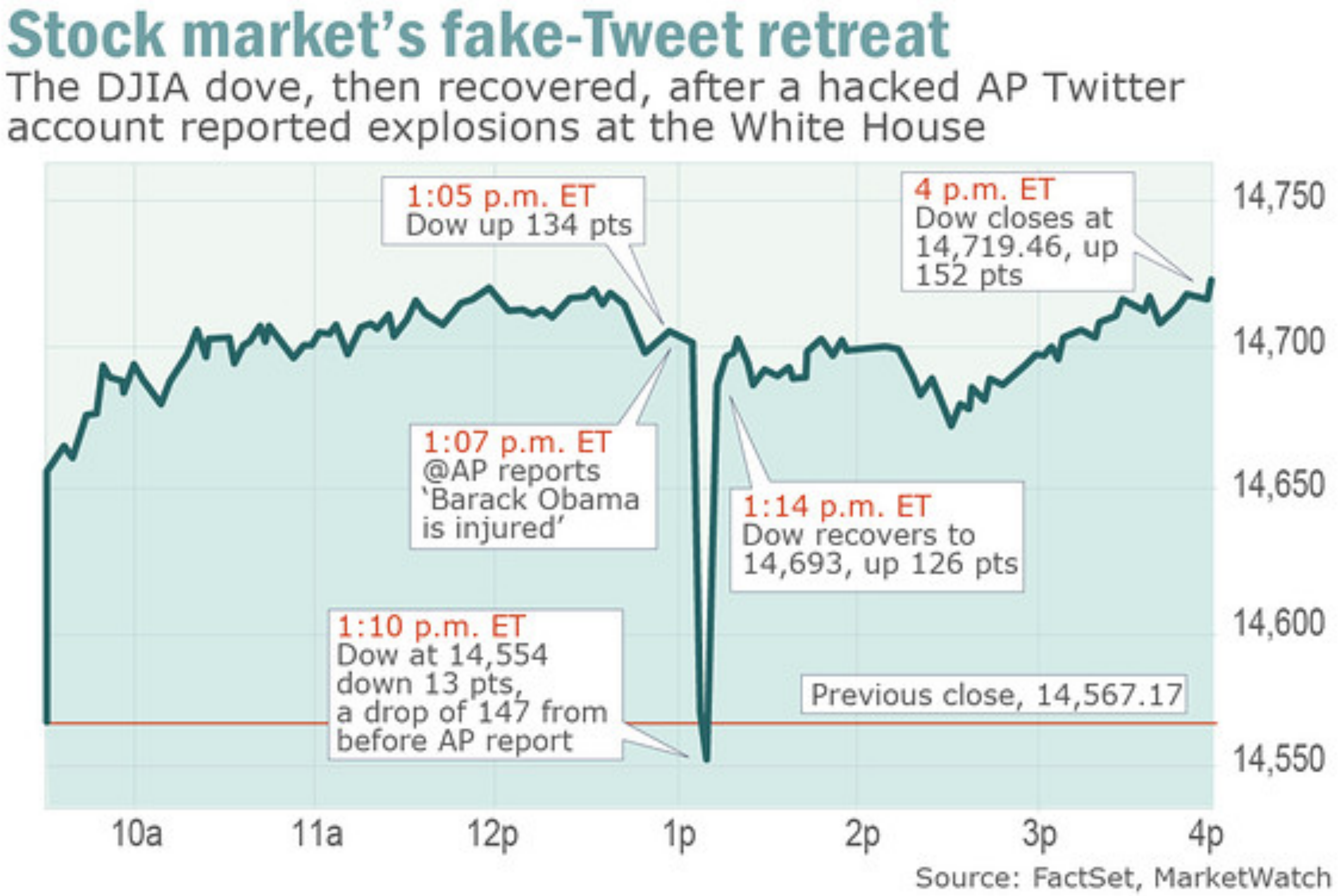
Stock market's fake-Tweet retreat
The DJIA dove, then recovered, after a hacked AP Twitter account reported explosions at the White House
1:05 p.m. ET
Dow up 134 pts
4 p.m. ET
Dow closes at 14,719.46, up 152 pts
1:07 p.m. ET
@AP reports 'Barack Obama is injured'
1:14 p.m. ET
Dow recovers to 14,693, up 126 pts
1:10 p.m. ET
Dow at 14,554 down 13 pts, a drop of 147 from before AP report
Previous close, 14,567.17
14,750
14,700
14,650
14,600
14,550
10a
11a
12p
1p
2p
3p
4p
Source: FactSet, MarketWatch

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New report shows that Swedish election second only to US in proportion of 'junk news' shared

Published:
6 September 2018

Research from the Oxford Internet
'junk news' shared on social media
European country studied – and se

1 in 3 news articles shared about Sweden election are fake, finds study

COMMENTS

By Alice Cuddy • Updated: 08/09/2018



BOSTON

Problem definition

- Social media technologies are very prominent in guiding our access to information and news
- Little known about their contribution to falsity online

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How and why do truth and falsity diffuse differently?

Are there categorical differences that influence diffusion?

What factors of human judgement explain these differences?

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- Rumor
  - Social phenomena of a news story/claim spreading through Twitter
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  - Social phenomena of a news story/claim spreading through Twitter
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- Rumor cascade
  - Starts with a user making an assertion on Twitter (text, photos, links, etc.)
  - Unbroken retweet (RT) chain with a common & singular origin
  - Rumor diffusion through one or more cascades

Overview

- Investigating the differential diffusion of true, false, and mixed news stories
- Dataset of ~126,000 rumor cascades on Twitter
  - Spread by ~3M people more than ~4.5M times
  - Between 2006-2017. Access to all tweets ever posted.
  - Investigated by six independent fact-checking organizations (95-98% agreement on classifications)

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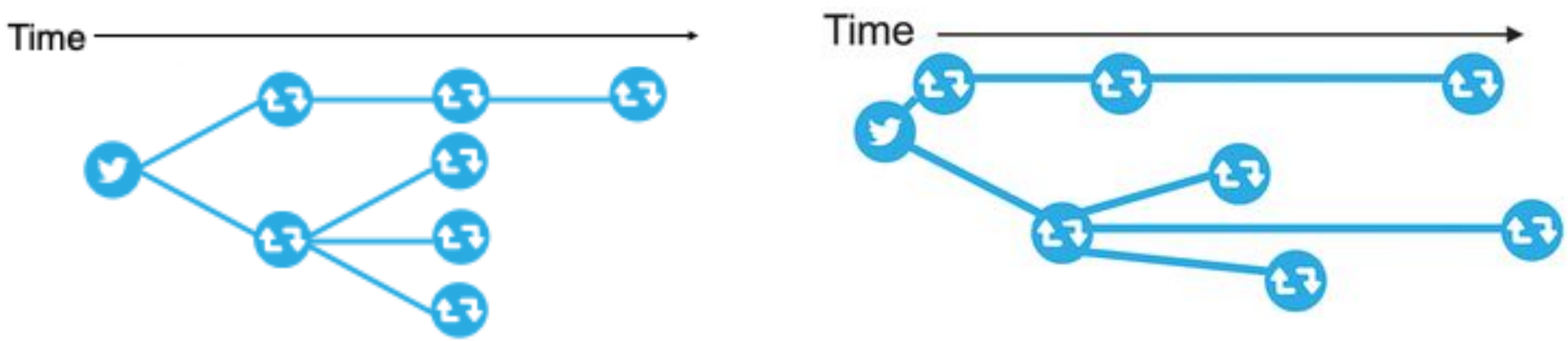
- Each RT cascade = rumor propagating on Twitter
  - Veracity of the RT cascade - through the reply with link
- Manually and automatically ensure that replies address the original tweet
  - Only considered replies that target the original tweet (no replies to replies)
  - Compared the headline of the linked article to that of the original tweet
    - Cosine similarity

Rumor cascades



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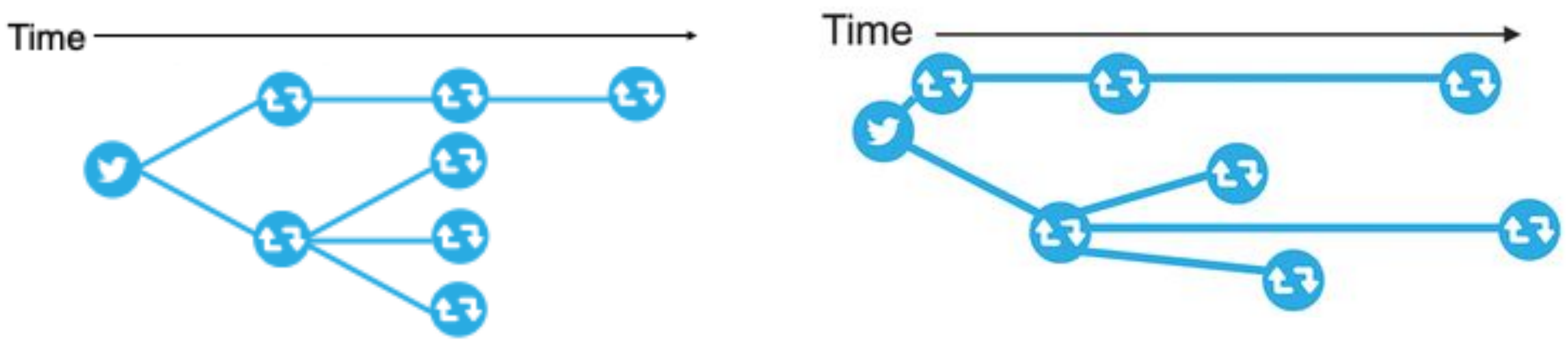

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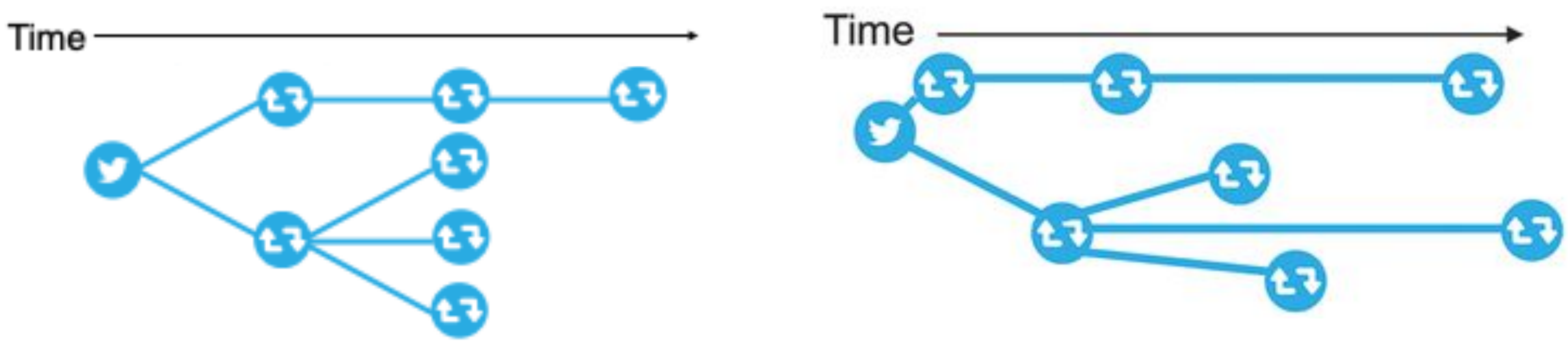

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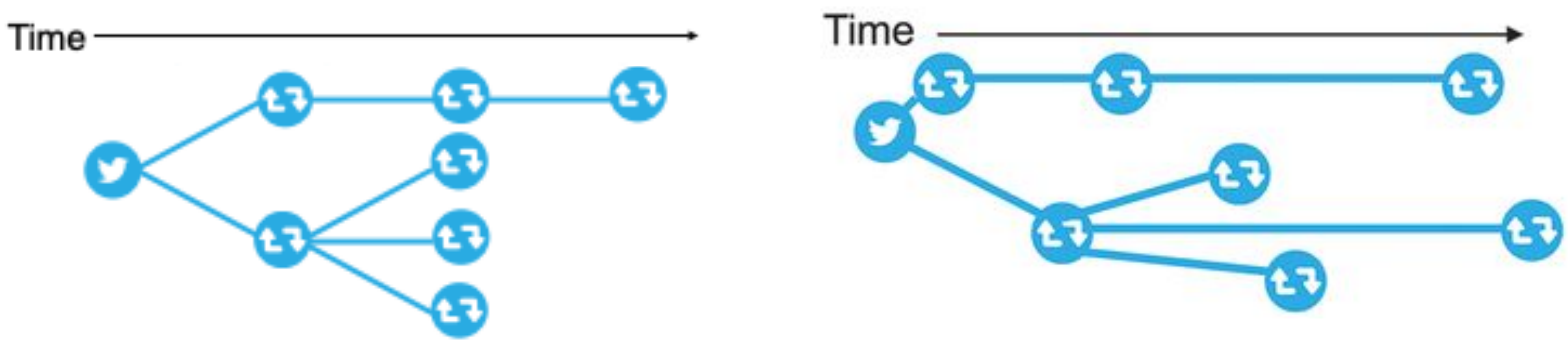

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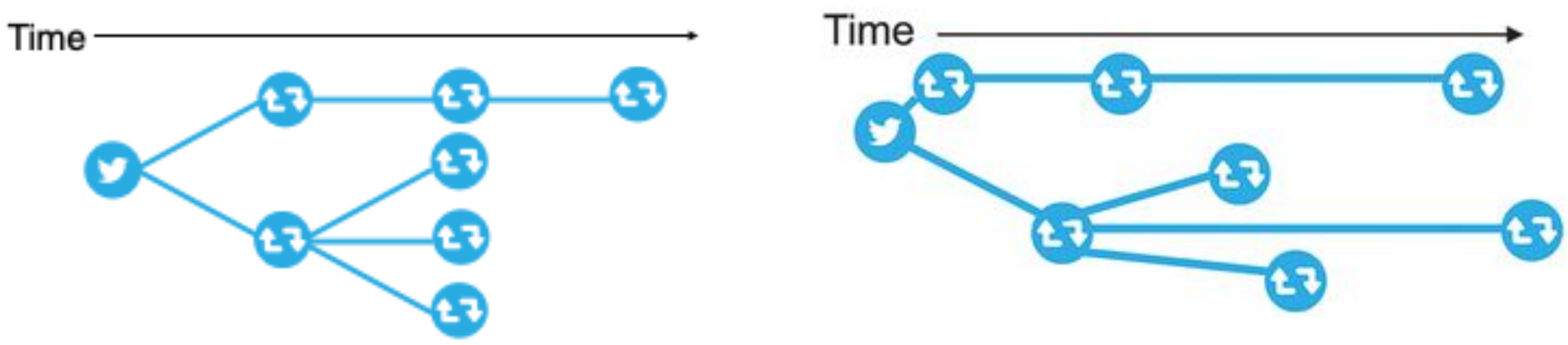

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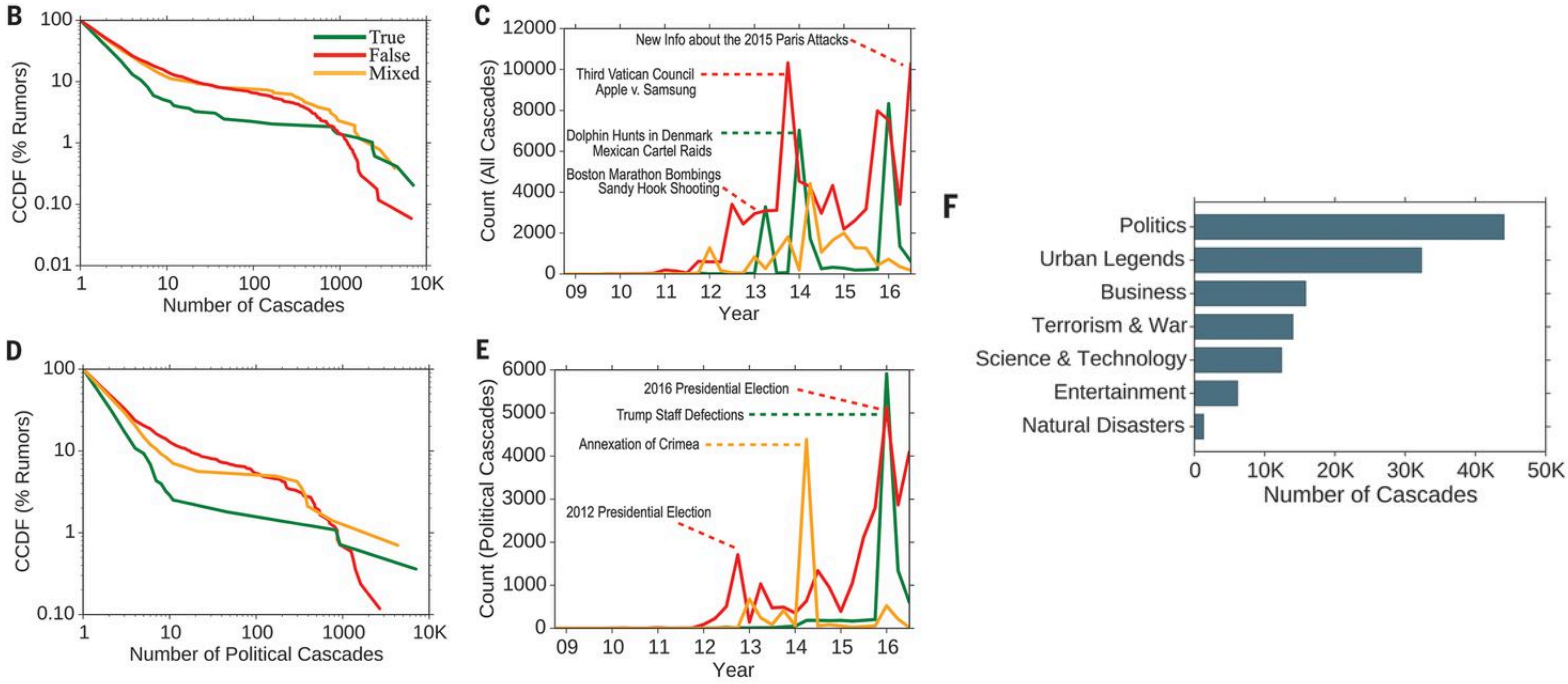
- **Structural virality:** average distance between all pairs of nodes in the cascade

Rumor cascades



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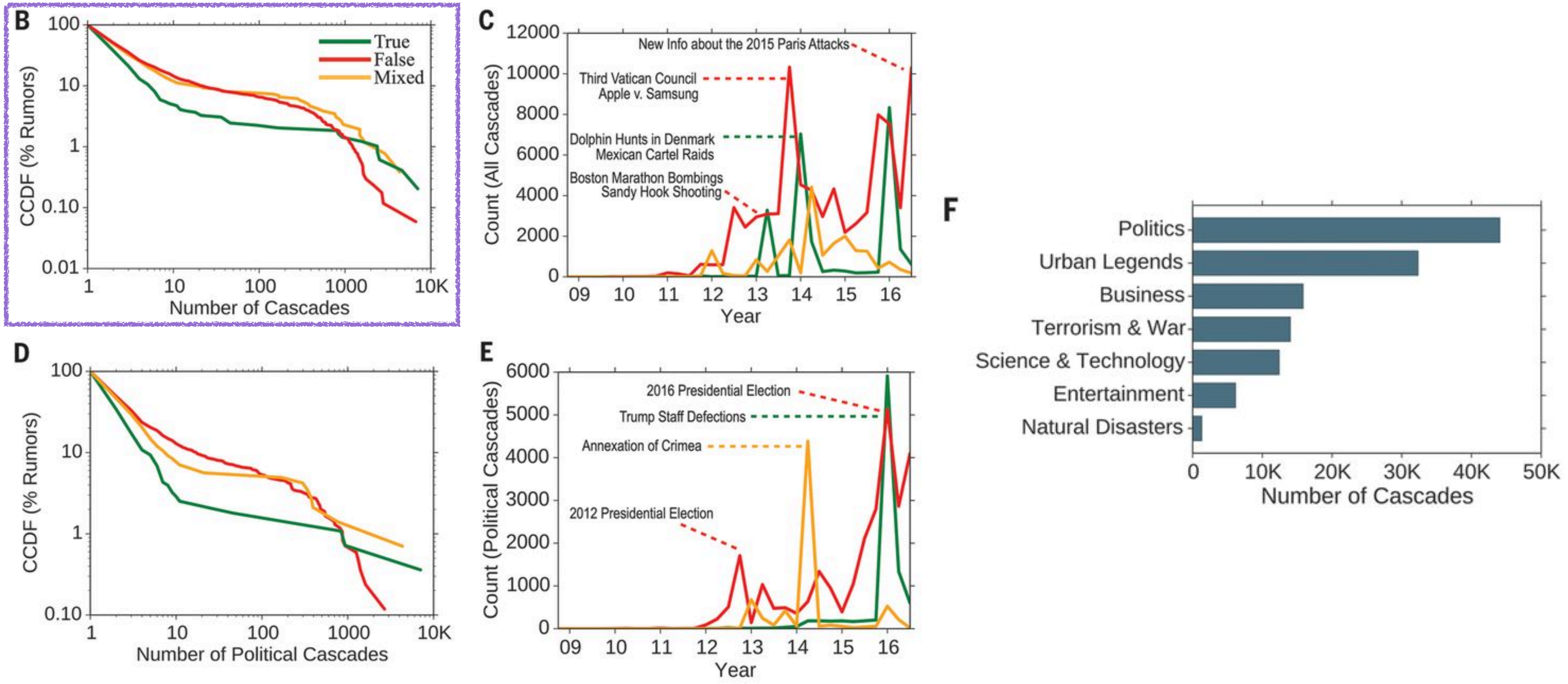

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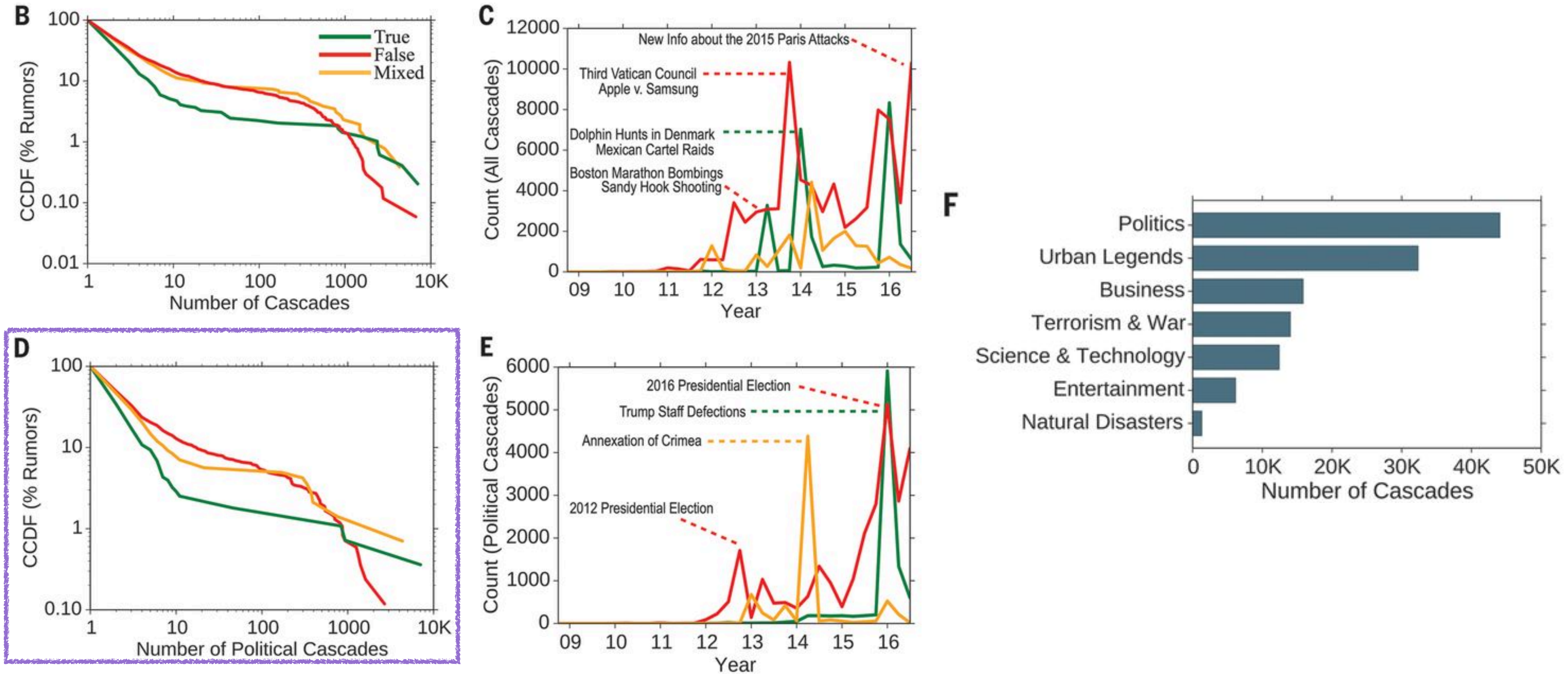

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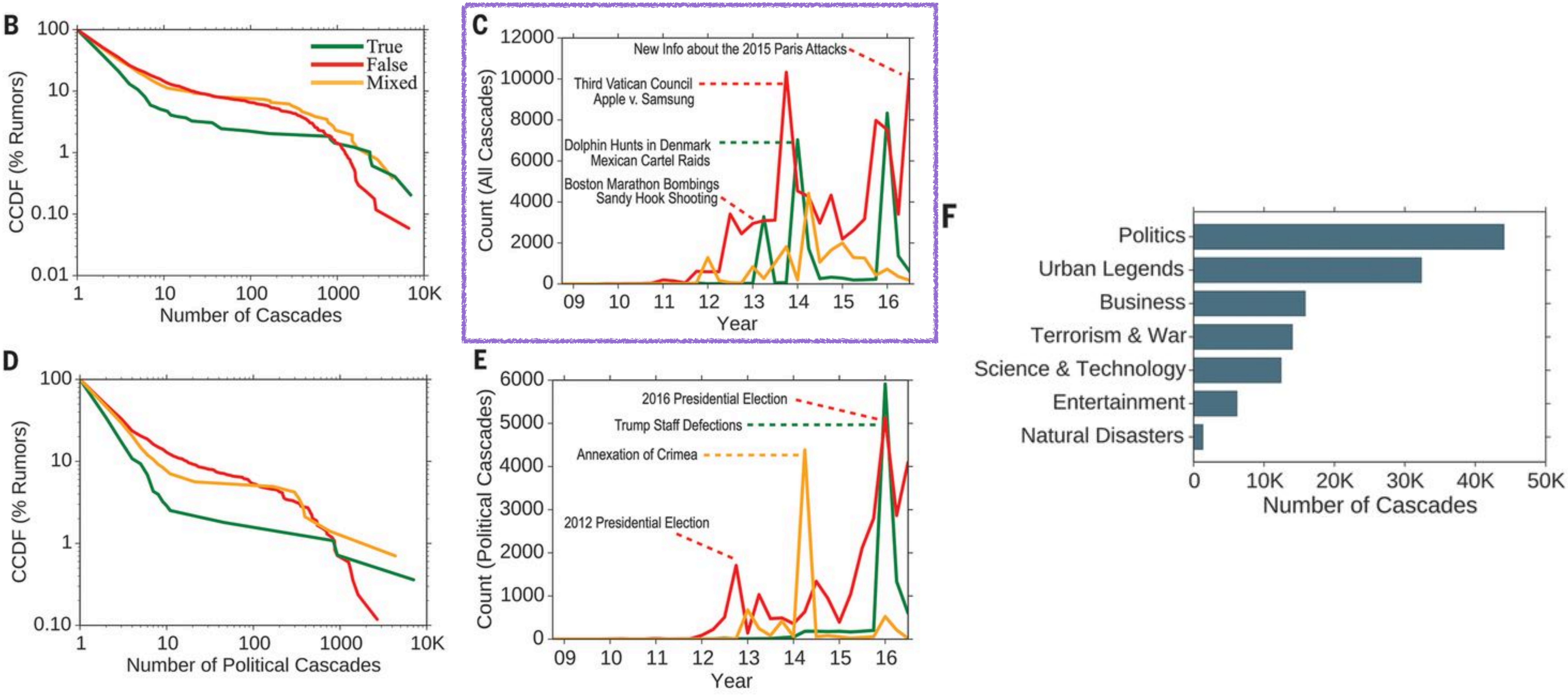

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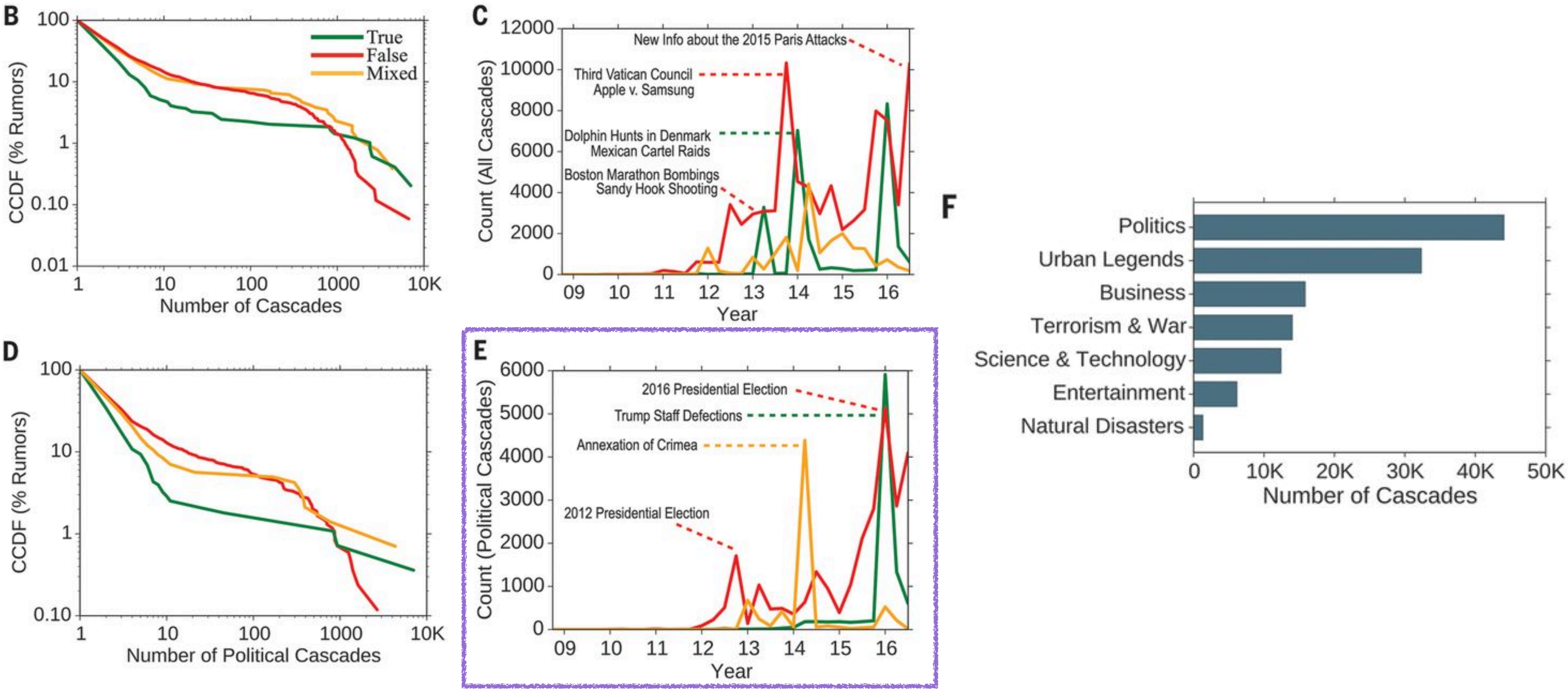

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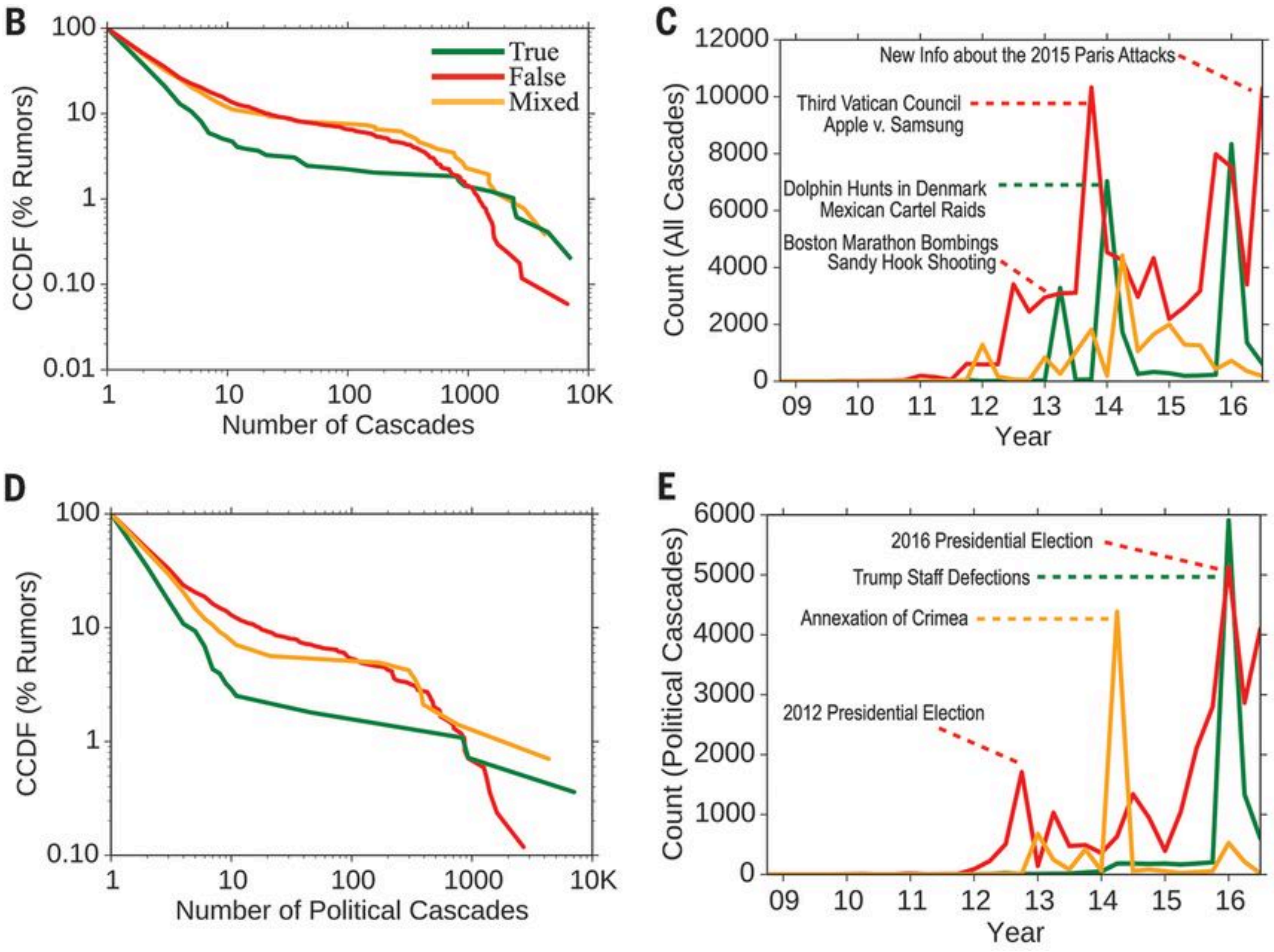
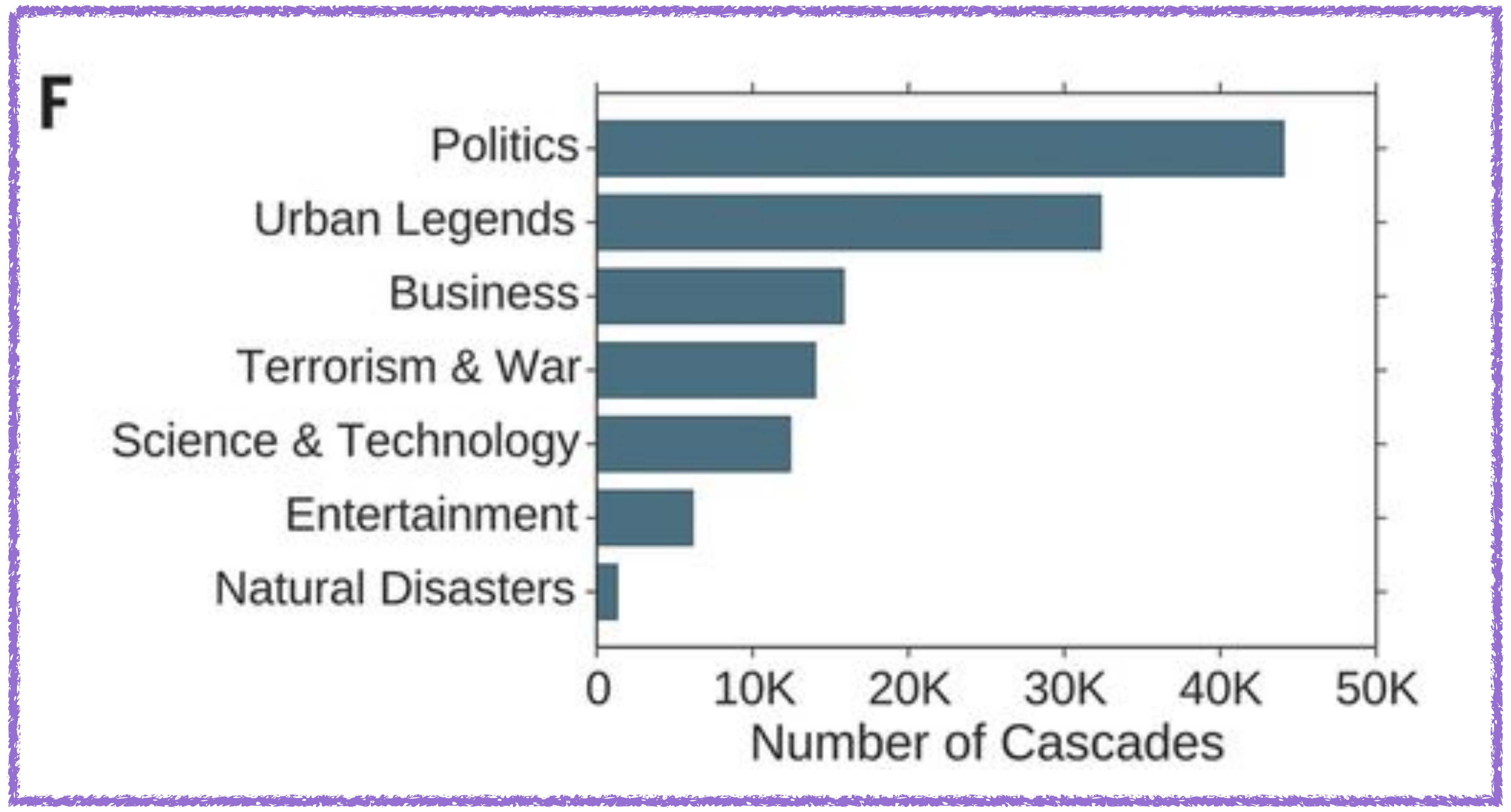
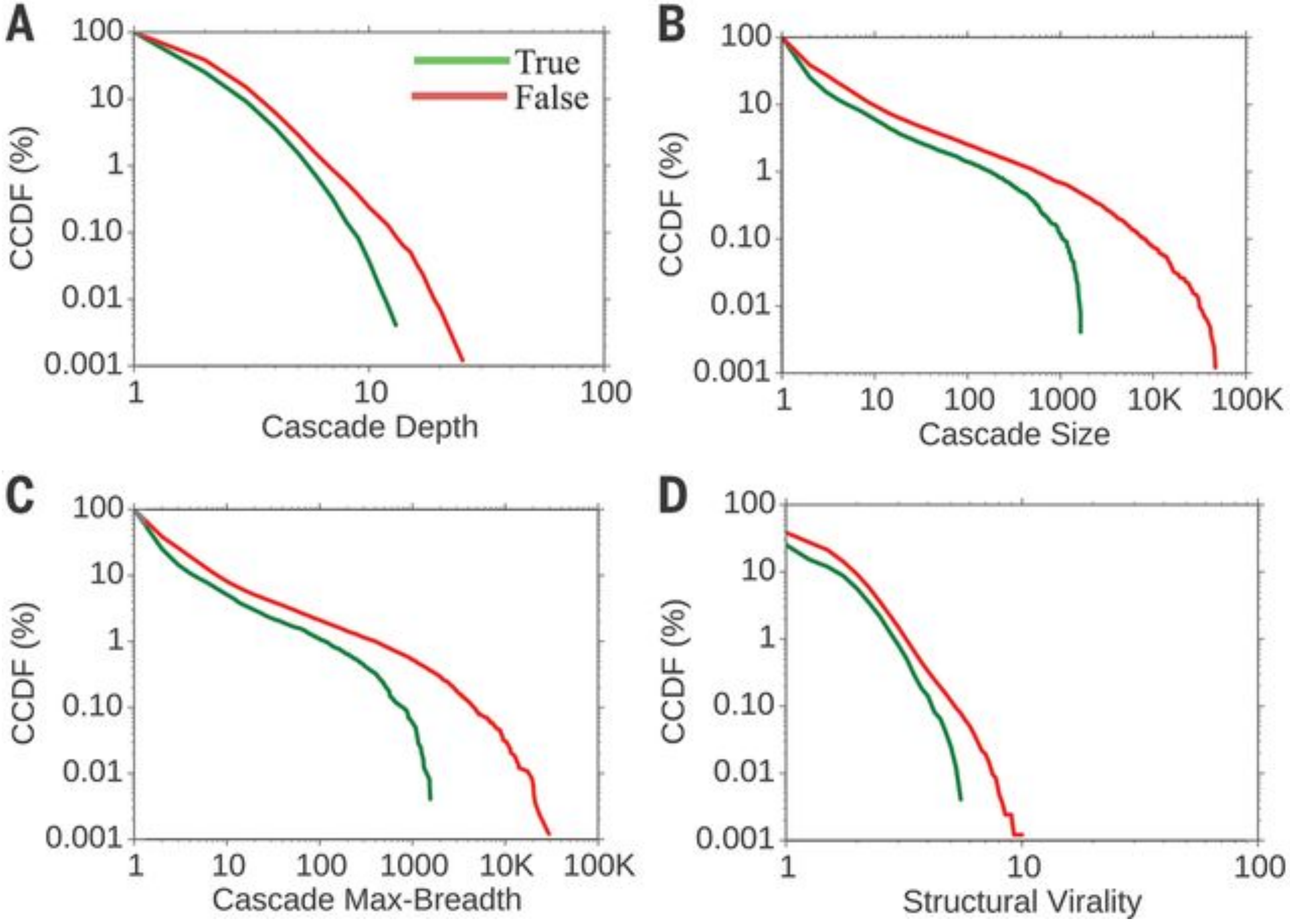




Diffusion dynamics of rumors



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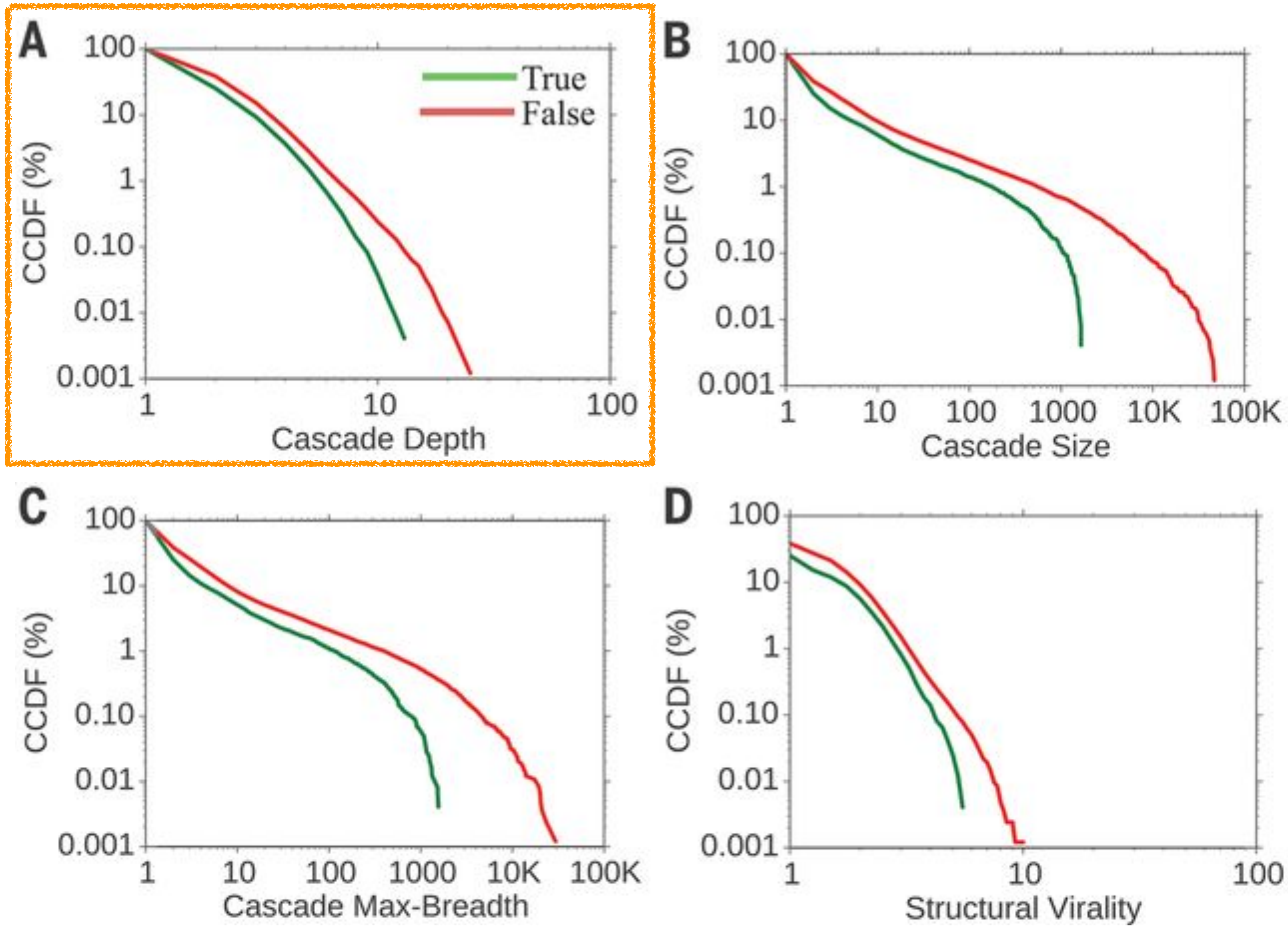

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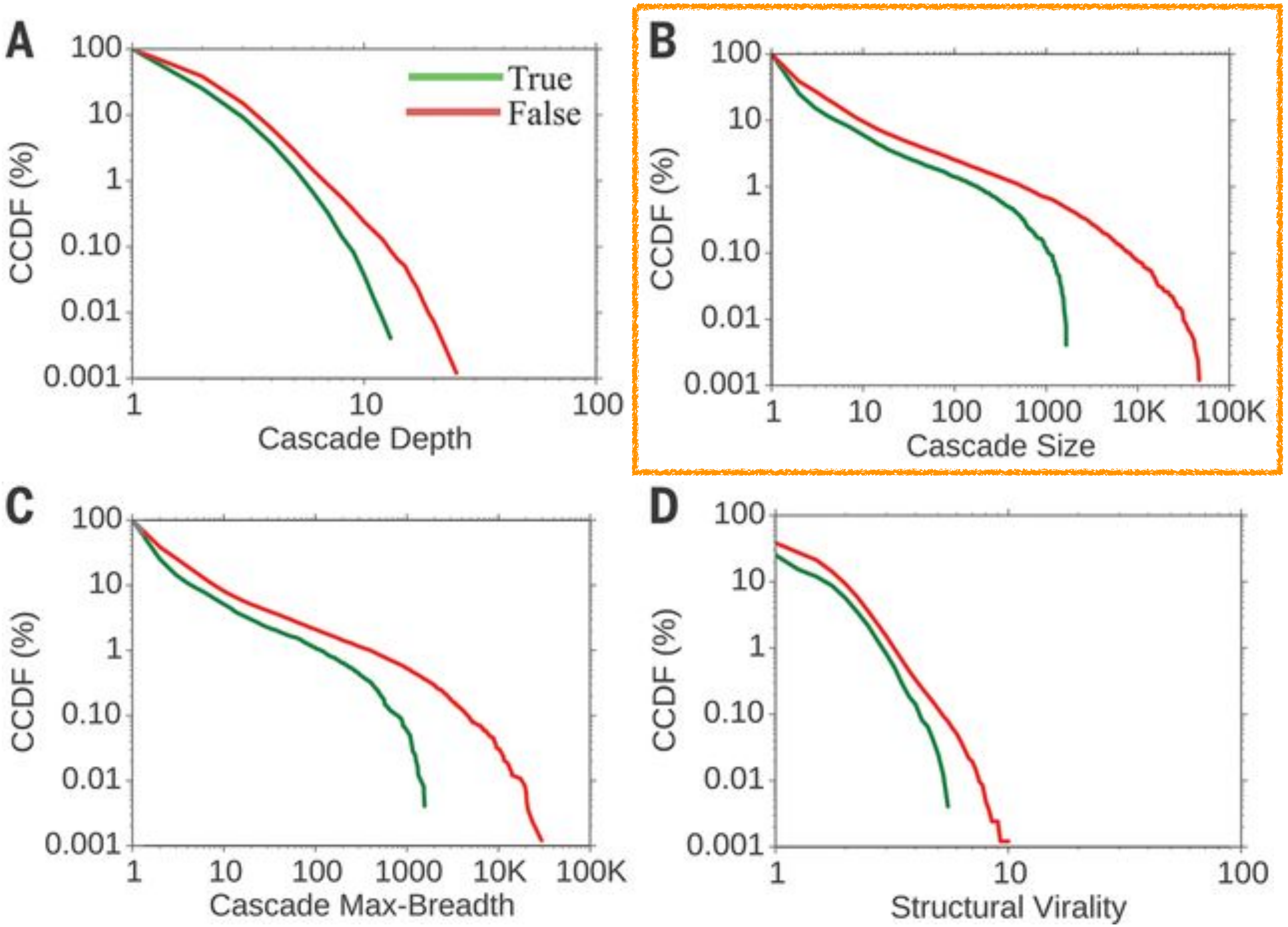

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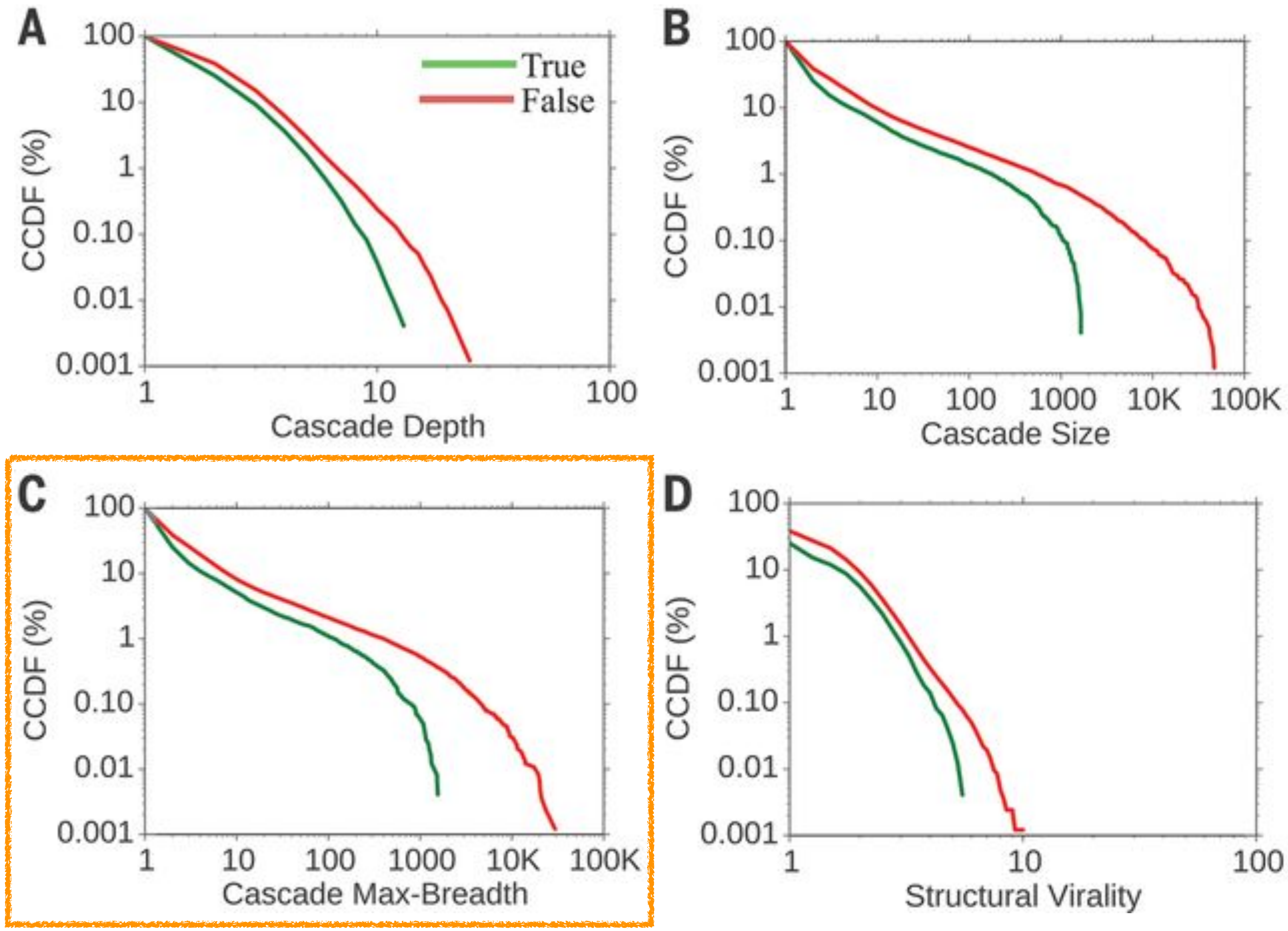

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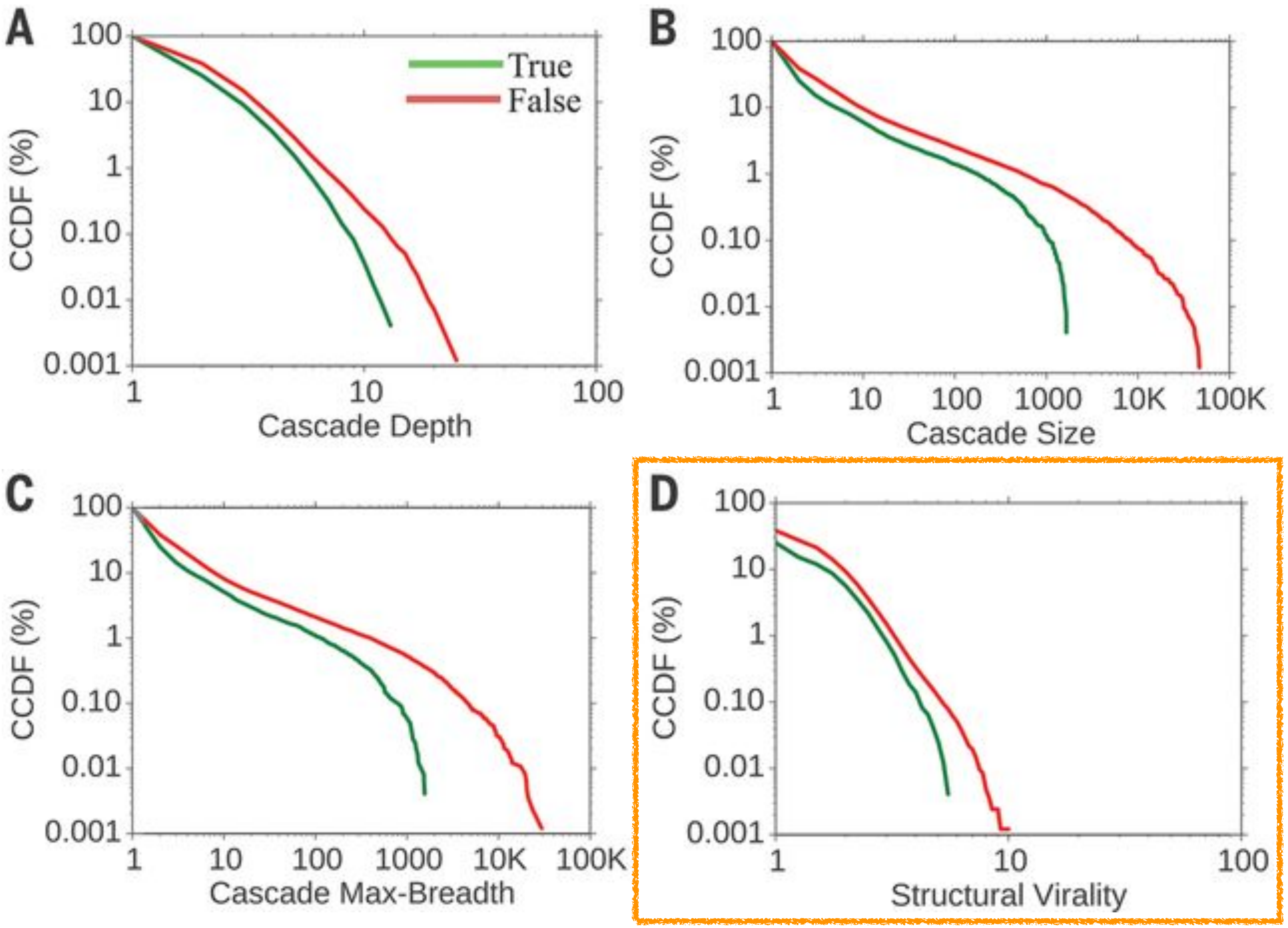

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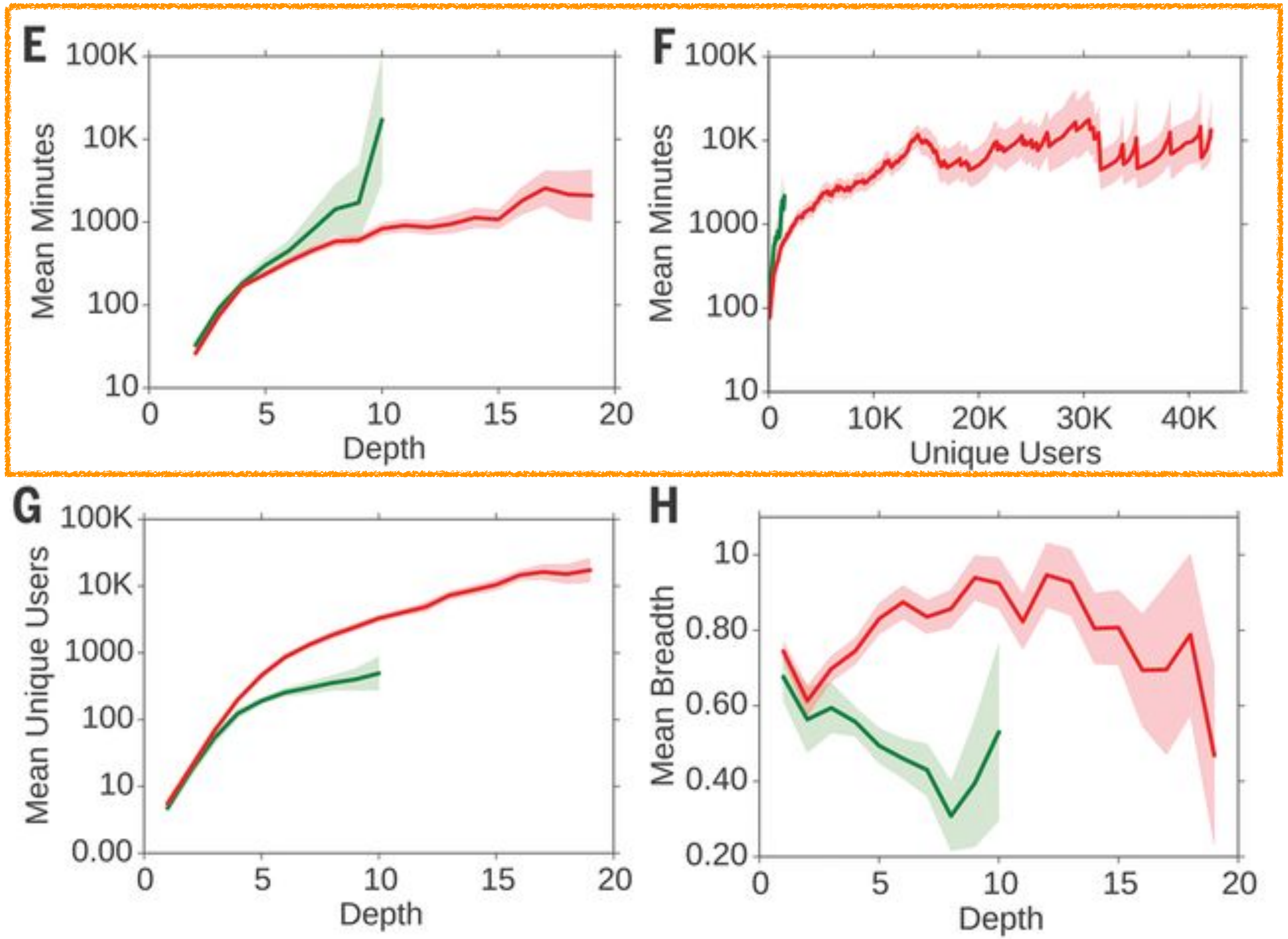

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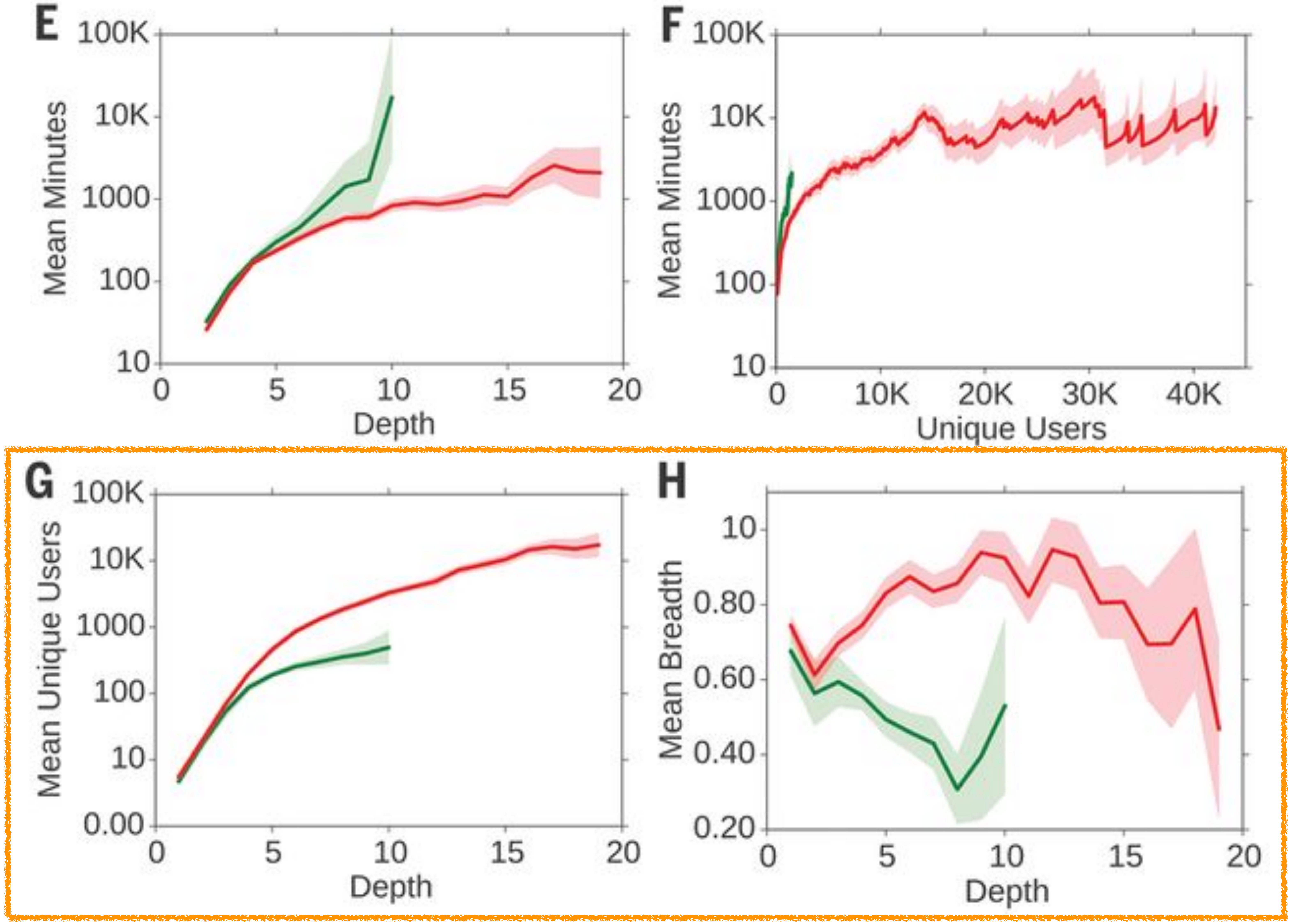
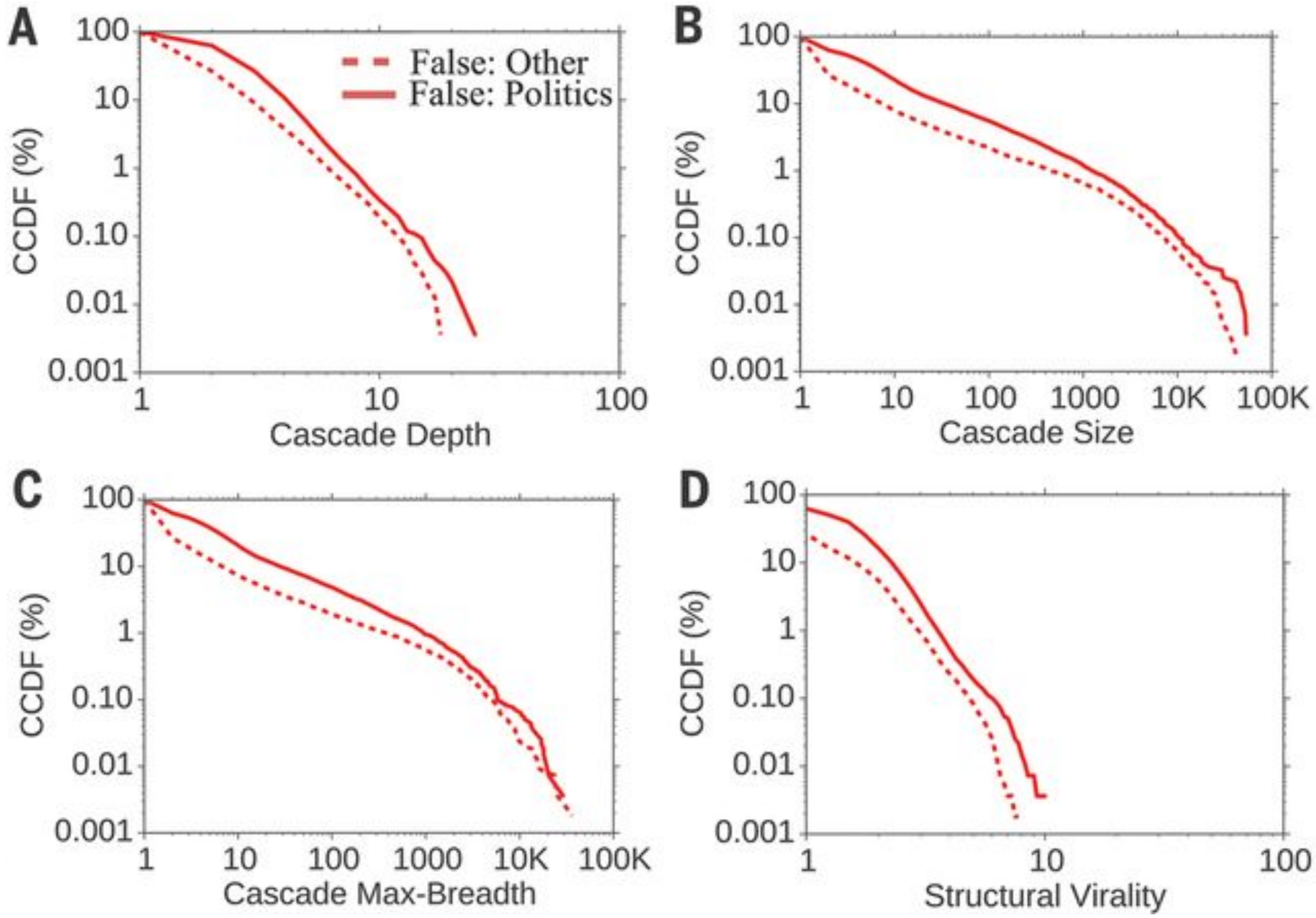


Falsehood diffused significantly <u>farther</u>, <u>faster</u>, <u>deeper</u> and <u>more broadly</u> than the truth in <u>all</u> categories of information.

Diffusion dynamics of false political news



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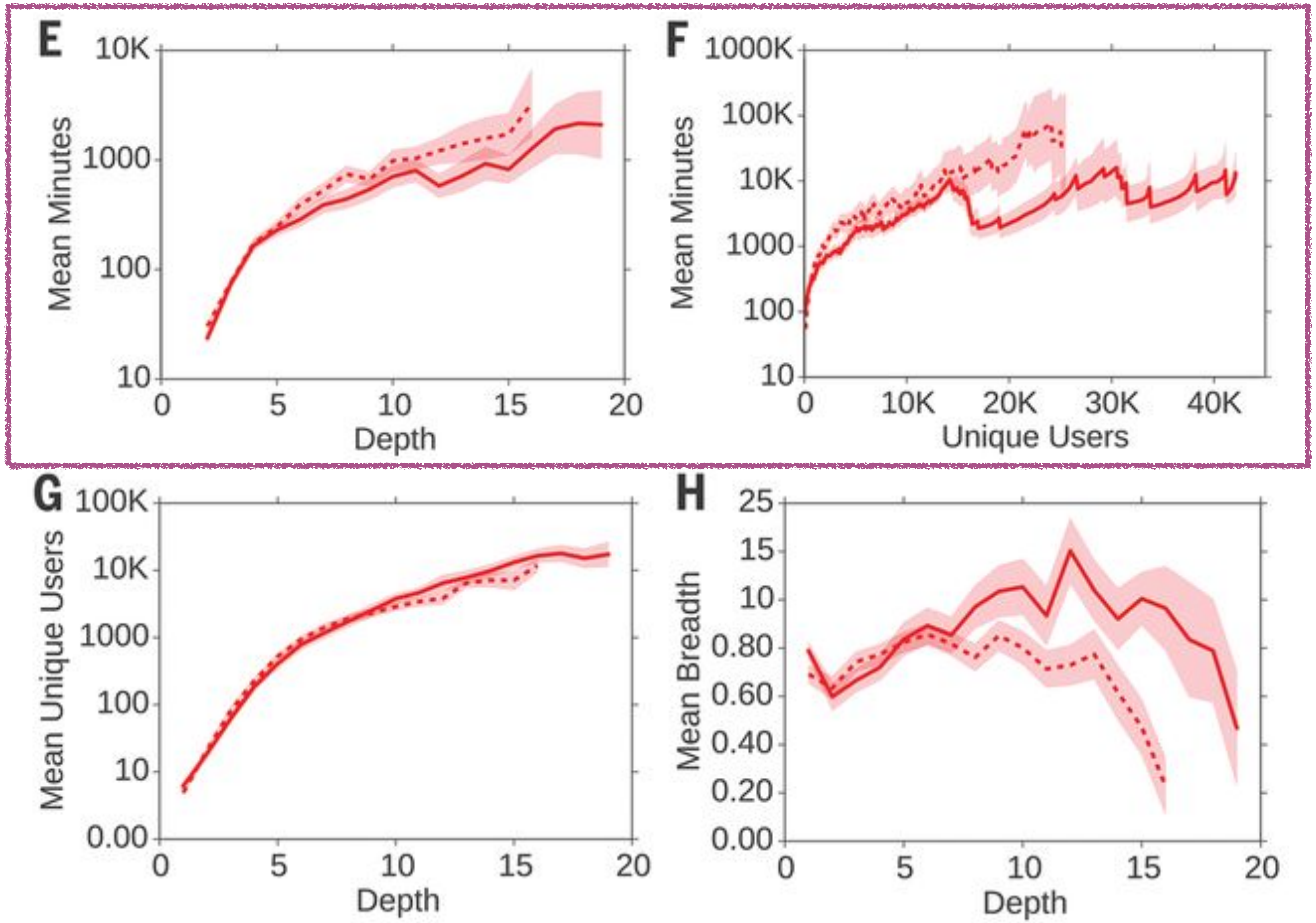

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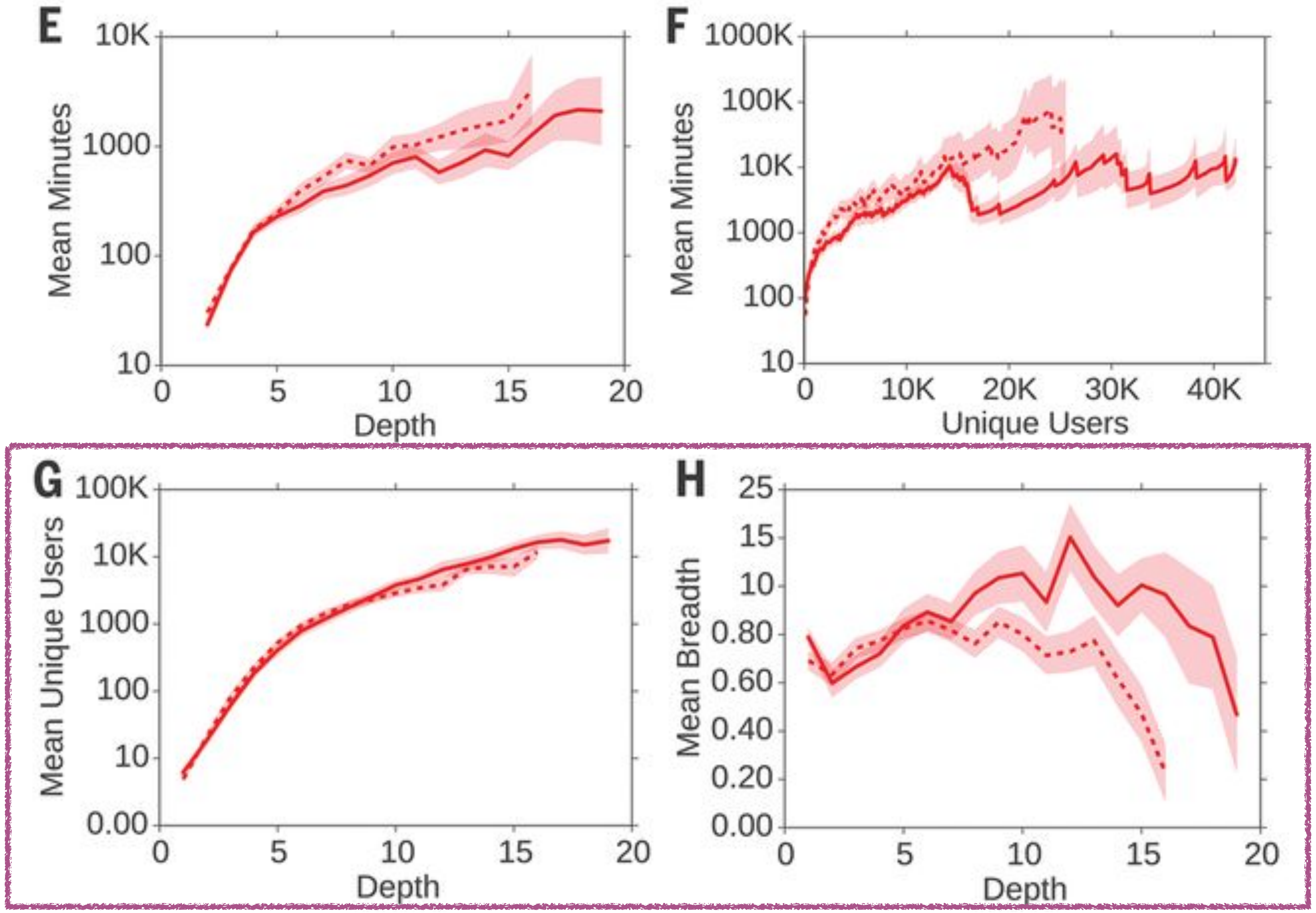

False political news diffused farther, faster, deeper and more broadly than any other type of false news.

Network structure

- What if the structural elements of the network or individual characteristics of the users explain why falsehood travels faster than the truth?

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A

	median		mean		mean (log)		stdv (log)		ks-test
	false	true	false	true	false	true	false	true	
followers	410	466	2234	5240	2.62	2.68	0.69	0.88	D=0.104, p~0.0
followees	383	509	1002	1707	2.59	2.72	0.85	0.96	D=0.136, p~0.0
verified	0	0	0.002	0.006	nd	nd	nd	nd	D=0.005, p<0.001
engagement	9.52	9.54	19.70	24.65	0.91	0.90	0.65	0.76	D=0.054, p~0.0
account age	982	1214	1072	1269	2.90	2.97	0.39	0.42	D=0.125, p~0.0

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Falsehood diffused farther and faster than the truth despite the differences in the network structure, not because of them.

Novelty of information

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- Novel information:
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  - Contributes to decision-making
  - Encourages information sharing
  - More valuable both from an information theoretic perspective and from a social perspective
- **Q1:** Was falsity more novel than the truth?
- **Q2:** Were Twitter users more likely to RT information that was more novel?

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False rumors were significantly more novel than the truth.

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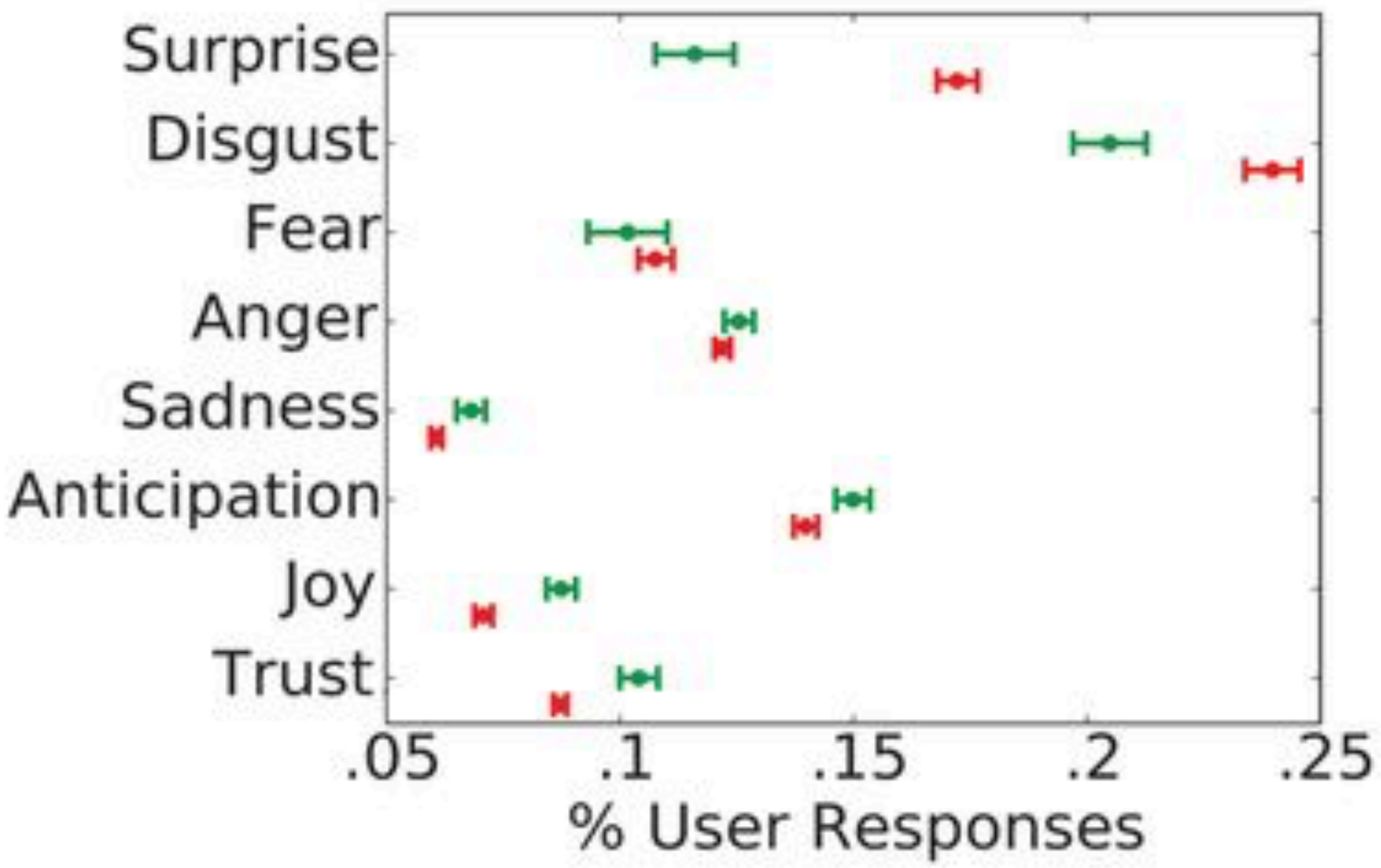

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anticipation	0.140	0.150	0.0093	0.0154	D=0.038, p~0.0
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- Solution:
  - Specified cluster-robust standard errors and calculated variance at rumor-cluster level
  - Clustering reduced precision but the significance of the results did not change

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- Potential selection bias
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- Solution:
  - Independently verified another sample of rumor cascades that was not verified by any fact-checking organizations
  - Manually fact-checked by three undergrads (agreed on the veracity of 90% of the 13,240 cascades)
  - Diffusion dynamics of true & false rumors are nearly identical to the main data set

Validation of findings (3)

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- Potential presence of bots that can bias conclusions about human judgement
- Solution:
  - Bot-detection algorithm to identify and remove all bots before the analysis
  - Adding back bot traffic into the analysis did not change the main conclusions
  - Inclusion of bots accelerated the spread of both true and false news and affected their spread equally

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- Effects are more pronounced for political news
- Network structure and individual characteristics of spreaders do not favor promoting false news
- False news are more novel than true news - greater likelihood of being shared with others
- Bots accelerated the spread of true and false news at the same rate