Pinpointing Influence in Pinterest

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Motivation

- The extreme growth of online social networks enables us to study influence patterns at scale.
- We want to answer if there exist certain individuals with the power to affect their social contacts and convince them to buy a product or adopt a political idea.

Identifying influential individuals

allows for cost-effective viral marketing techniques to increase brand awareness or even sway the public opinion!

Studies on Twitter [CHBG10] reveal that topological measures such as indegree fail to capture the influential strength of users.

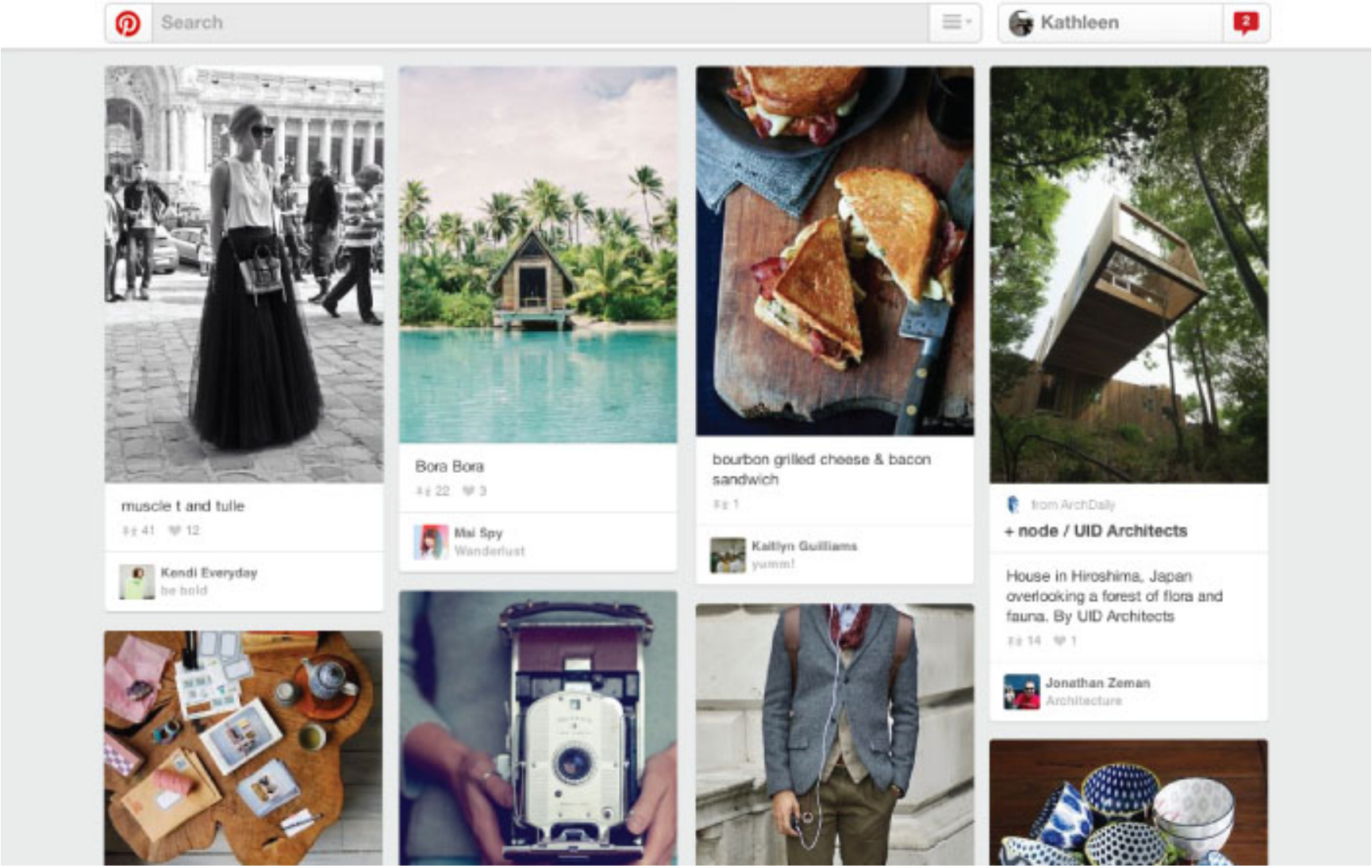
Contribution

We perform an in-depth empirical analysis on Pinterest and seek to answer:

- Is the finding of [CHBG10] true across other online social networks as well, and to what extent?
- Does the use of PageRank [LSMW98] allow for a better estimation of a user's influential power?

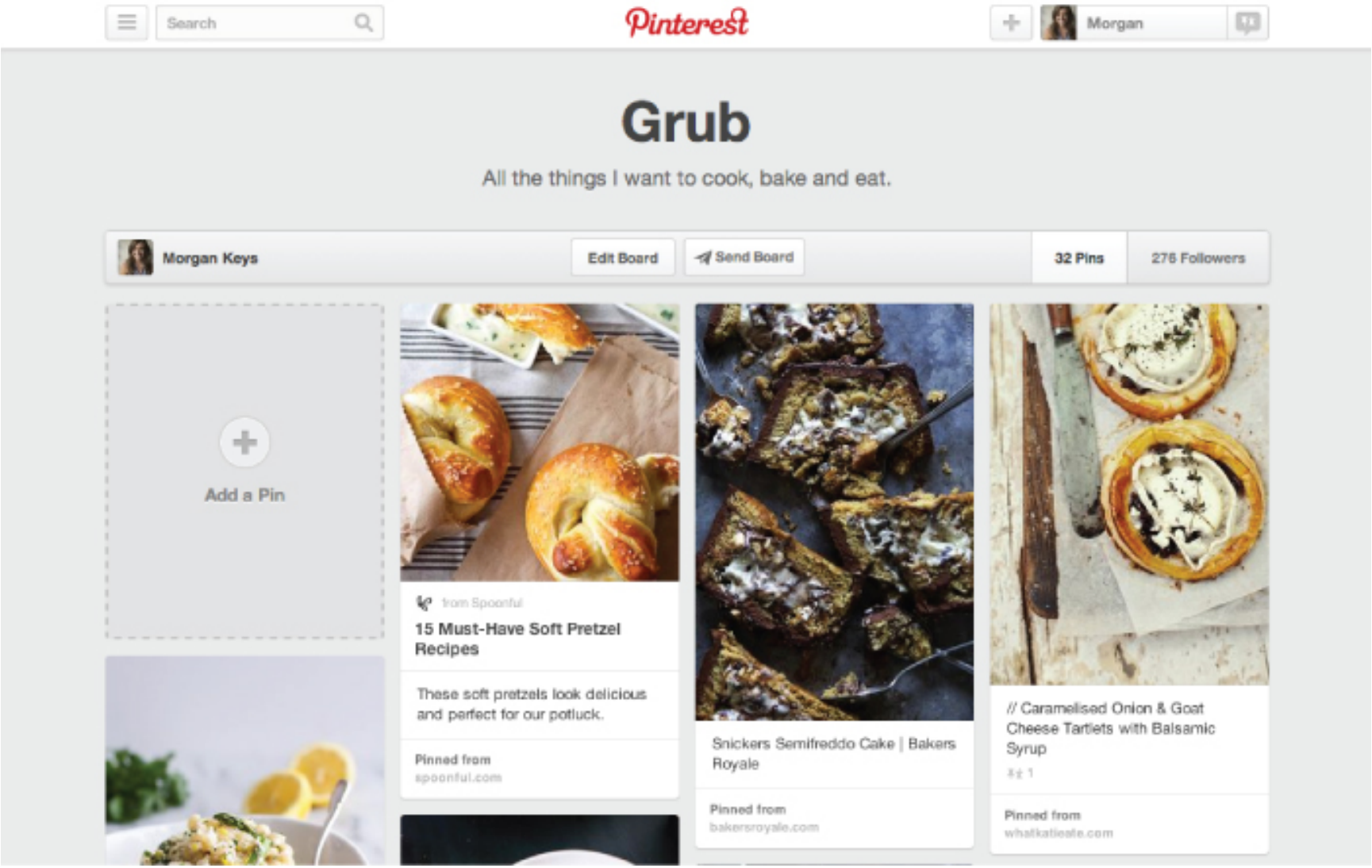
What is Pinterest?

Pinterest is a visual bookmarking tool that helps you discover and save creative ideas.



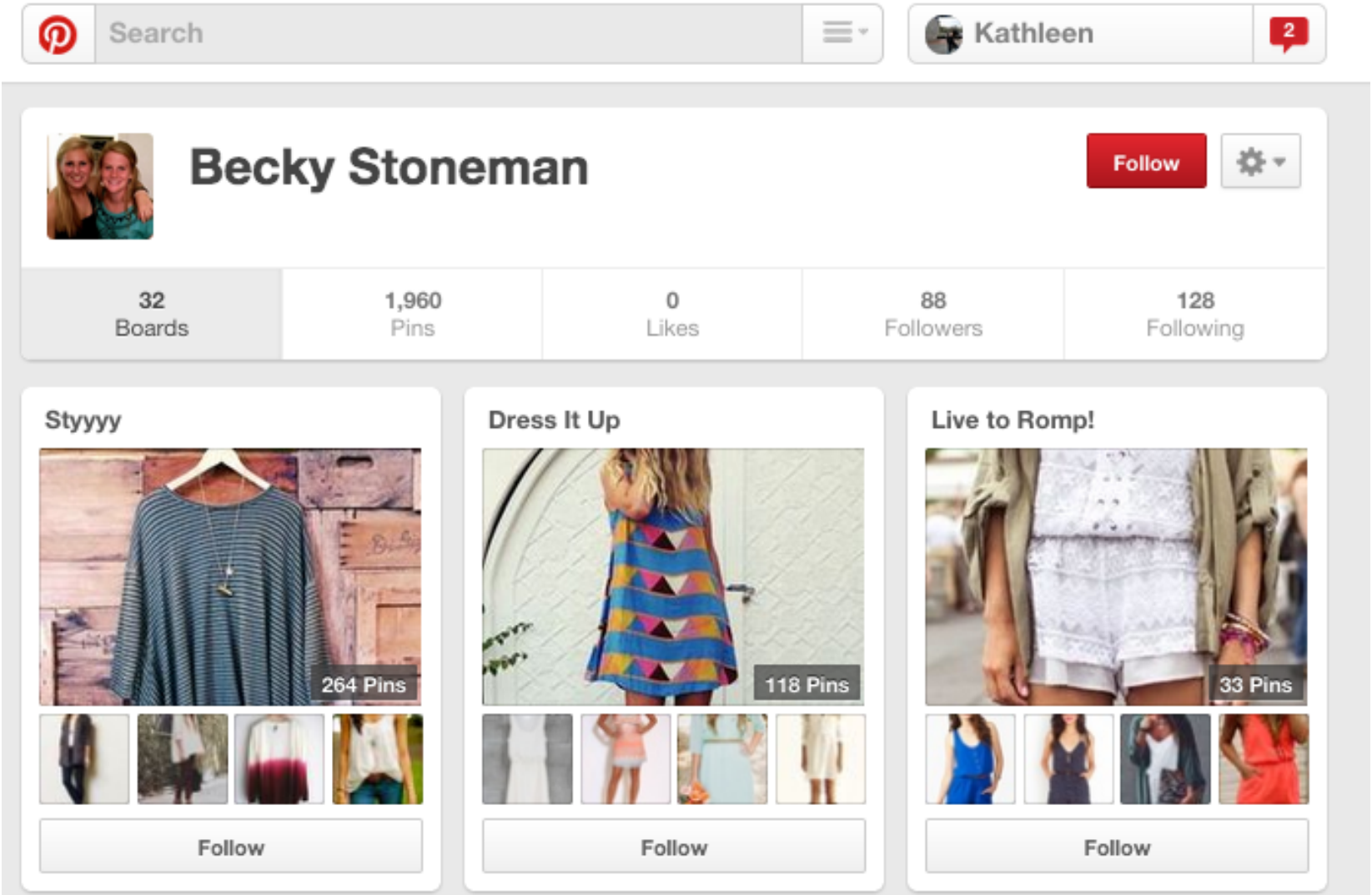
Pinterest lets you:

Pin something to a board
and come back to it later to learn more.



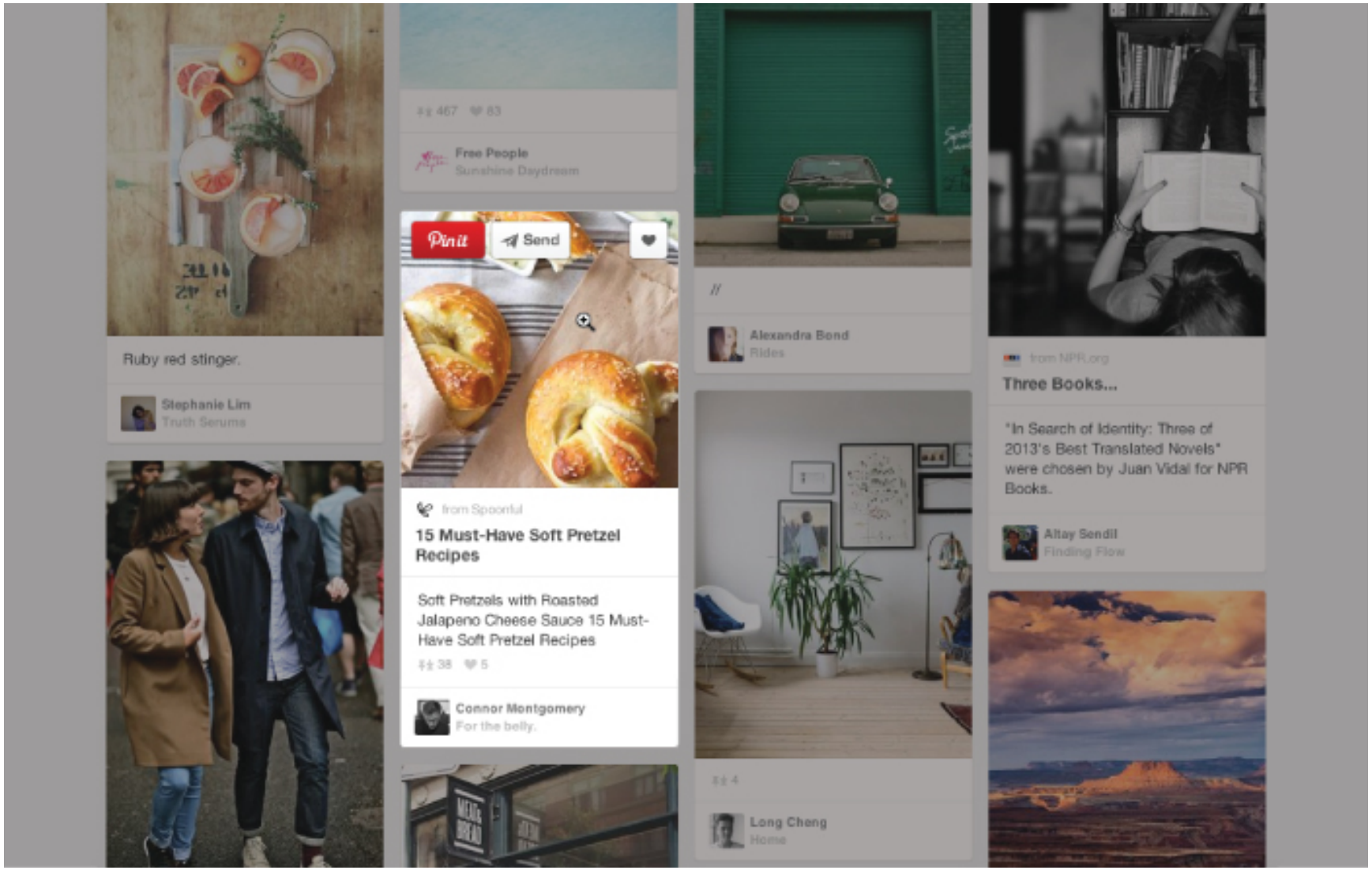
Pinterest lets you:

Follow people whose taste you admire
to receive their pins in your home feed.



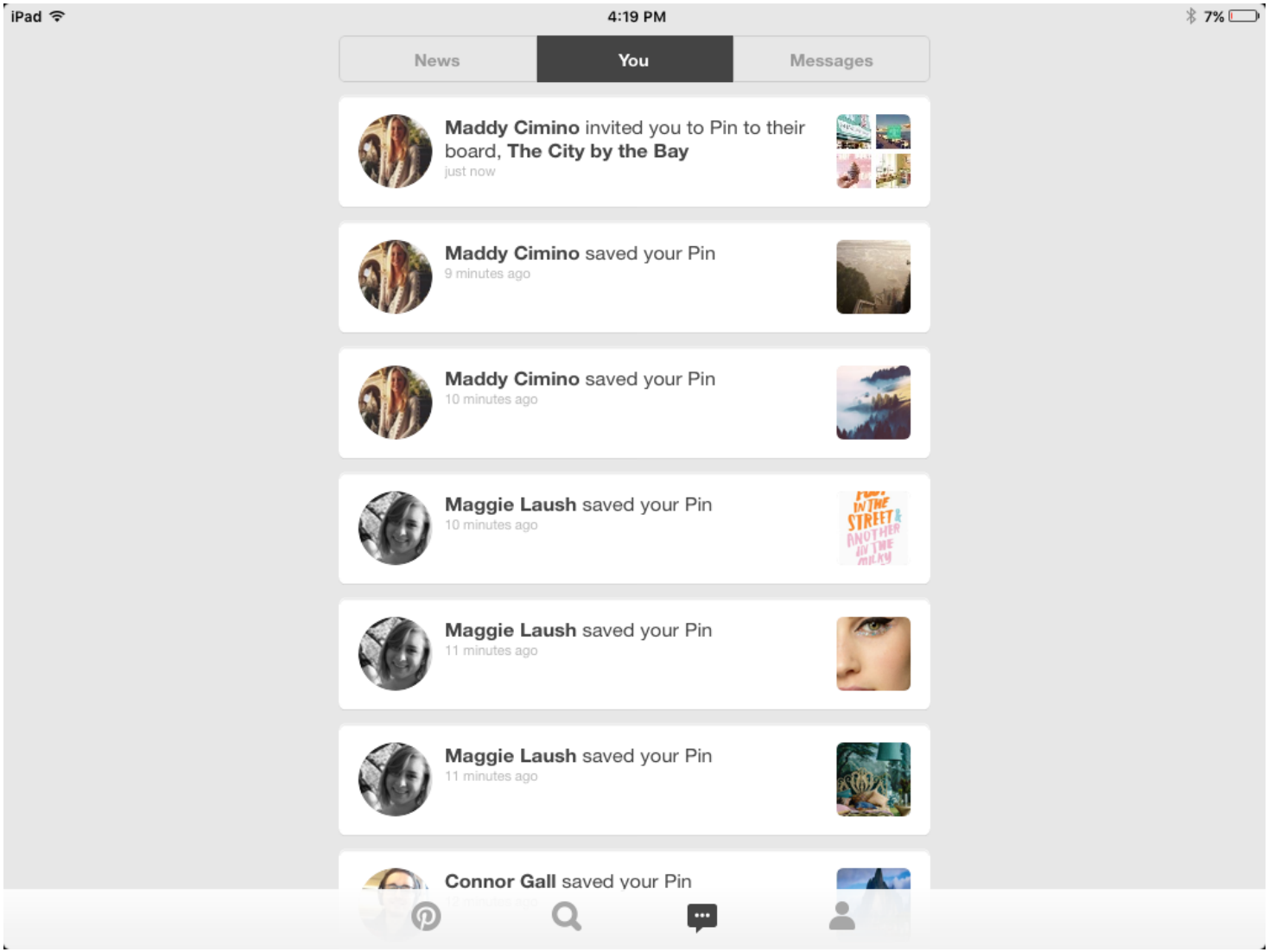
Pinterest lets you:

Repin or Like pins of others.



Pinterest lets you:

See how others interact with your pins.



Why Pinterest?

Pinterest stands out for many reasons:

- It was the fastest site to surpass 10,000,000 monthly active users.
- It has more than 100,000,000 monthly active users.
- Its vast majority of users are female.

Pinterest has attracted significant commercial attention:

Users tend to create digital shopping lists of products they are interested in buying.
Therefore, businesses invest in creating compelling boards in Pinterest to increase their revenue.

Definition of Influence in Pinterest

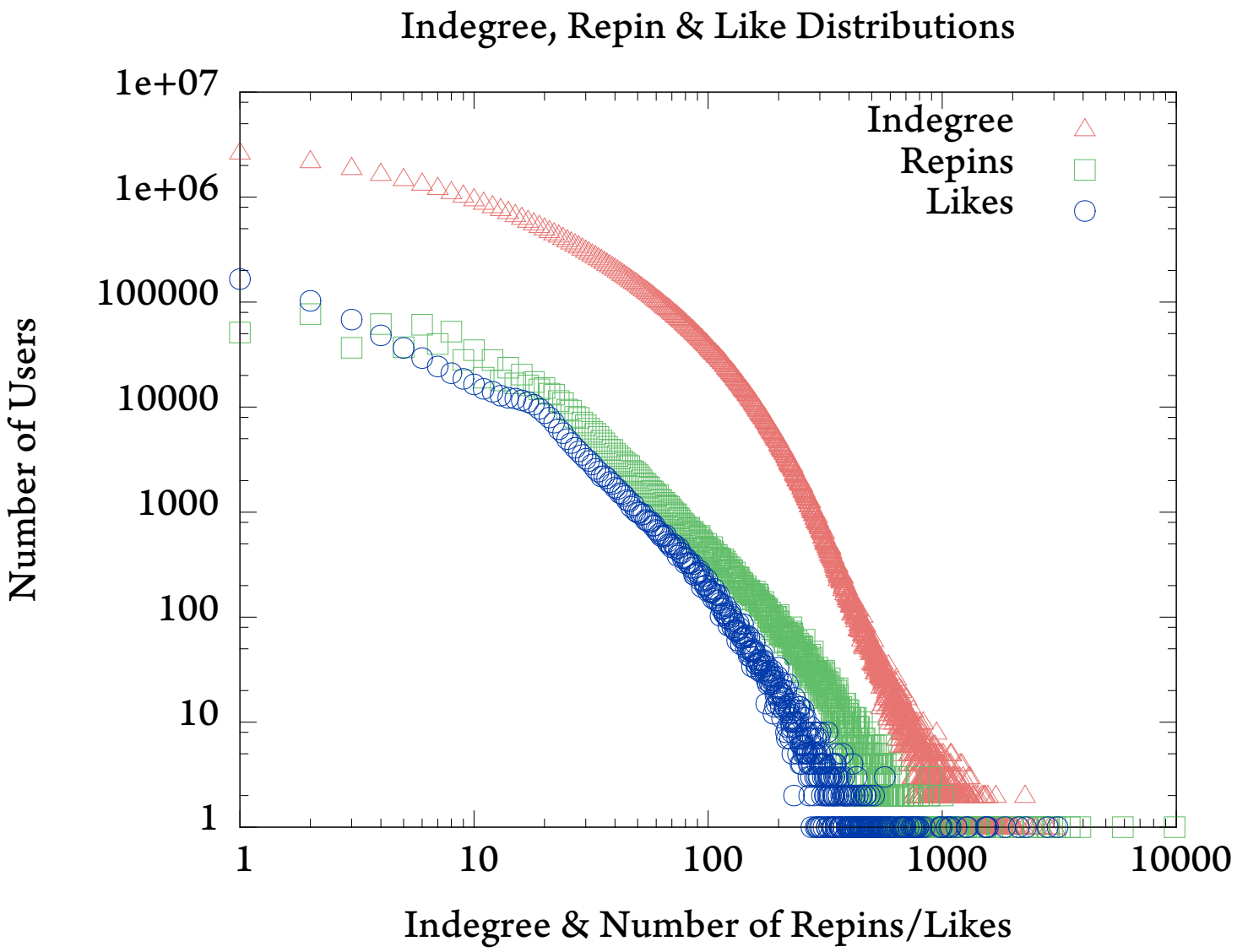
- Indegree influence: the number of followers of a user directly indicates the *size of the audience* of that user.
- PageRank influence: the PageRank of a user indicates the *strength of her influence on her followers*.
- Like influence: the number of likes containing one's name indicates the ability of that user to generate *popular* content.
- Repin influence: the number of repins containing one's name indicates the ability of that user to generate content with *pass-along value*.

Experimental Setting

- Dataset [ZSS+14, ZSSS13]:
  - 36,198,633 users
  - 983,520,986 social ties
  - 18,957,340 repins
  - 9,066,973 likes
- PageRank Execution:
  - Dell PowerEdge R630 server with an Intel® Xeon® E5-2630 v3, 2.40 GHz processor, and 256 GB of RAM
  - Deployed an Apache Hadoop 2.7.1 cluster using Juju[1]
  - Run PageRank as an Apache Giraph process

[1] `https://jujucharms.com/big-data`

Distribution of indegree and received repins/likes



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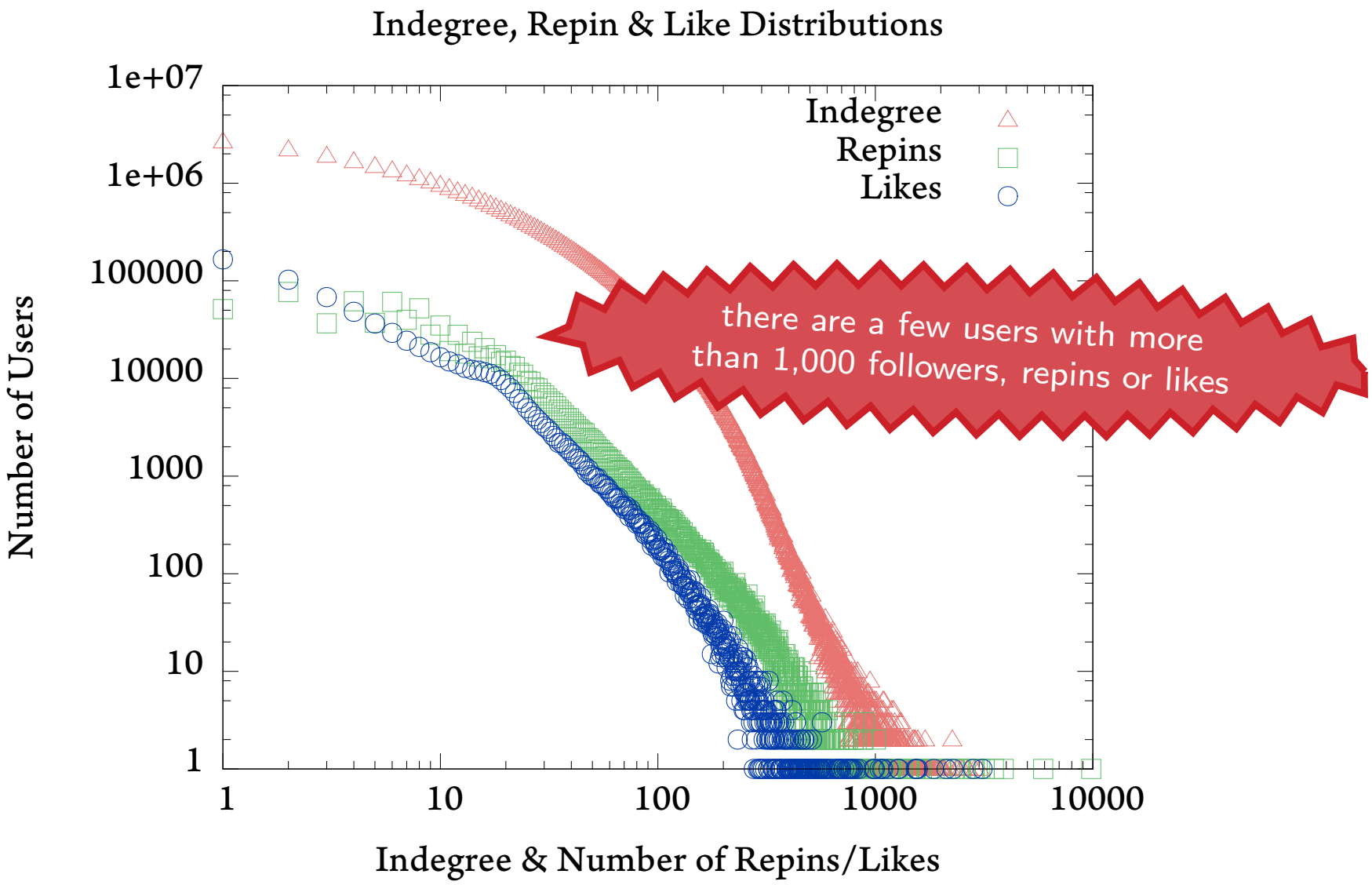
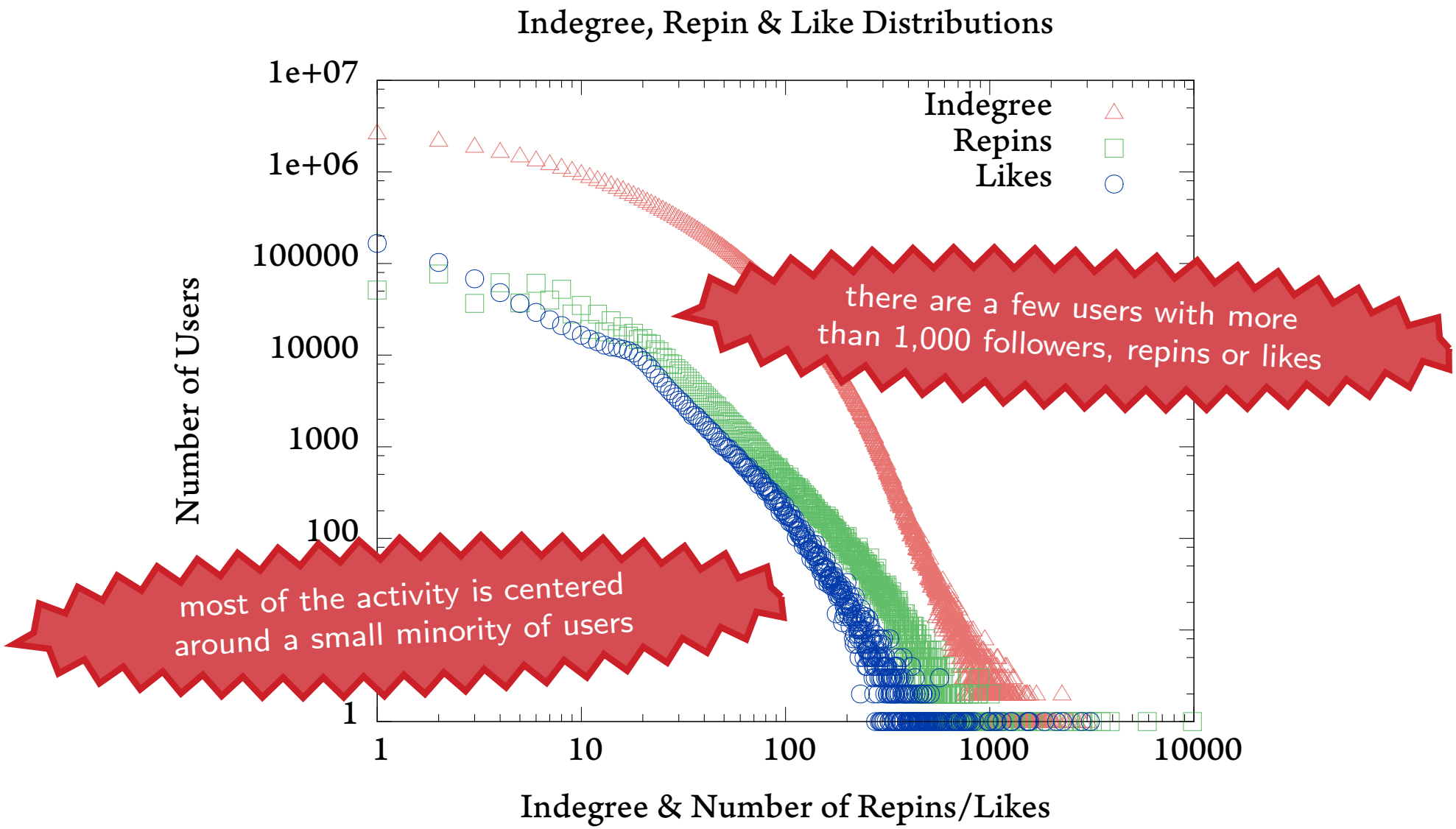
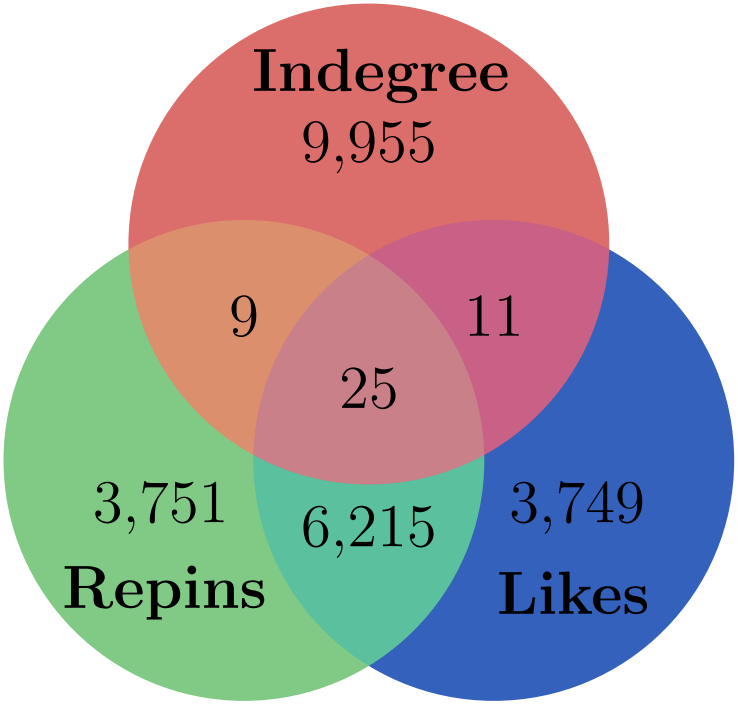
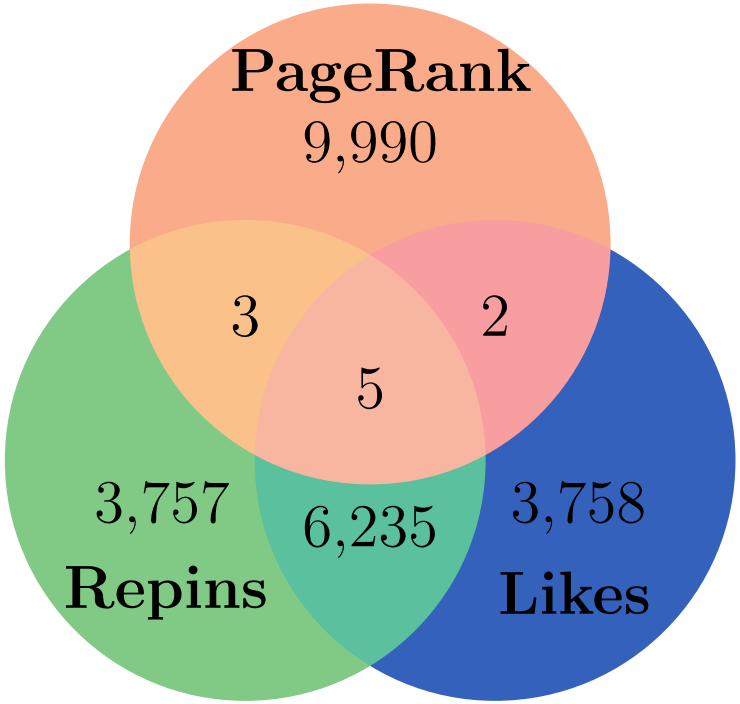


Distribution of indegree and received repins/likes



Overlap of Top-Ranked Users

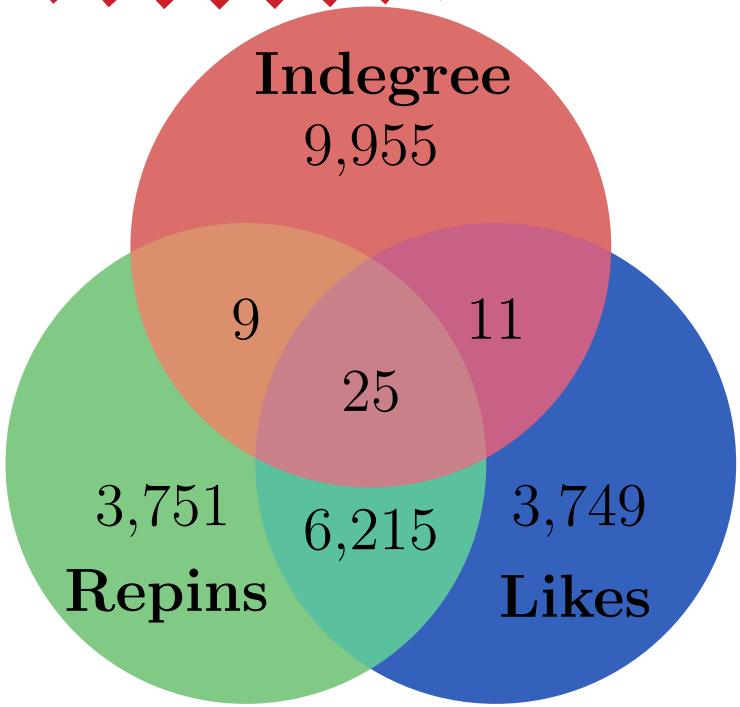


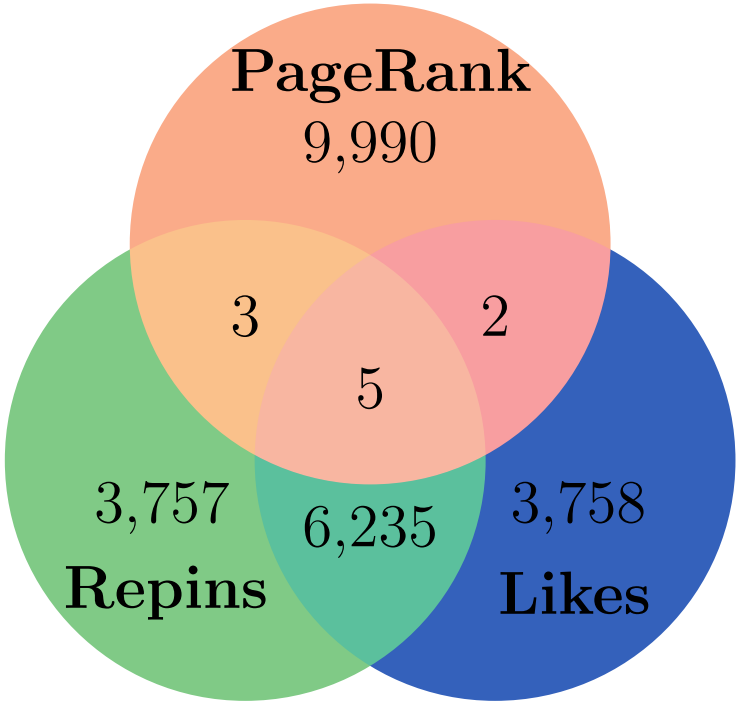


Overlap of top-10,000 users ranked by the measures of influence under consideration

Overlap of Top-Ranked Users

the overlap of indegree with both repins and likes is marginal





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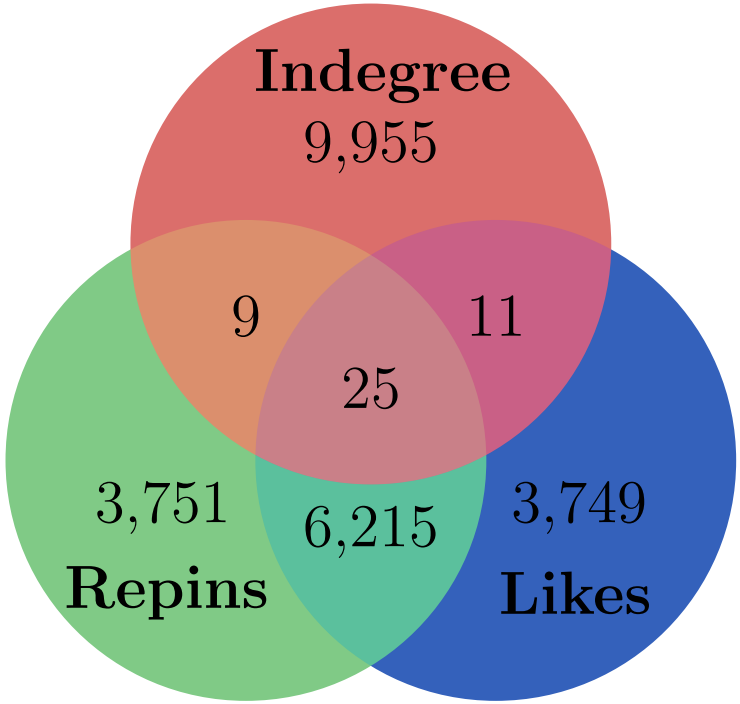
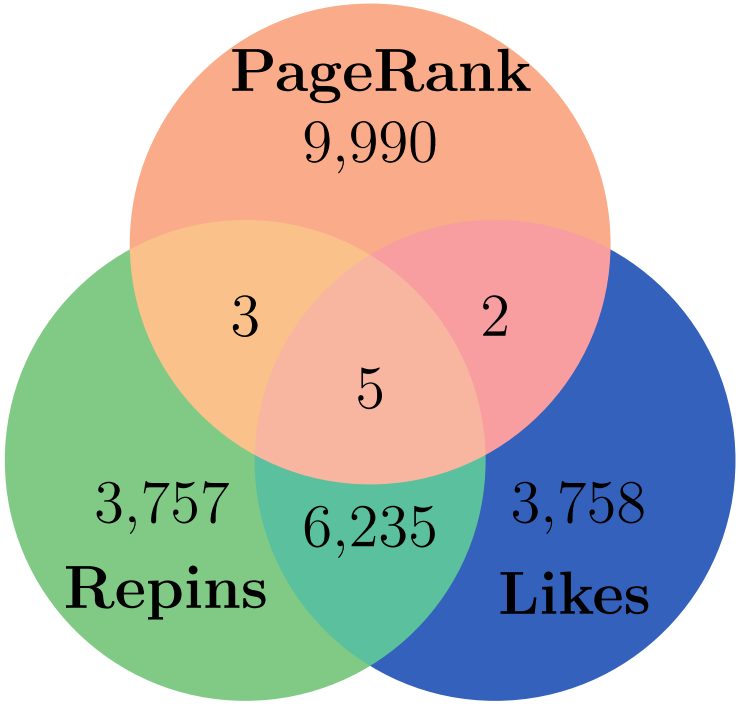
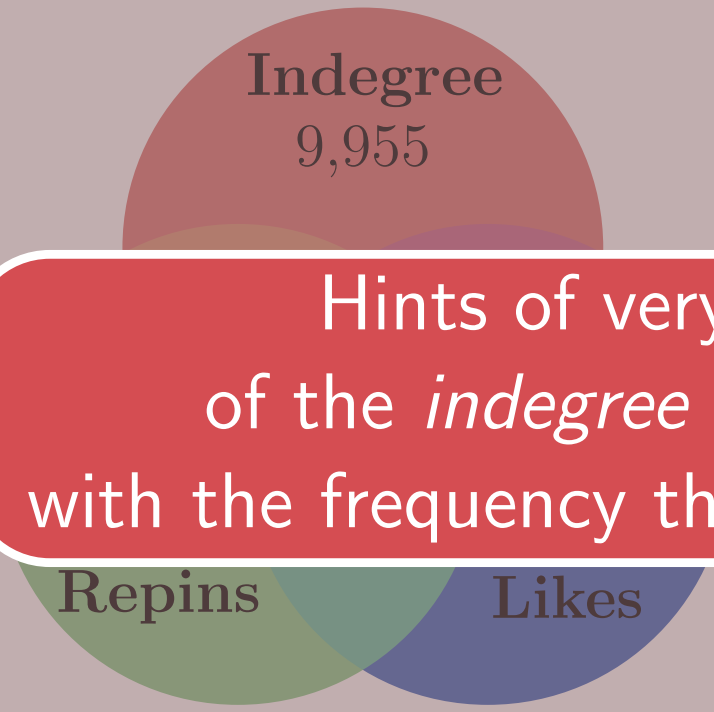
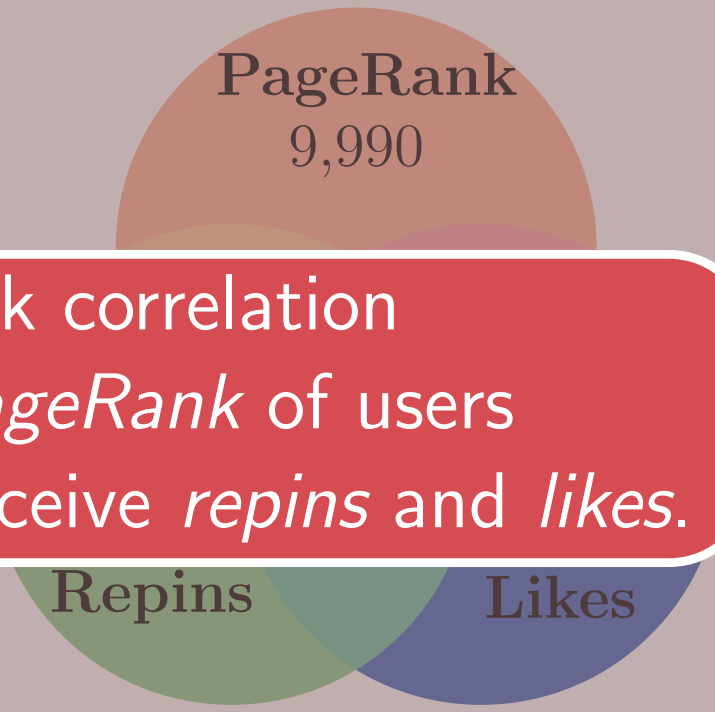




the overlap of PageRank with repins and likes is also insignificant

Overlap of Top-Ranked Users





Hints of very weak correlation
of the *indegree* or *PageRank* of users
with the frequency they receive *repins* and *likes*.

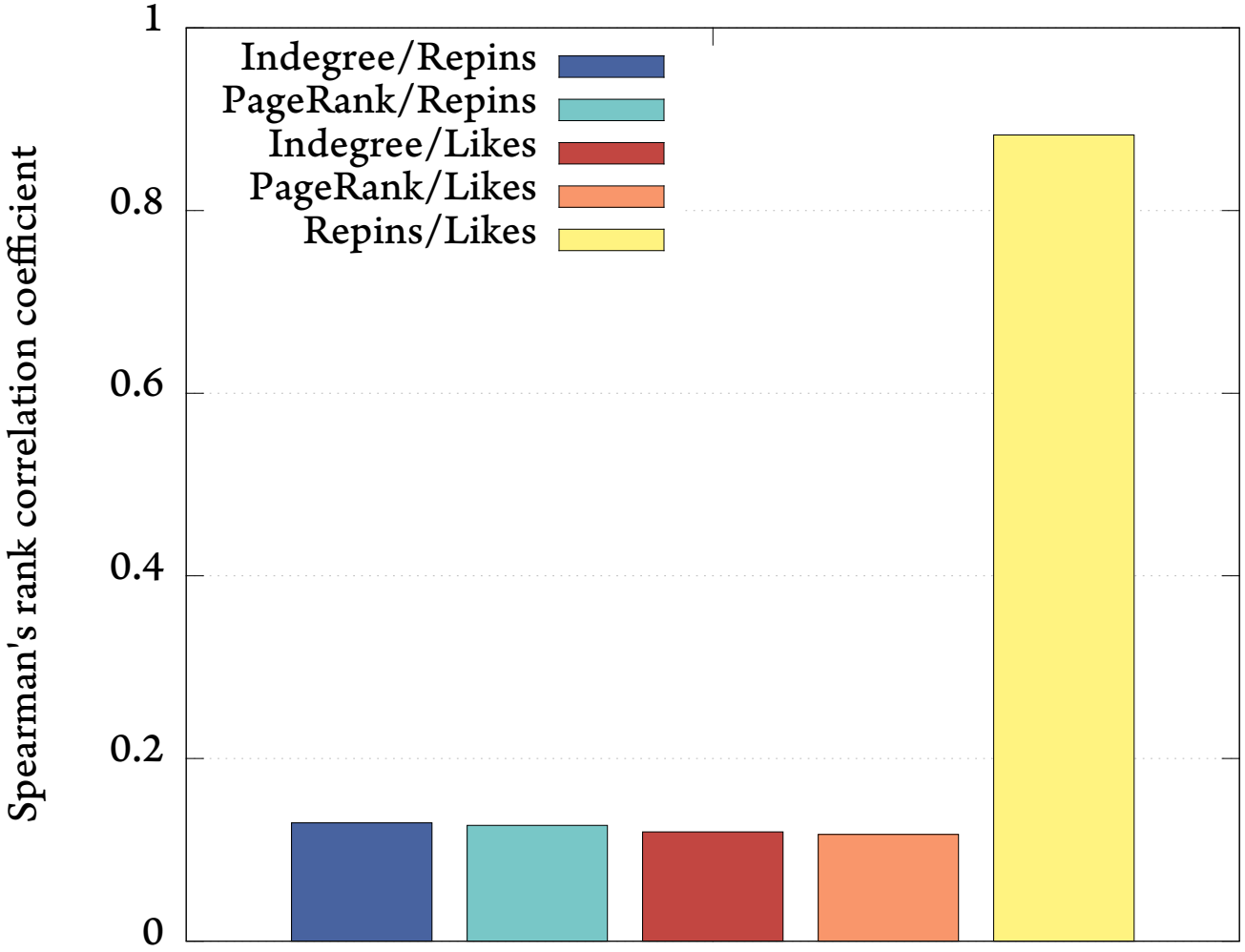
Comparing Influence Measures

- For all measures of influence:
  - We assigned the rank of 1 to the most influential user, and increased the rank as we proceeded to less influential users.
  - Identical values were each assigned fractional ranks equal to the average of the positions in the ascending order of the values.
- We used Spearman's rank correlation coefficient ρ to examine whether two rankings covary.

$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}$$

where $d_i = rg(X_i) - rg(Y_i)$ is the difference between the two ranks of user i, and n is the total number of users.

Rank correlation for all users



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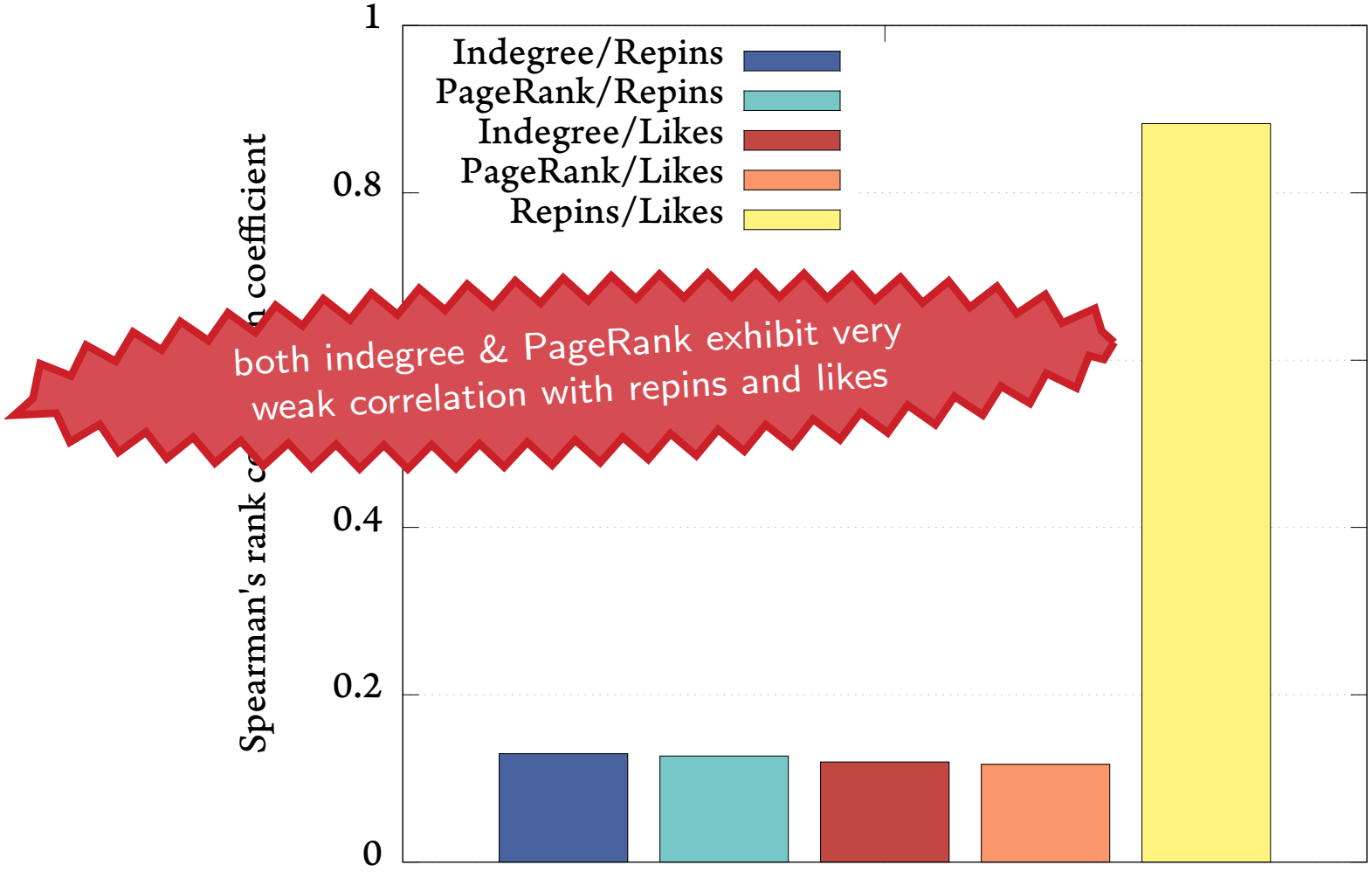

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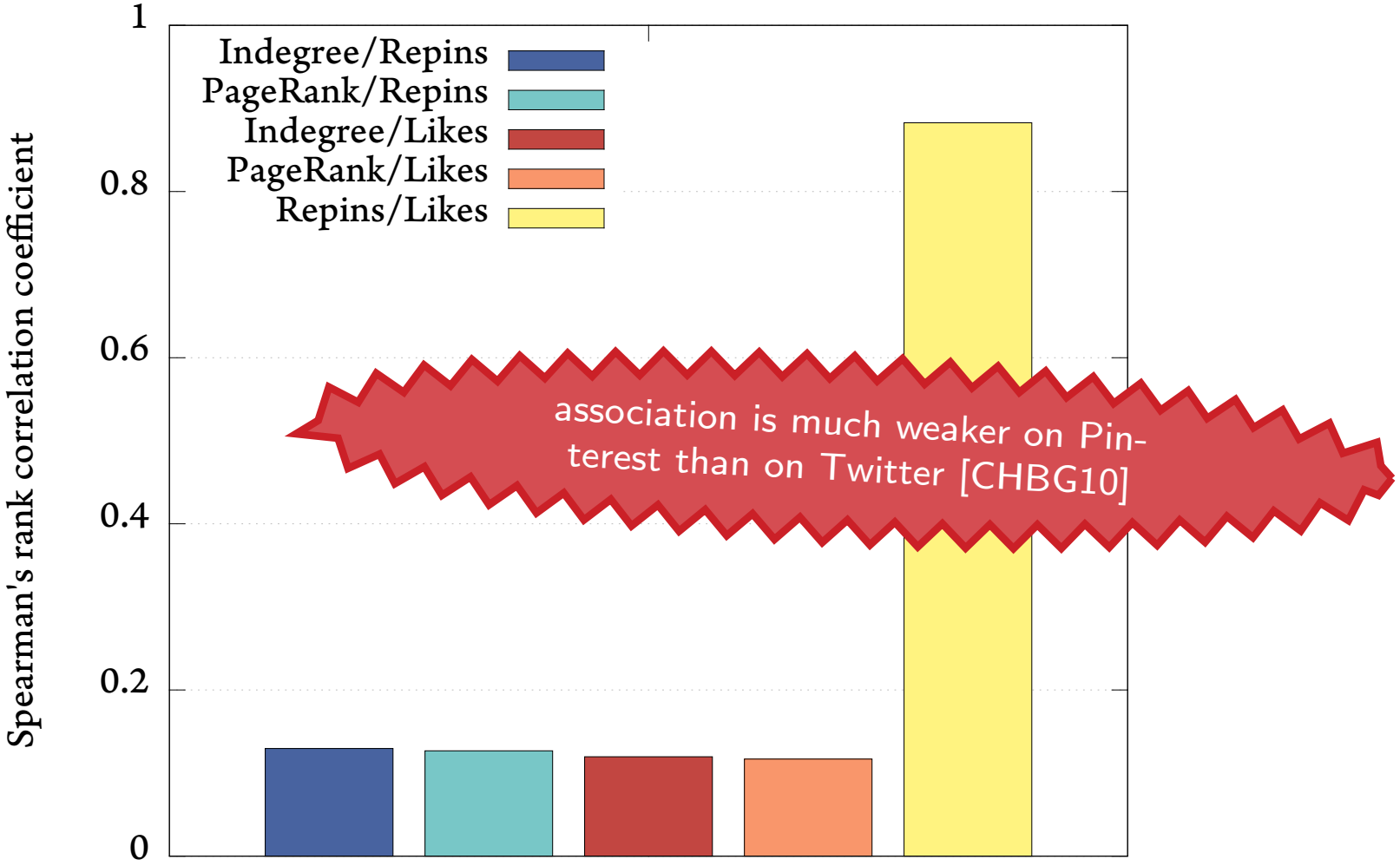

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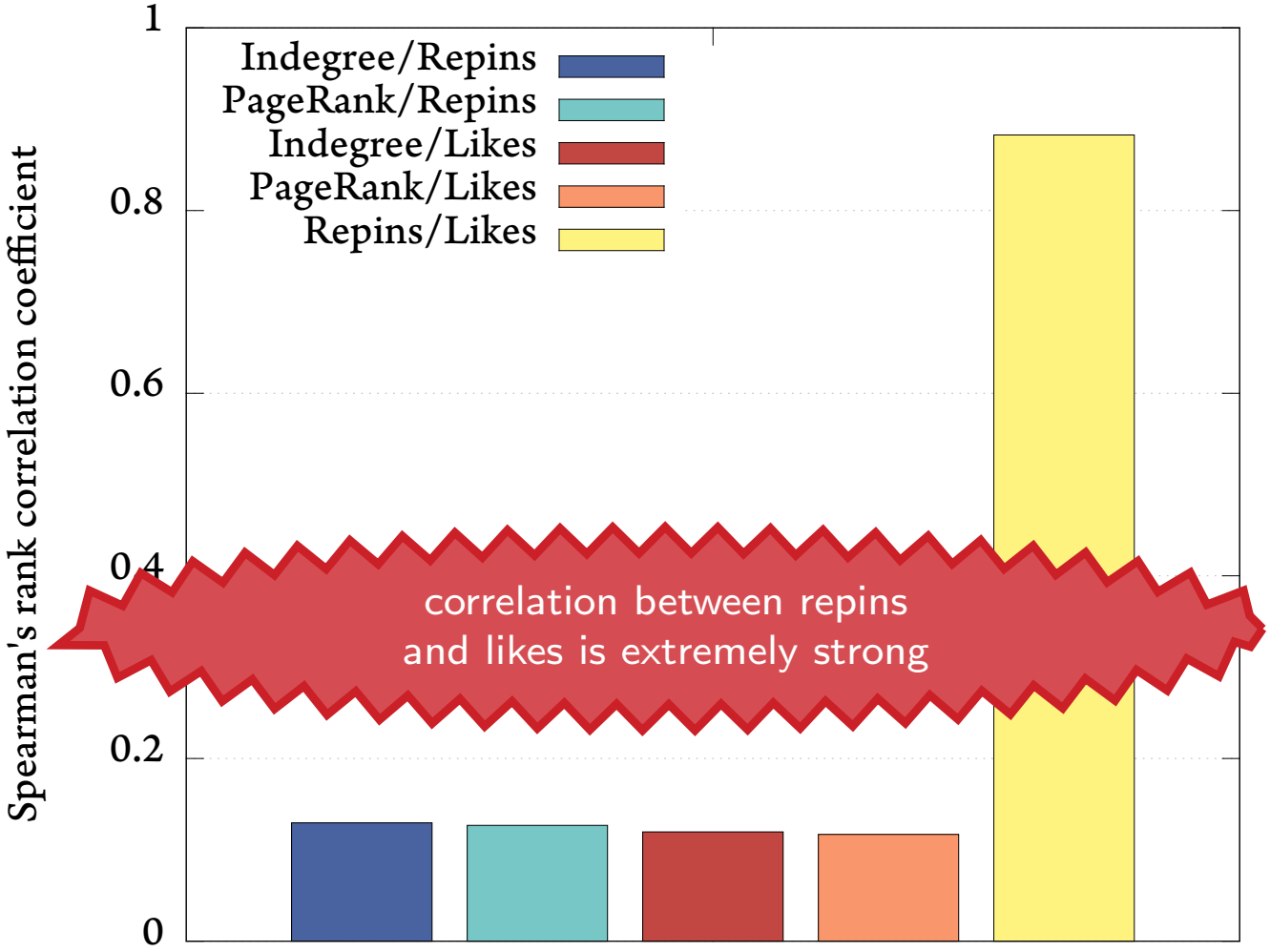
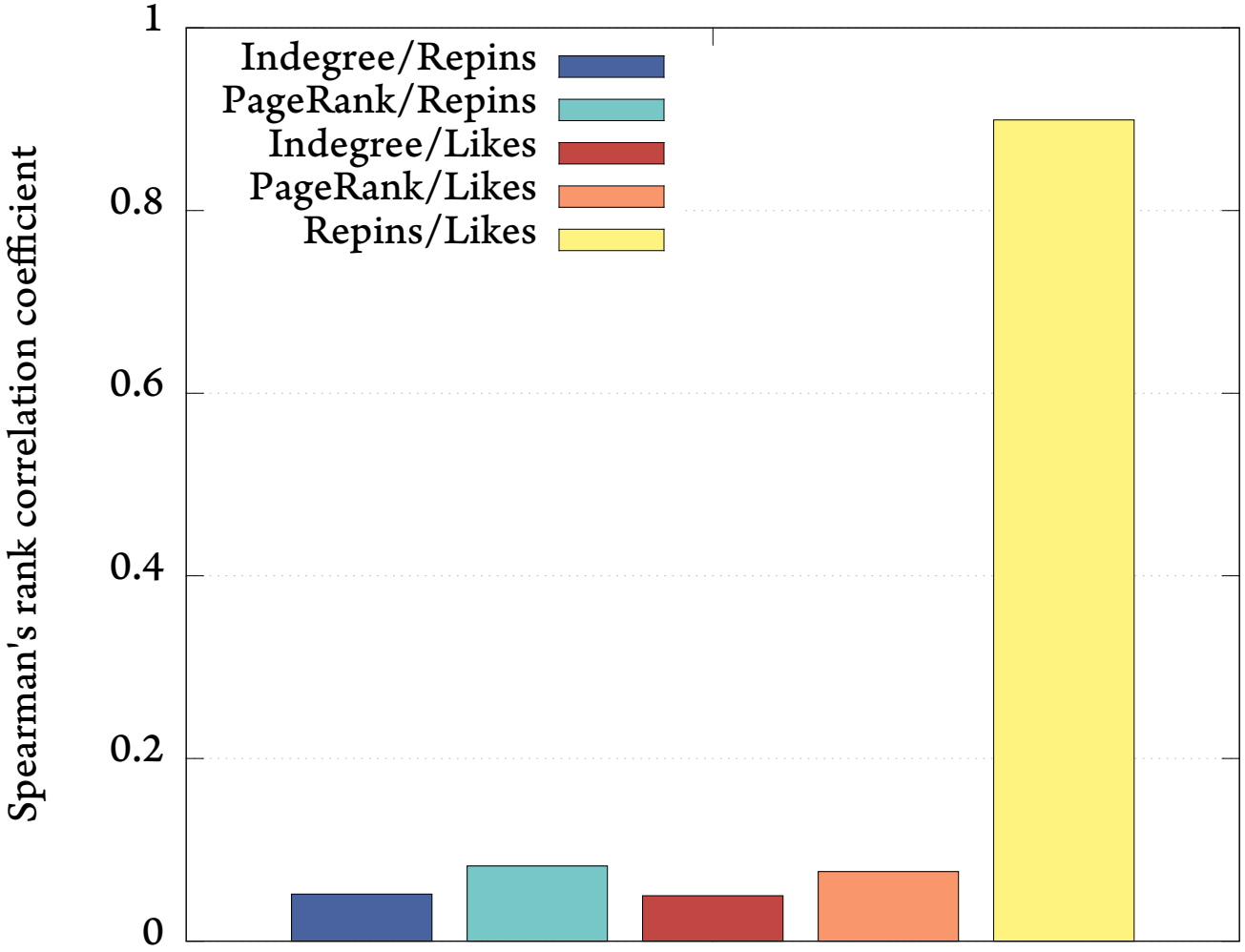


Rank correlation for the top 10th percentile of users



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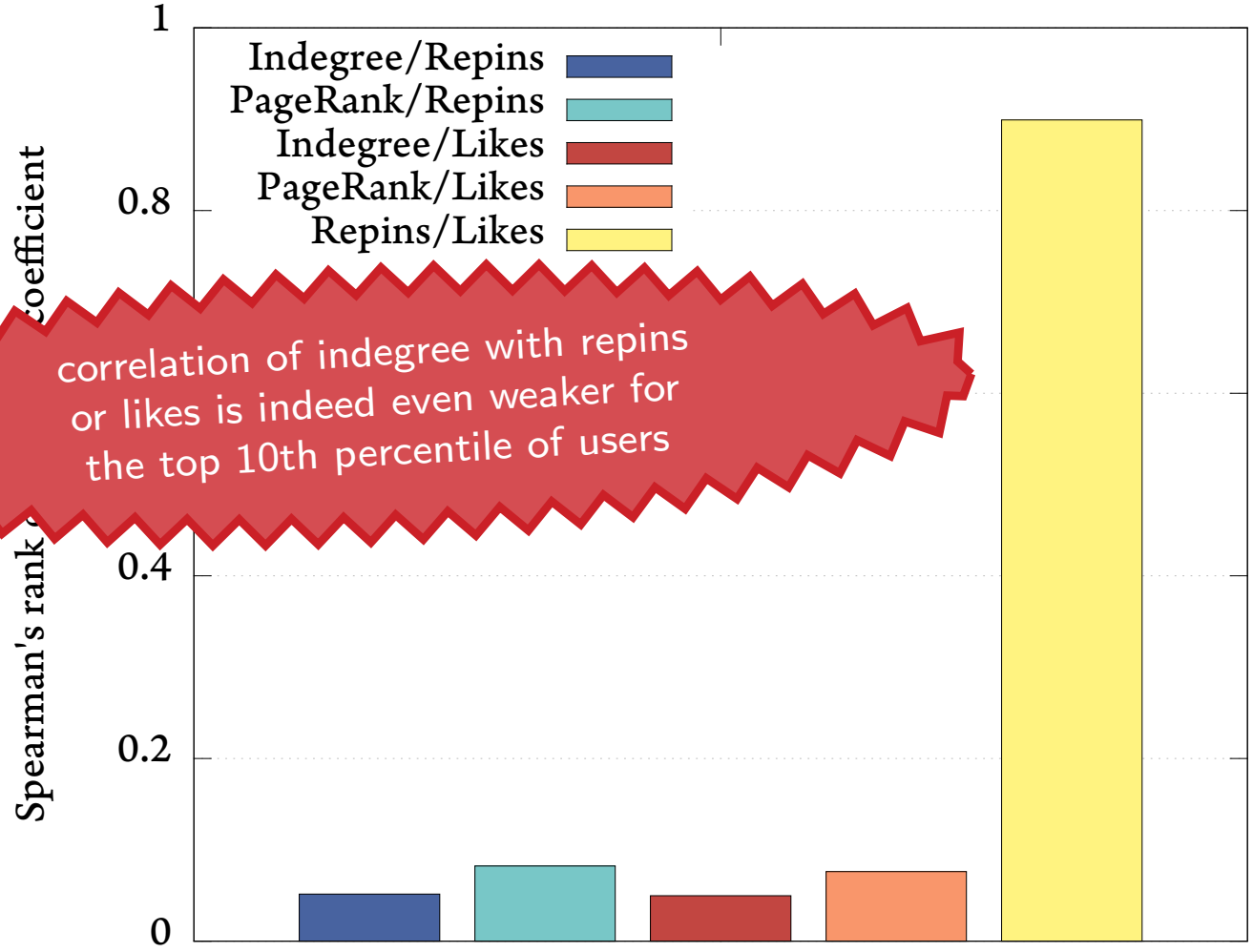
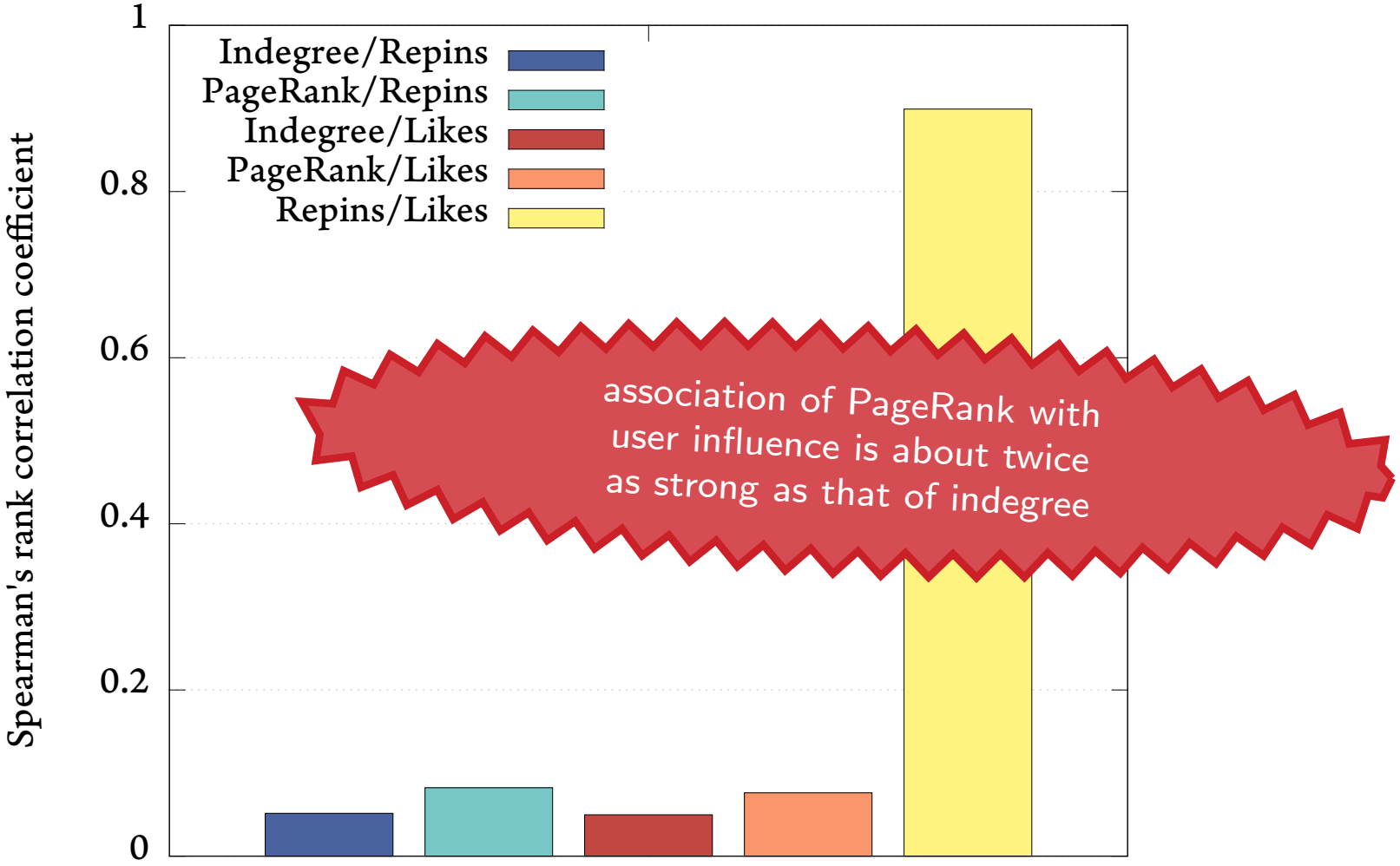
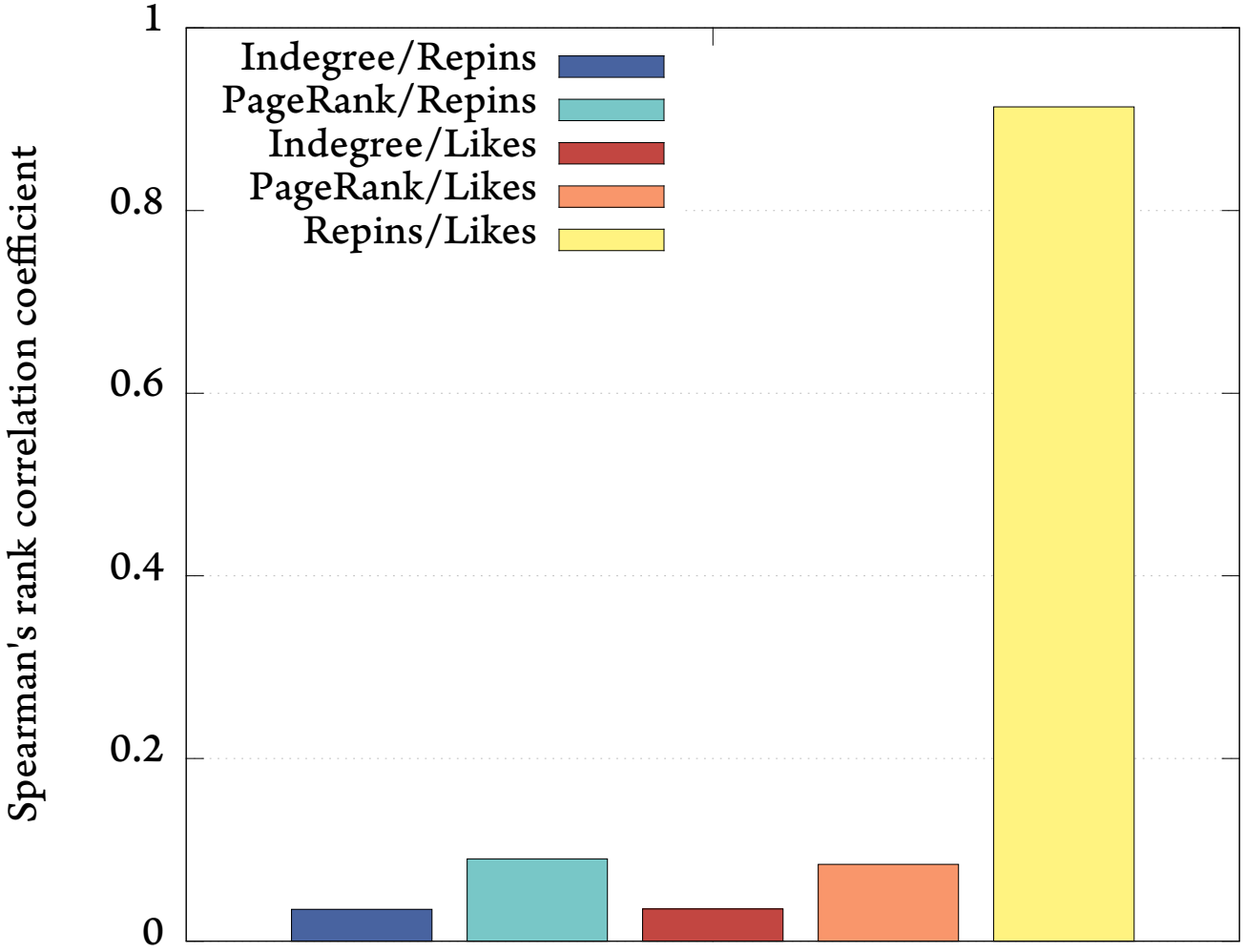


correlation of indegree with repins or likes is indeed even weaker for the top 10th percentile of users

Rank correlation for the top 10th percentile of users



Rank correlation for the top 1st percentile of users



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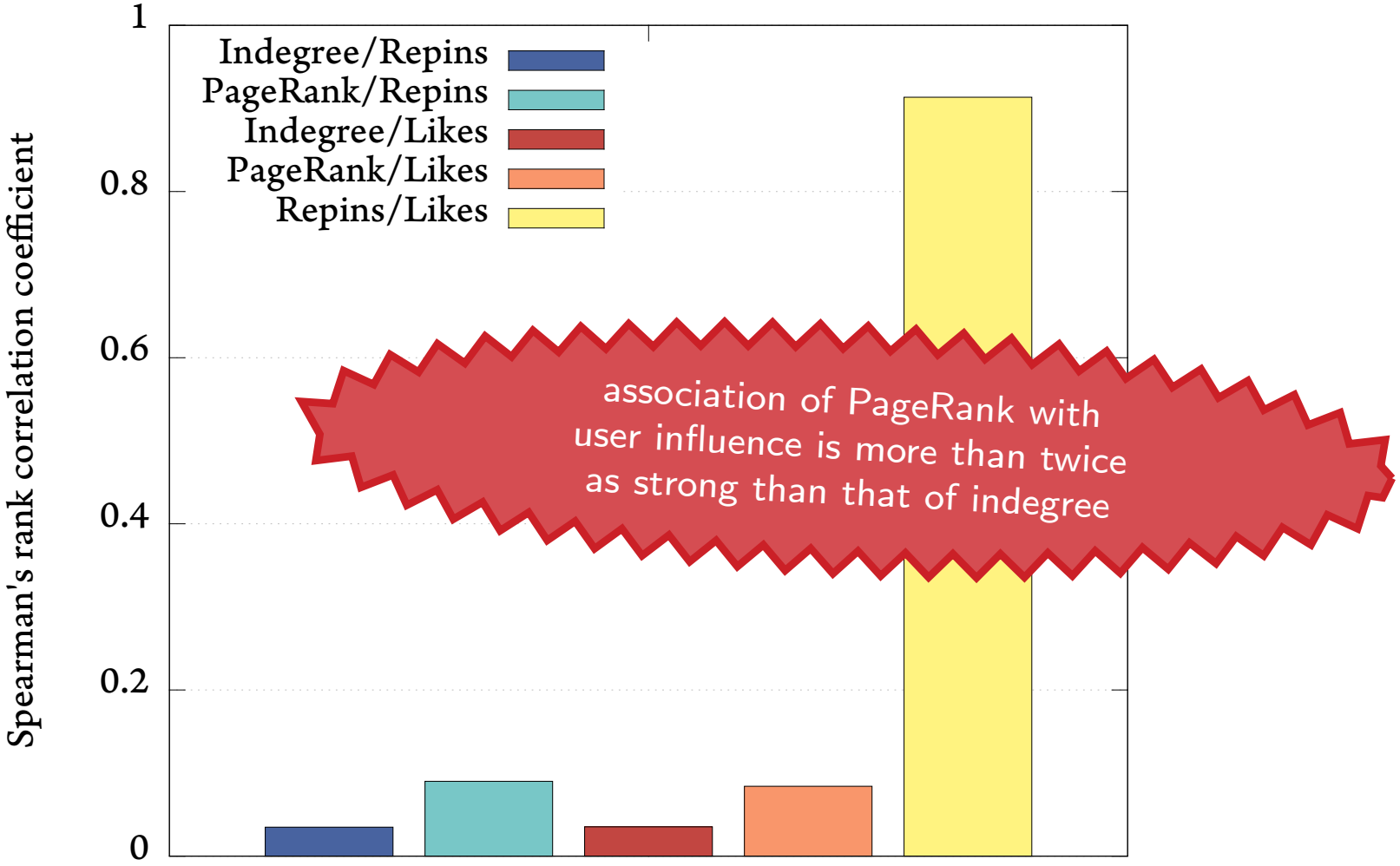

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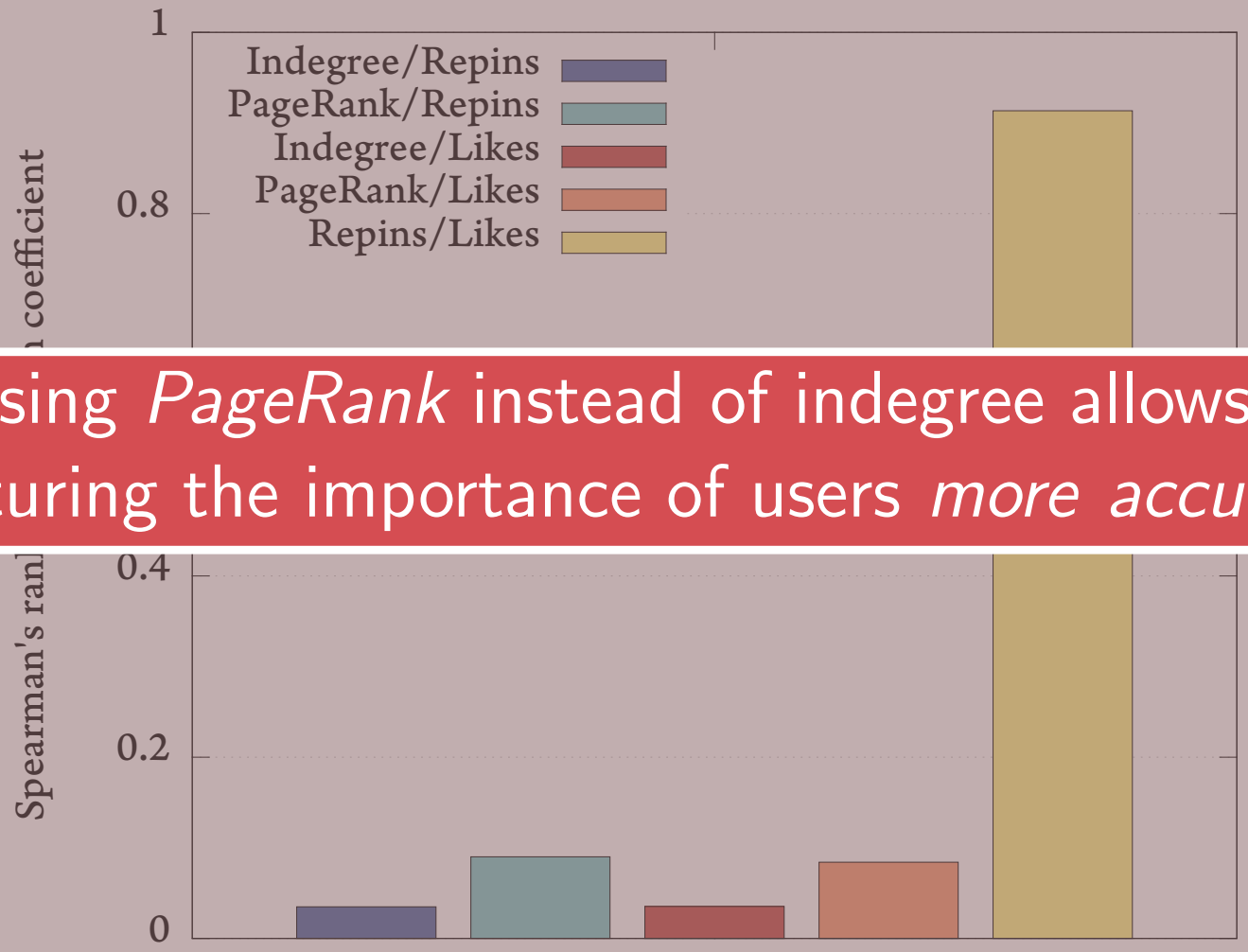

Using *PageRank* instead of indegree allows for capturing the importance of users *more accurately*.

References

[CHBG10] Meeyoung Cha, Hamed Haddadi, Fabrício Benevenuto, and P. Krishna Gummadi, *Measuring User Influence in Twitter: The Million Follower Fallacy*, ICWSM, 2010.

[LSMW98] Page Lawrence, Brin Sergey, Rajeev Motwani, and Terry Winograd, *The PageRank Citation Ranking: Bringing Order to the Web*, Technical report, Stanford University, 1998.

[ZSS+14] Changtao Zhong, Mostafa Salehi, Sunil Shah, Marius Cobzarenco, Nishanth Sastry, and Meeyoung Cha, *Social Bootstrapping: How Pinterest and Last.fm Social Communities Benefit by Borrowing Links from Facebook*, WWW, 2014.

[ZSSS13] Changtao Zhong, Sunil Shah, Karthik Sundaravadivelan, and Nishanth Sastry, *Sharing the Loves: Understanding the How and Why of Online Content Curation*, ICWSM, 2013.

Conclusion - Future Work

- The study of *influence patterns* is essential for the design of successful *advertising strategies*.
- We performed an in-depth *analysis* of Pinterest.
- We found that there is very little *correlation* between the ranking of users based on their *indegree* and their ranking based on the number of either *repins* or *likes* they receive.
- We proposed the use of *PageRank* instead of indegree for the identification of influential users.
- We found that Pagerank's correlation with the ranking of users based on repins or likes received is *limited*, however, *much stronger* than that of indegree.

thank you!

for further details visit:
http://hive.di.uoa.gr/network-analysis/

or email me at: sioutis@cril.fr