

# A Puff of Steem:

## Security Analysis of Decentralized Content Curation

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# Content curation

The process of ranking and/or removing posts in a forum/social network, with the aim of promoting quality content

# Manual content curation

- Pros
  - Trivial algorithm
- Cons
  - Subjective, error-prone
  - Does not scale
  - Moderator trusted

# Crowdsourced content curation



- Pros
  - All opinions count - objectivity
  - Scales well
- Cons
  - Ranking algorithm complicated
  - Website admin trusted

# Decentralized content curation

- Pros
  - All opinions count - objectivity
  - Scales well
  - Blockchain - No trust needed
- Cons
  - Ranking algorithm not good enough yet
  - Sybil attacks harder to avoid

# Steemit



- Social media platform
- 1.26M accounts
- Lives on Steem blockchain
- Uses decentralized content curation

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## Trending: All Tags



Featured



**steemitblog** (72) in dtube • 17 hours ago

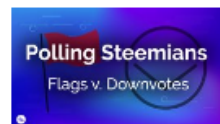


**Steemit Community Contributions (D.tube Embeds!)**  
 At Steemit, we want to empower community developers to help impr...  
 ▲ \$0.06 ▼ ▲ 59 ▲ 1

Featured



**steemitblog** (72) in poll • 21 hours ago



**Poll: Flags or Downvotes?**  
 Hello Steemians, we want to hear your thoughts on whether we sho...  
 ▲ \$0.35 ▼ ▲ 116 ▲ 164

**nextcolony** (67) in nextcolony • 23 hours ago



**Battle starts on June 8th**  
 Immediately after the launch of Next Colony about 2 weeks ago, we ...  
 ▲ \$293.09 ▼ ▲ 518 ▲ 57

**crypt0lizard** (70) in appics • yesterday



**VLOG #13: Street food in Shimla, India. Well guys, this is my first time eating ...**  
 ... street food in India. A lot of my Indian friends suggested to do it, an...  
 ▲ \$210.96 ▼ ▲ 446 ▲ 61

**steemhunt** (72) in reviewhunt • 2 days ago



**Introducing Reviewhunt - a launching hub for makers. Pre Sign-up is Live**  
 Today, we initiated the pre sign-up for our upcoming product debut - ...  
 ▲ \$320.43 ▼ ▲ 746 ▲ 51

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[The blockchain](#)  
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## Updates Log

[Steemit Community Contributions \(D.tube Embeds!\)](#)  
 By steemitblog . 17 hours ago  
[The Steemit Podcast \[Ep. 2\]: Oracle-D](#)  
 By steem.marketing . 13 days ago  
[Denial of Service Vulnerability Fix](#)  
 By steemitblog . 15 days ago  
[Happy Birthday Steem!](#)  
 By steemitblog . last month  
[The Guiding Mission, Vision and Values of Steemit, Inc.](#)  
 By ned . 3 months ago

## Coin Marketplace

# Our contributions

- Abstract Post Voting System
- Concrete PVS for Steemit
- Metric for curation quality
- Characterization of cases that Steemit ranks posts well:
  - $\#posts > 70 \rightarrow$  quality may be 0
- Simulation
  - Only honest players
  - Mixed honest-selfish players



# Posts

- Each post has a *likability vector*

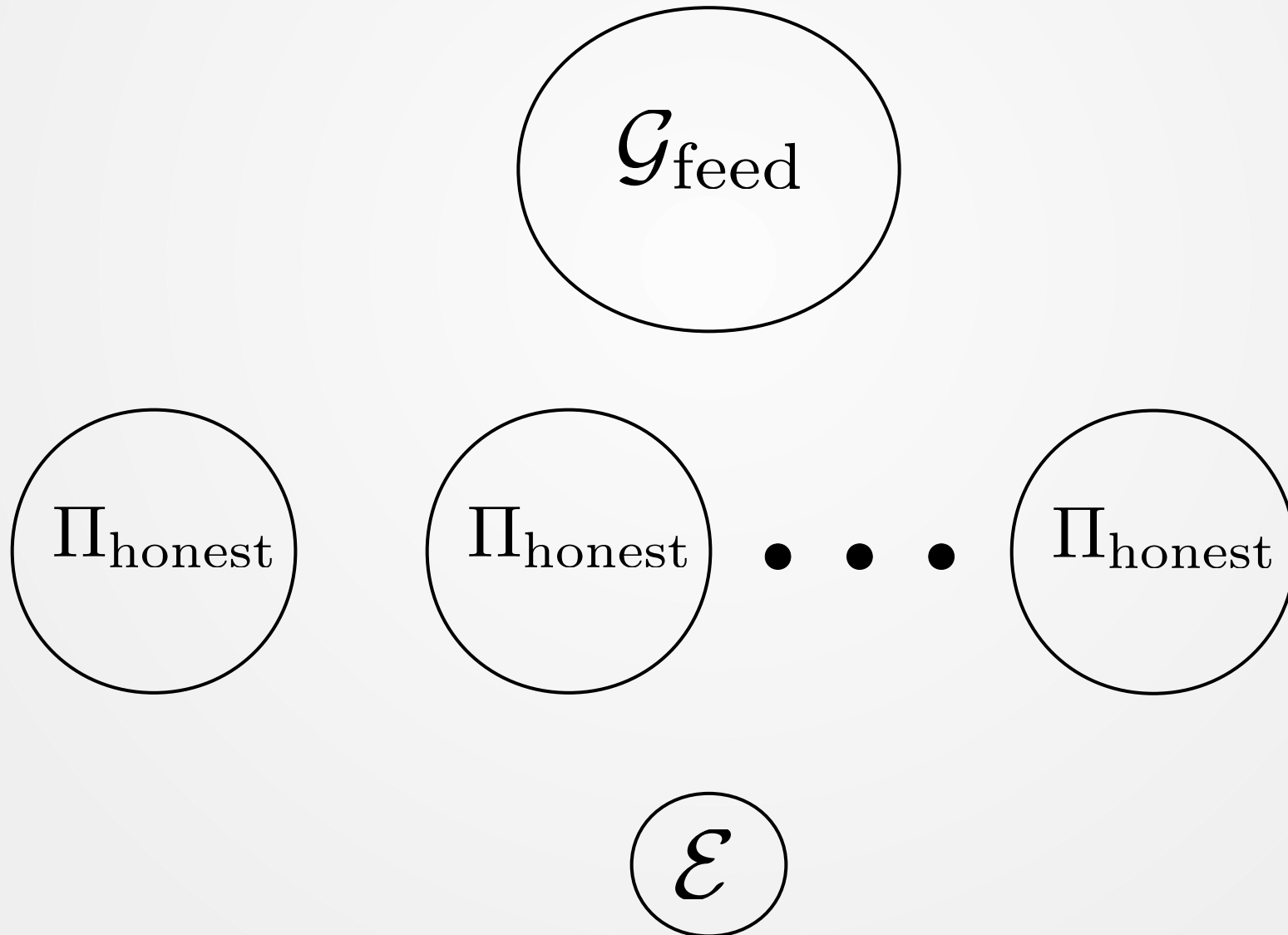
## Ideal post list

- List of posts, ordered by most liked

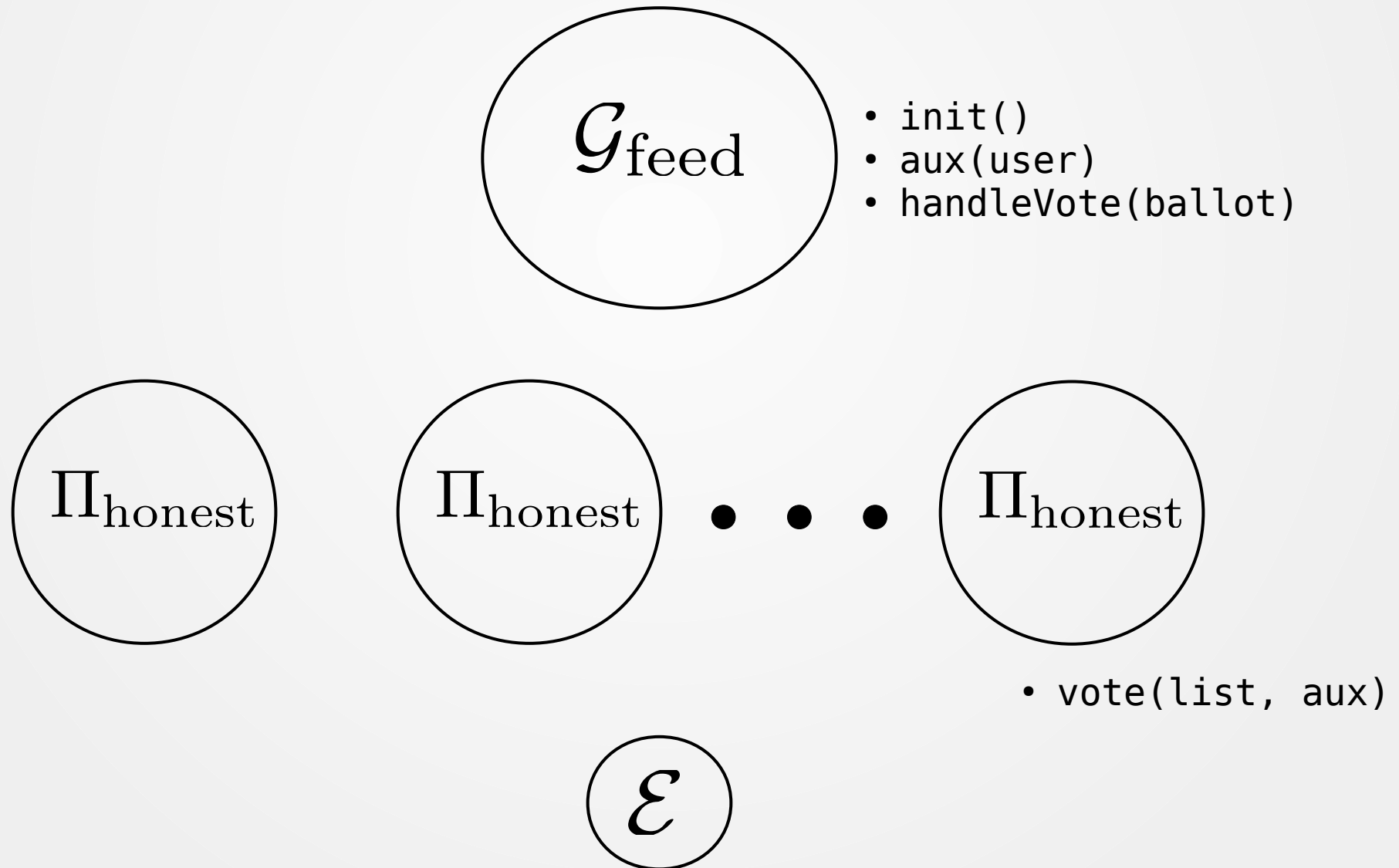
## $t$ -ideal post list

- List of posts, the  $t$  first are ordered ideally

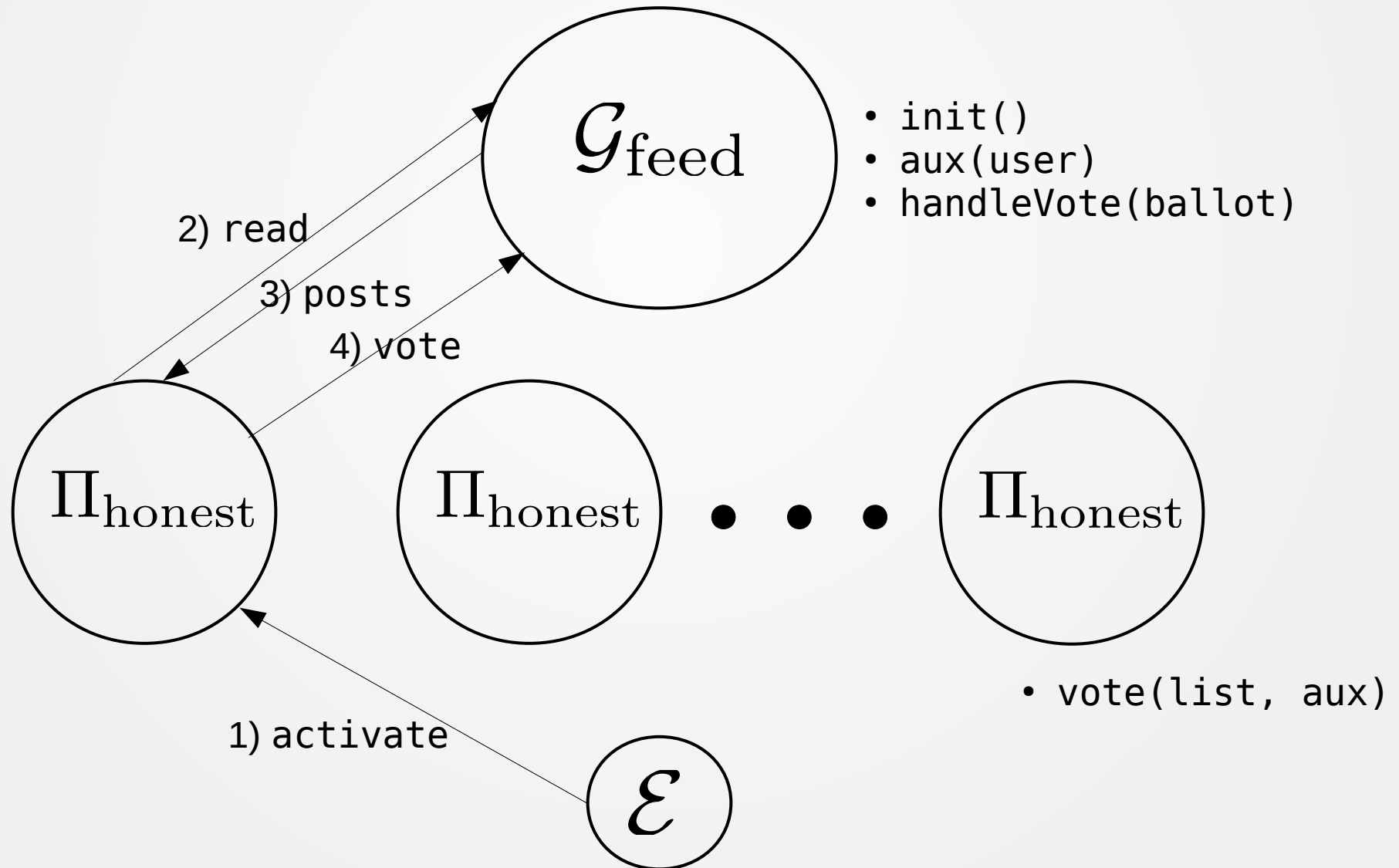
# Abstract Post Voting System



# Abstract Post Voting System



# Abstract Post Voting System



# Steemit Post Voting System

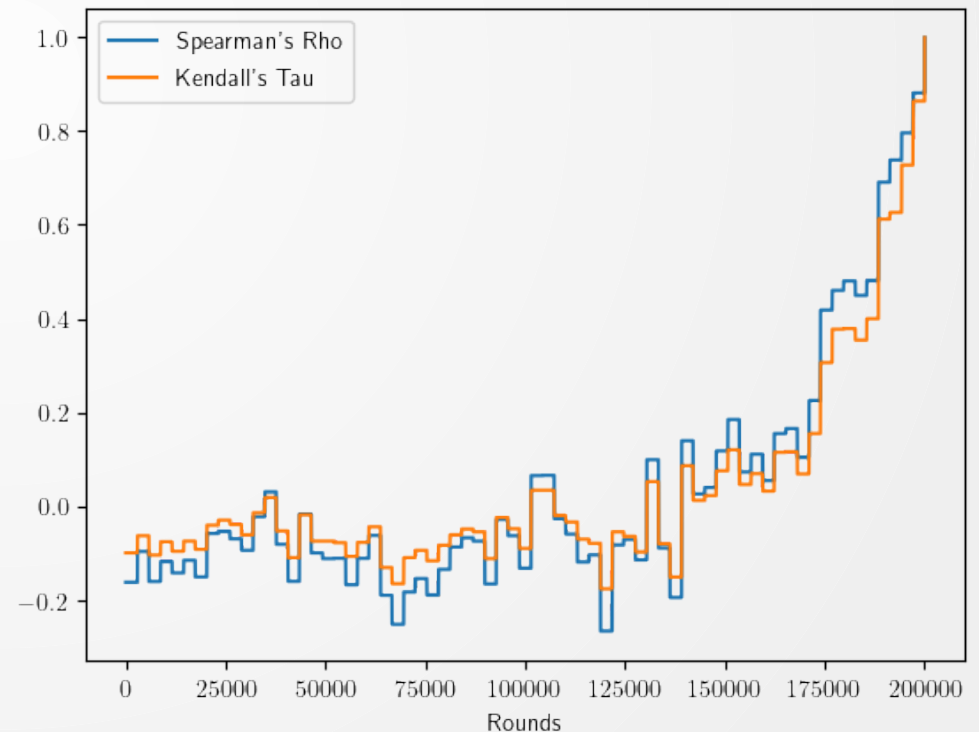
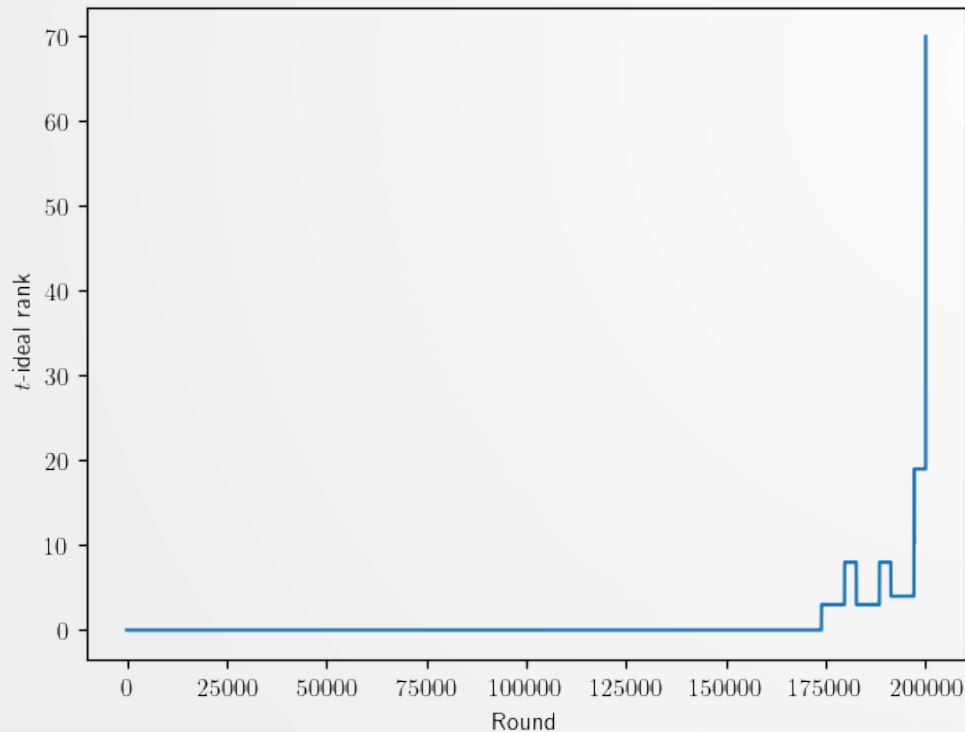
- `init(parms)`: initialize state (duh)
- `aux(user)`: send parameters & current round
- `handleVote(ballot)`:
  - count vote, weighted by money and *Voting Power*
  - Update *Voting Power*
- `vote(list, aux)`: choose best post of top *attSpan*, votes with *weight = likability*. Spreads votes to maximize *Voting Power*

# Main theorem

- If some players have differing funds:  
Steemit PVS does not 1-converge
- If all players have the same funds:
  - If there are up to 70 posts:  
Steemit PVS fully converges
  - If there are more than 70 posts:  
Steemit PVS does not 1-converge

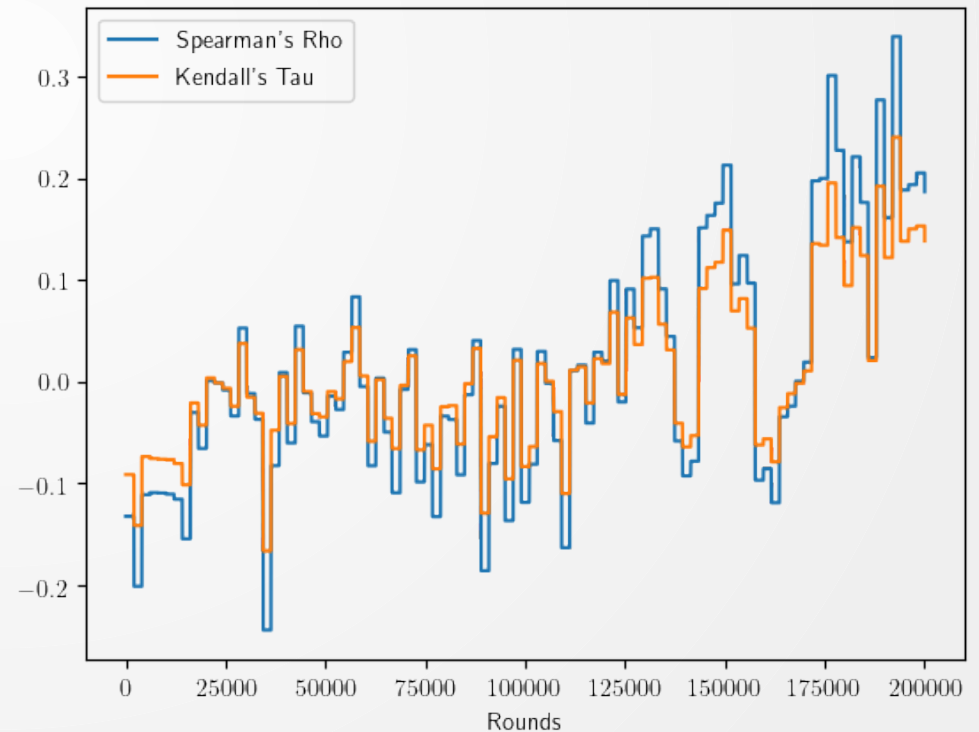
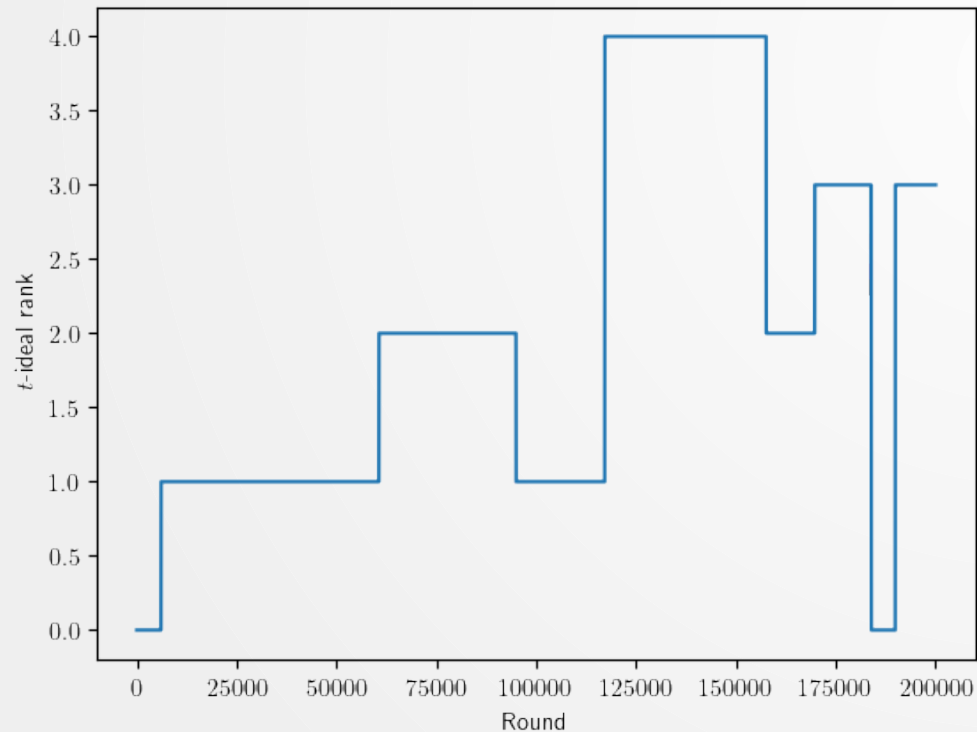
# Simulation

## All honest, few posts



# Simulation

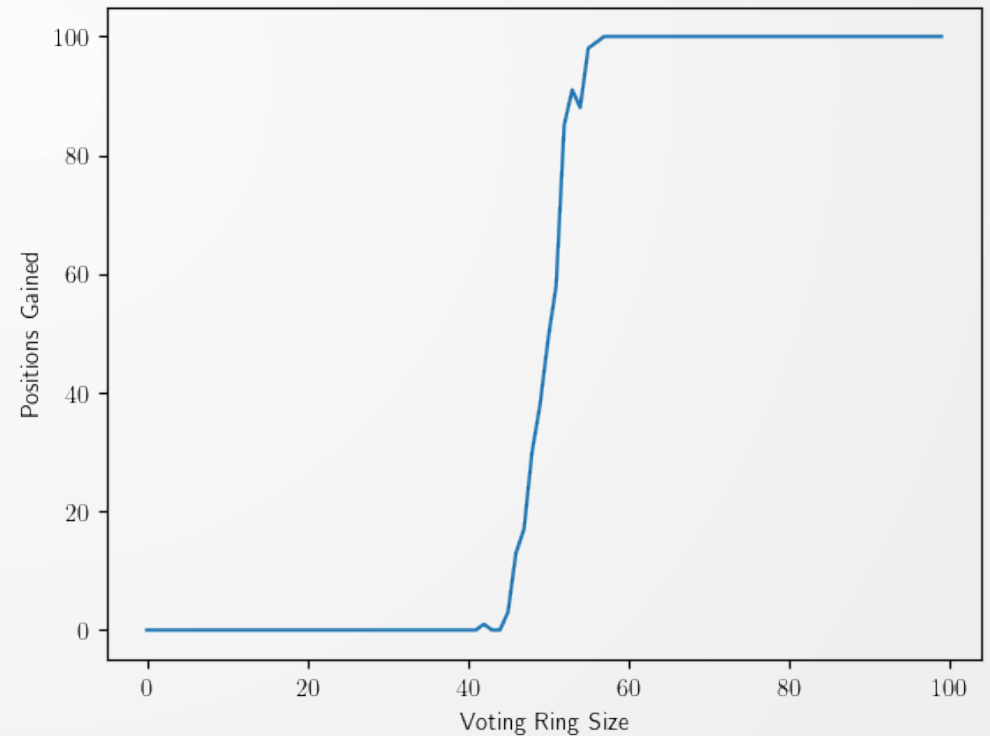
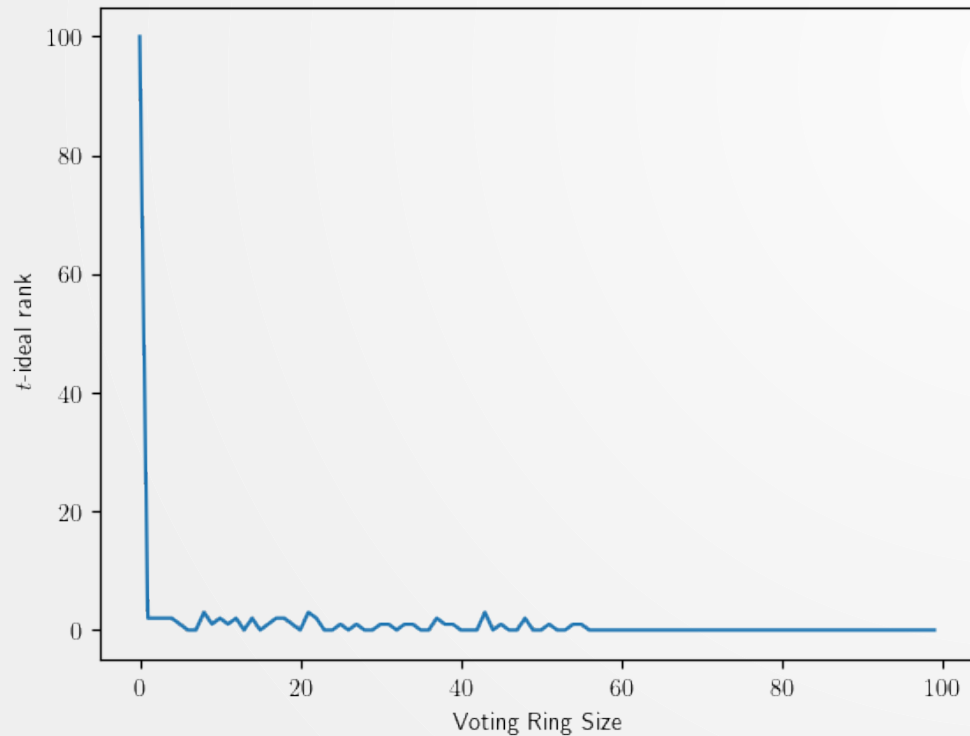
## All honest, many posts





# Simulation

## Mixed honest-selfish



# Conclusions

- Steemit curates well in limited cases
- More research into decentralized content curation needed

# Future work

- Analysis of other selfish strategies
- Game-theoretic analysis
- Dynamic post addition

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Thank you!  
Questions?