# A Puff of Steem:
## Security Analysis of Decentralized Content Curation

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Tokenomics 6/5/2019

# 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

## All tags

dtube

spanish

photography

life

kr

steemhunt

actifit

steem

utopian-io

travel

art

tasteem

mindset

bitcoin

drugwars-fight

appics

busy

food

steemmonsters

cryptocurrency

contest

nextcolony

blog

steemit

ntopaz

haejin

steempress

music

## Trending: All Tags

Featured                                                                    ✕

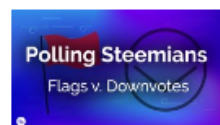**steemitblog** (72) in dtube • 17 hours ago

**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    ↪

## New to Steemit?

Quick start guide

The blockchain

FAQs

Sign up

Steemit Blog

## 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 → quality may be 0
- Simulation
  - Only honest players
  - Mixed honest-selfish players
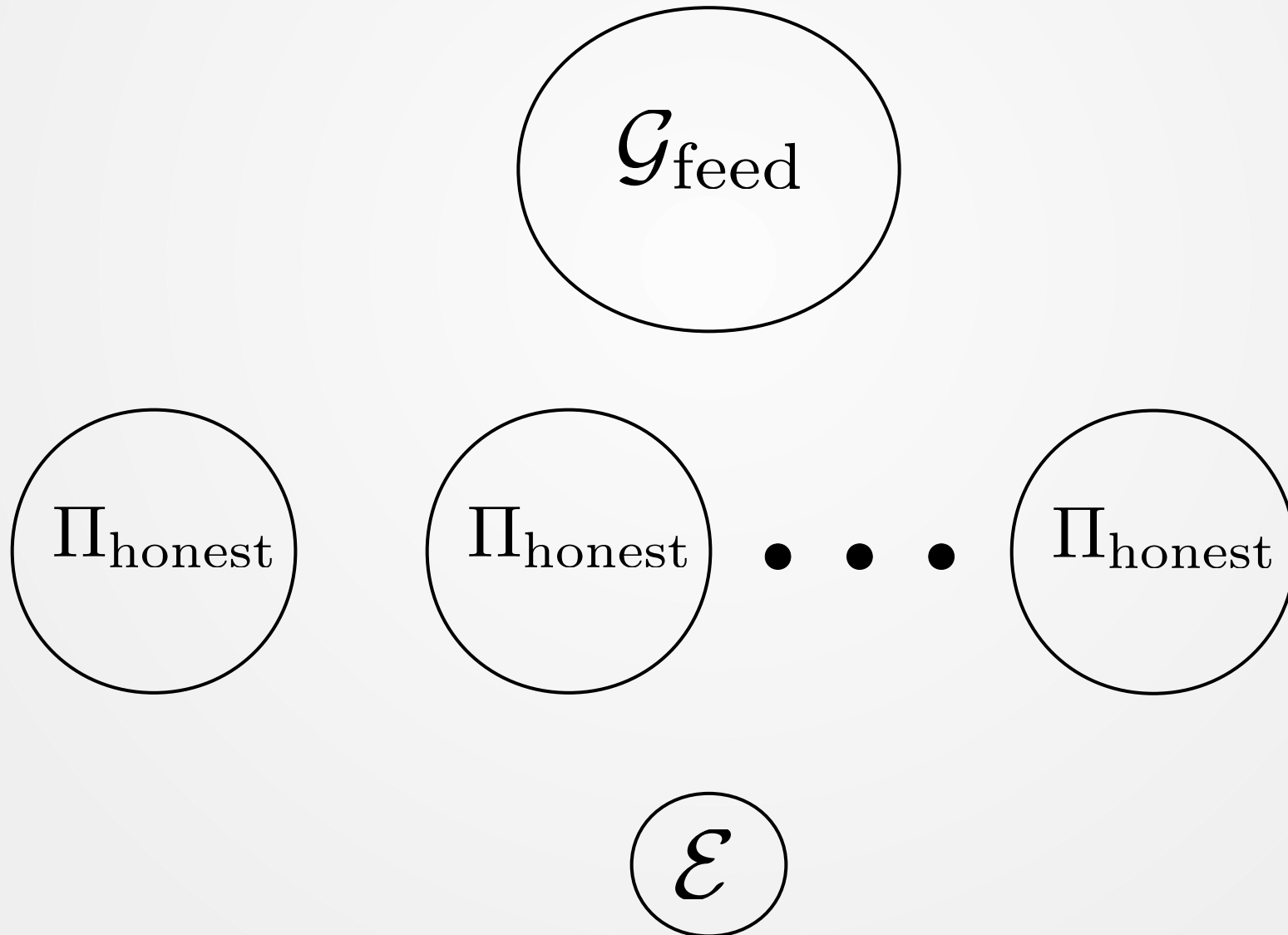
# Posts

- Each post has a *likability vector*

# Ideal post list
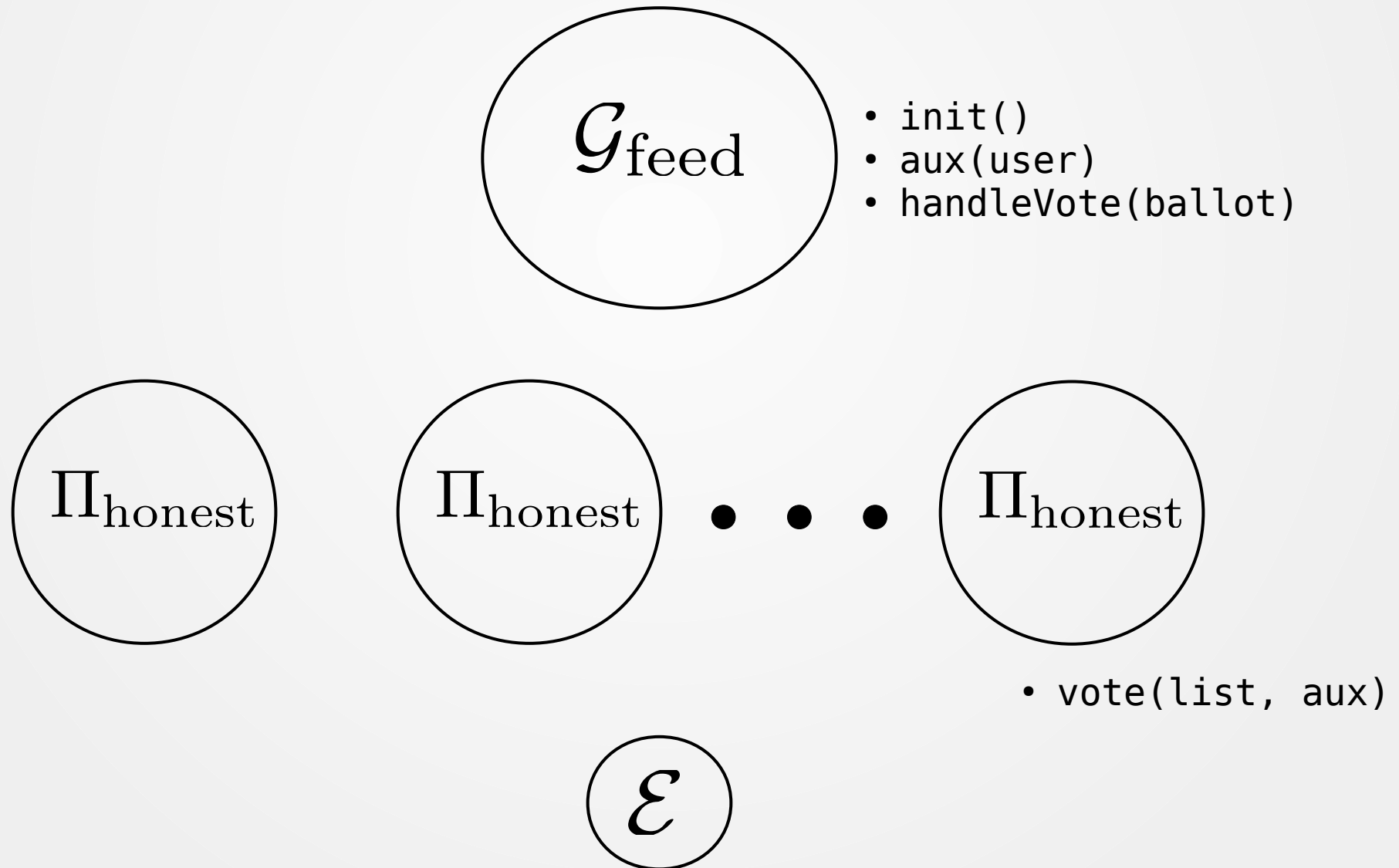
- List of posts, ordered by most liked

# $t$-ideal post list

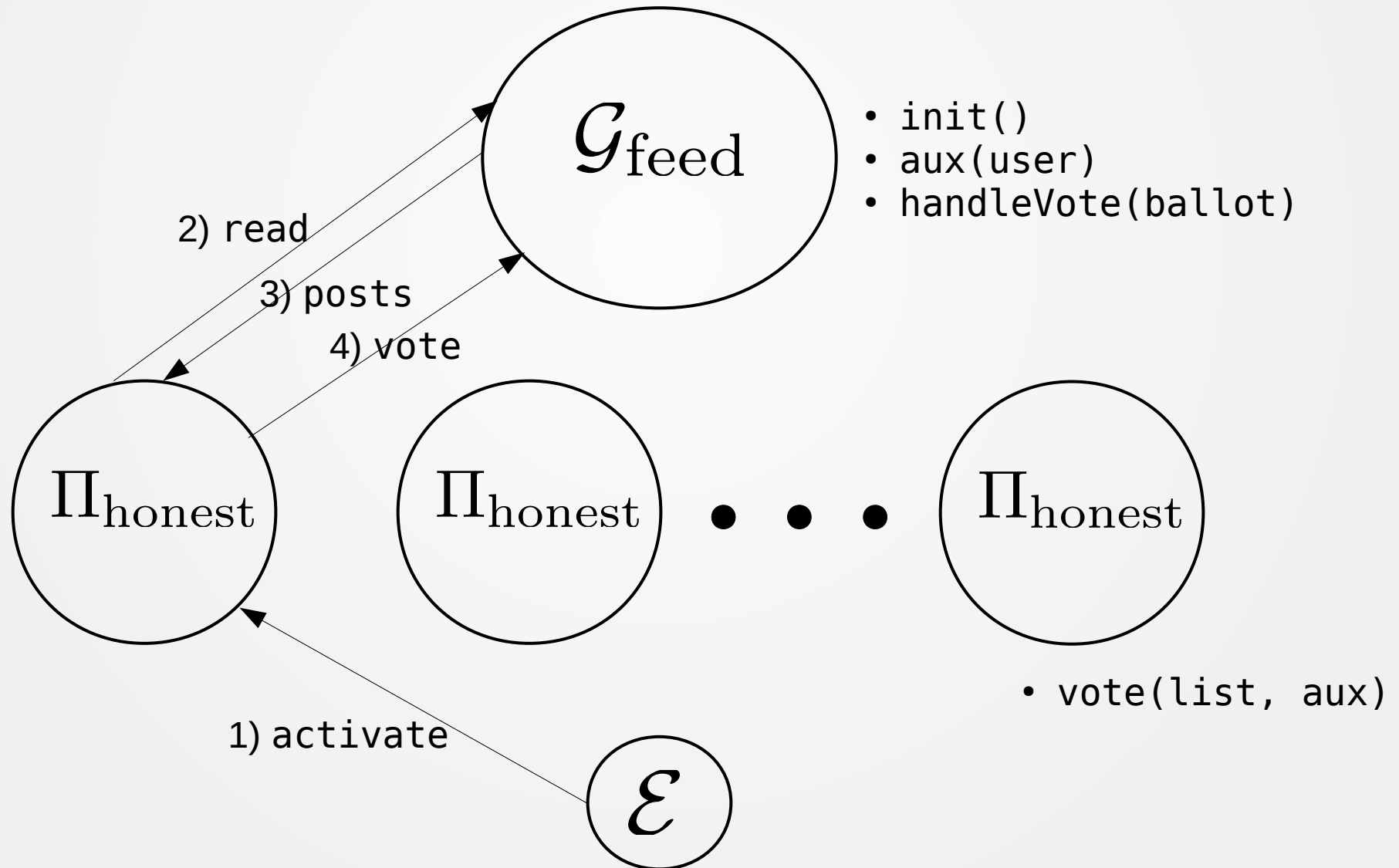- List of posts, the $t$ first are ordered ideally

# Abstract Post Voting System

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# Abstract Post Voting System



$\mathcal{G}_{\text{feed}}$

- `init()`
- `aux(user)`
- `handleVote(ballot)`

2) `read`

3) `posts`

4) `vote`

$\Pi_{\text{honest}}$ $\Pi_{\text{honest}}$ $\cdots$ $\Pi_{\text{honest}}$

- `vote(list, aux)`

1) `activate`

$\mathcal{E}$

# $(N, R, M, t)$-convergence metric

- For $N$ honest players,
- for $R$ activations per player,
- for any post list with $M$ posts,

$\mathcal{G}_{\mathrm{feed}}$ holds a $t$-ideal list at the end

# 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:
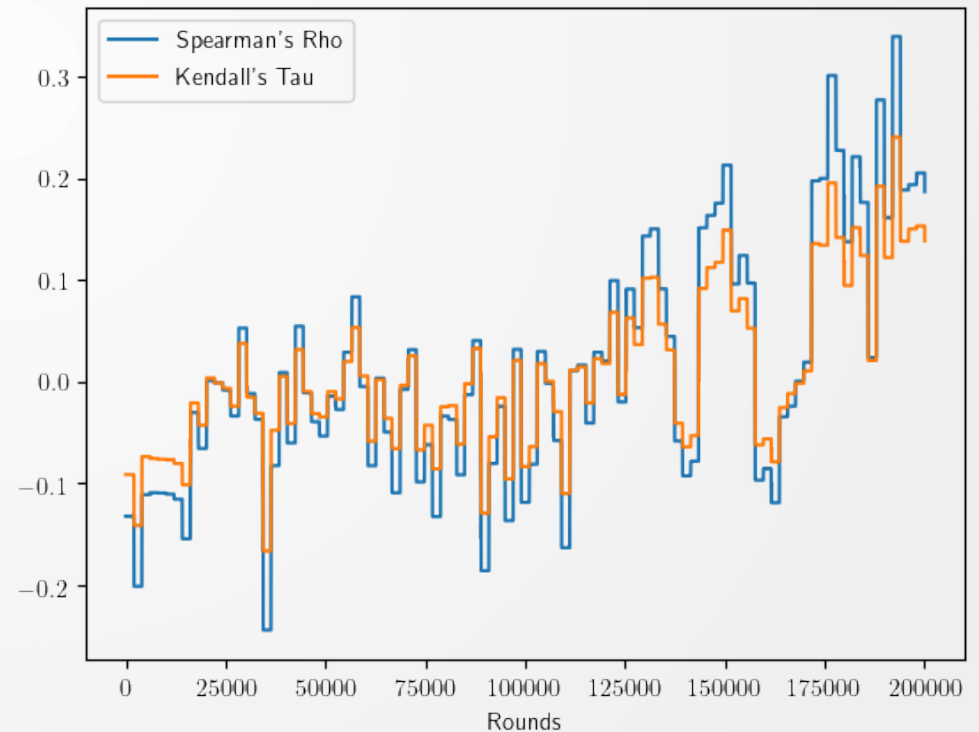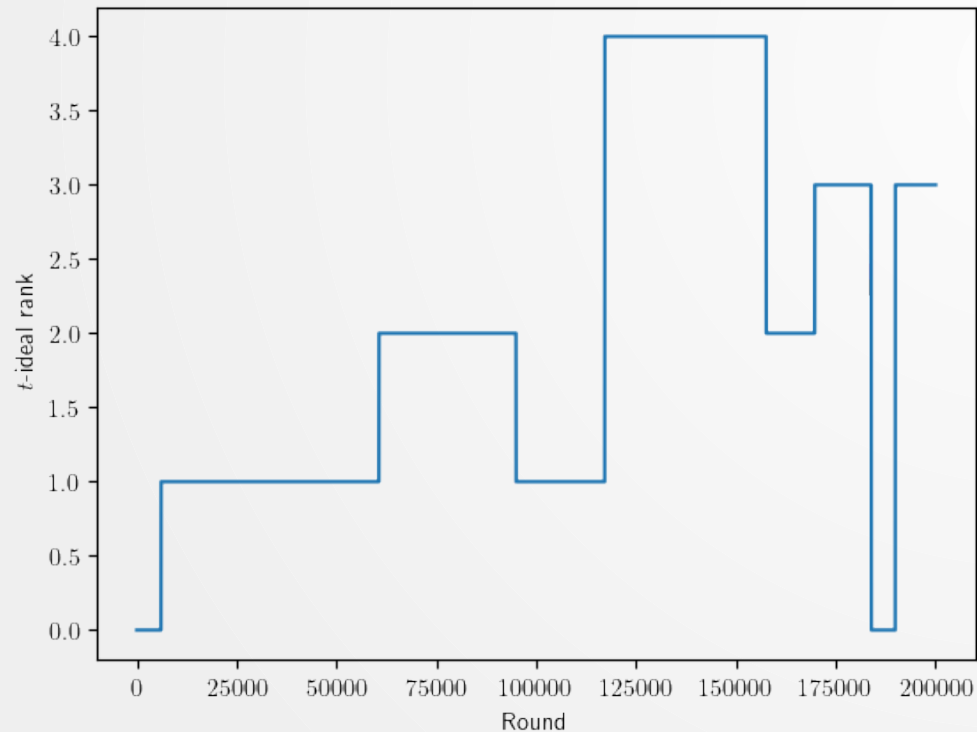       Steemit PVS does not 1-converge
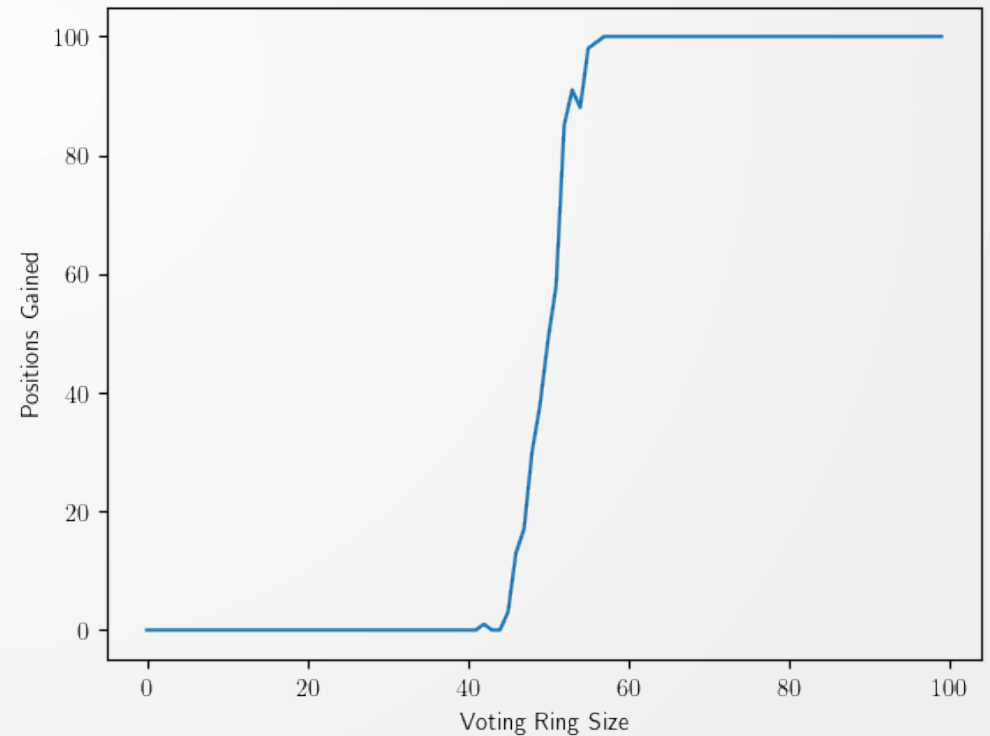
# Simulation
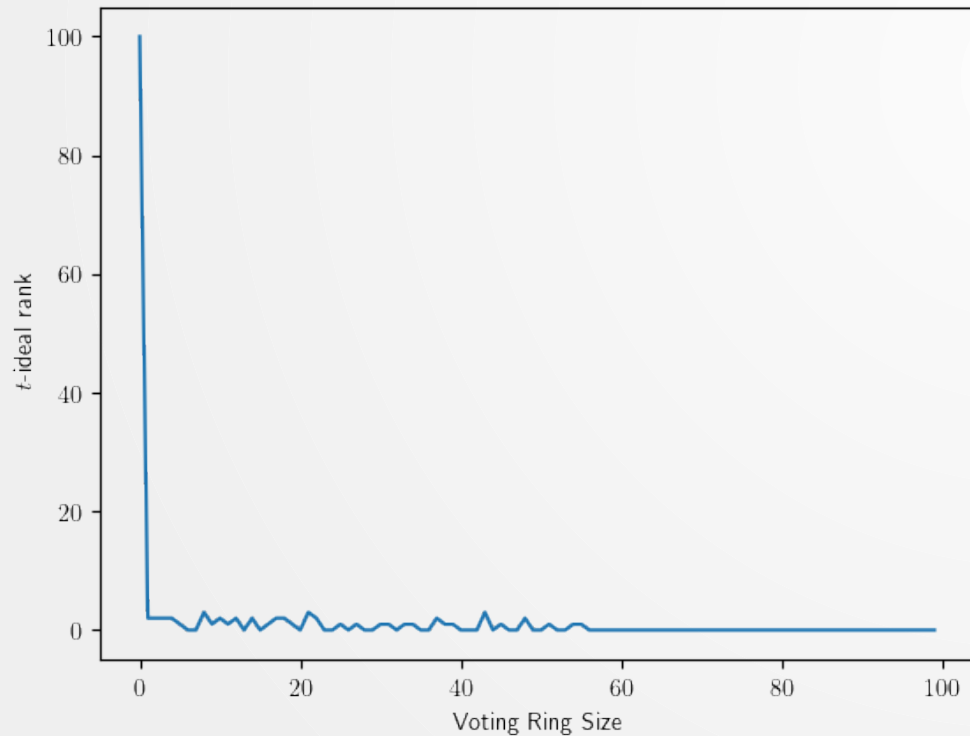## All honest, few posts
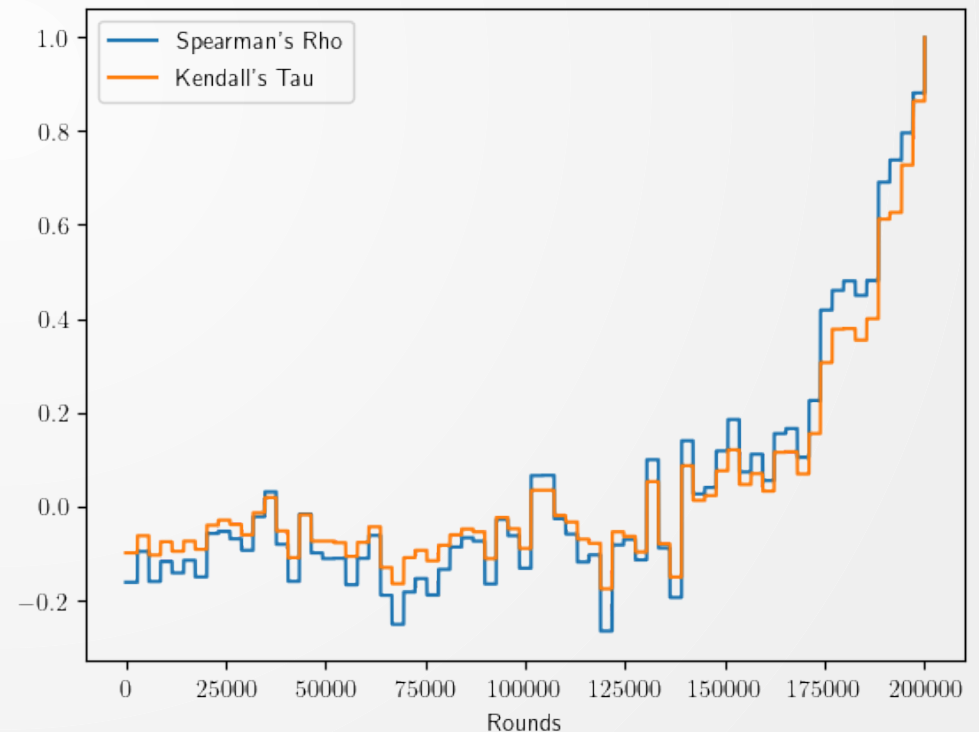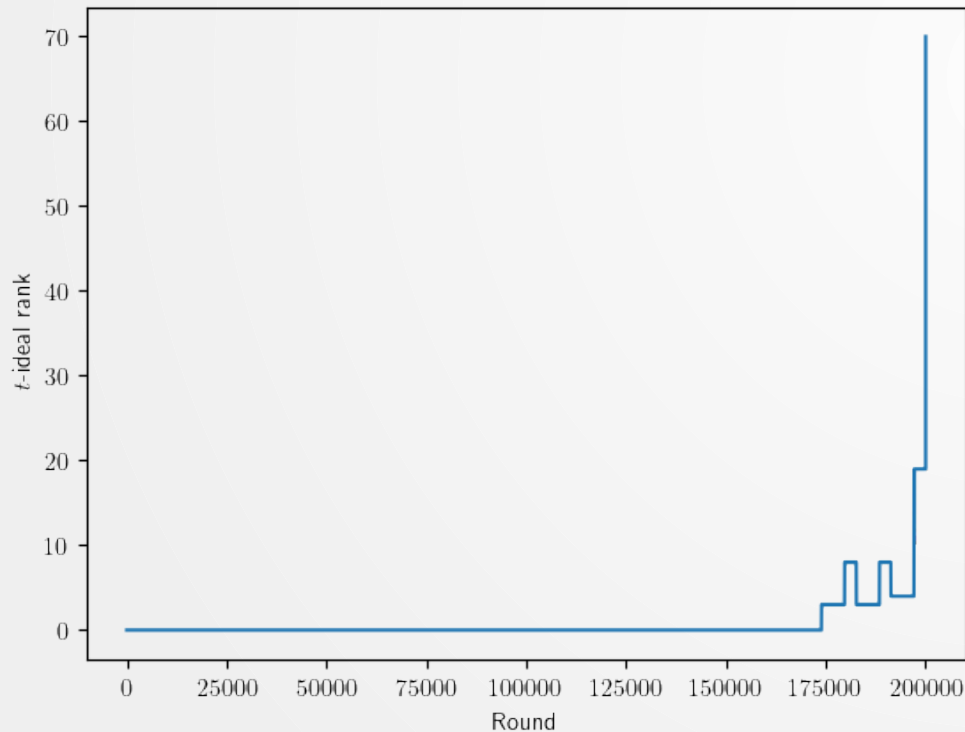
# Simulation
# All honest, many posts

# 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?