

Decentralized Governance

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MAX PLANCK INSTITUTE
FOR SOFTWARE SYSTEMS

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Who Am I?



Computer Scientist

- Bachelor (UFOP), Master (UFMG), and PhD (MPI-SWS) in Computer Science



Vast academic experience

- UFOP, UFMG, ELTE, MPI-SWS, and good publication record.



Vast industrial experience

- Kunumi, Chainlink Labs, Matter Labs



Taught and organized classes and seminars

- EEDS, UFOP, UFMG, UdS/MPI-SWS, received award nominations.

Socially disruptive technologies



Social Computing

- Vast topics of interest, publications.



Machine Learning

- Most innovative ML health software in Brazil by IT Forum 365, promoted by PwC and ITMidia.



Decentralized technologies

- Vast topics of interests, talks, papers.

Research interests



Decentralized Technologies – Blockchains

Decentralized Governance 🗳️

- Fairness in Token Delegation: Mitigating Voting Power Concentration in DAOs ([under submission](#))
- **Understanding Blockchain Governance:** Analyzing Decentralized Voting to Amend DeFi Smart Contracts ([under submission](#))
- On the Centralisation of Governance Power in Decentralized Autonomous Organizations ([under submission](#))

Airdrops 💧

- Airdrops: Giving Money Away Is Harder Than It Seems ([under submission](#))
- Crypto Airdrops and Finance in Digital Cultures: From Speculation to Sociality ([under submission](#))

Data 📈

- A Public Dataset For the ZKsync Rollup ([FC-CAAW25](#))
- The Writing is on the Wall: Analyzing the Boom of Inscriptions and its Impact on EVM-compatible Blockchains ([FC-CAAW25](#))

DeFi / MEV 🚗

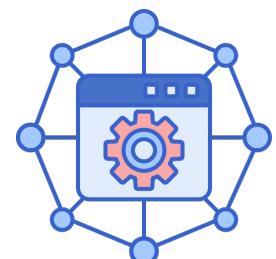
- The Express Lane to Spam and Centralization: An Empirical Analysis of Arbitrum's Timeboost ([under submission](#))
- Liquid Staking Tokens in Automated Market Makers ([Marble 24](#))
- Cross-Rollup MEV: Non-Atomic Arbitrage Across L2 Blockchains ([ArXiv24](#))
- Quantifying Arbitrage in Automated Market Makers: An Empirical Study of Ethereum ZK Rollups ([Marble 24](#))
- Cross-border Exchange of CBDCs using Layer-2 Blockchain ([CfC 24](#))
- Dissecting Bitcoin and Ethereum Transactions: On the Lack of Transaction Contention and Prioritization Transparency in Blockchains ([FC 23](#))
- Selfish & Opaque Transaction Ordering in the Bitcoin Blockchain: The Case for Chain Neutrality ([IMC 21](#))

ZK 🔒

- Unrolling the Performance of ZK-Rollups through Stochastic Modeling ([IEEE SMC 25](#))

And more 💎

What Is a Decentralized Autonomous Organization (DAO)?



Decentralized Governance

- **Decision-making authority is distributed among members** instead of being concentrated in a central entity.
- **Benefits:** Increased inclusivity, resistance to centralized power abuse, and enhanced resilience.



Transparency

- Operations, decisions, and treasury **management are recorded on a blockchain, visible to all members** and stakeholders.
- **Benefits:** Builds trust and accountability within the community.



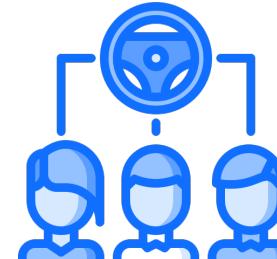
Smart Contract Automation

- **Rules and operations of the DAO are encoded in smart contracts**, enabling autonomous execution of tasks **without intermediaries**.
- **Benefits:** Efficiency, reliability, and reduced risk of human error.



Token-Based Membership and Voting

- **Members hold tokens** that represent **voting power** or rights within the DAO. Governance **often operates on principles like one-token-one-vote** or quadratic voting.
- **Benefits:** Aligns incentives, fosters active participation, and enables scalable governance.



Community-Driven Purpose

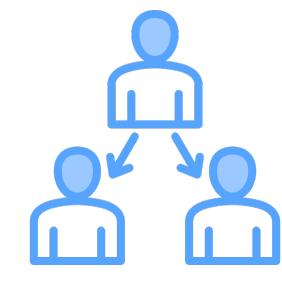
- DAOs are **typically mission-oriented**, focusing on goals such as funding projects, managing decentralized protocols, or creating shared value for members.
- **Benefits:** Engages a global, like-minded community united by a common vision.

What Are the Key Characteristics?



Token ownership

- It represents a **stake in the system**, allowing participation in decision-making.



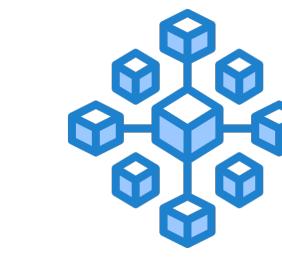
Token delegation

- It enables holders to transfer **voting power to trusted representatives**, similar to liquid democracy.



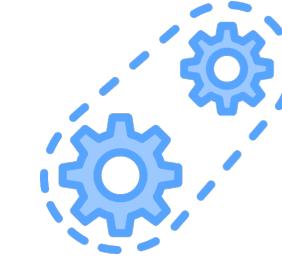
Who can vote?

- Anyone with governance **(delegated) tokens** can vote on proposals via secure blockchain platforms.



On-chain vs off-chain voting

- On-chain voting ensures **transparency and immutability**.
- Off-chain voting is **faster** but less transparent.



Most typical voting systems

- Majority voting and quadratic voting.
- Locking tokens.
- Continuous voting.
- Fixed or dynamic quorum.



DAO Operating Systems



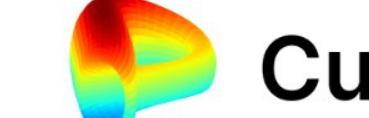
Investment DAOs



Collector DAOs



Protocol DAOs



Service DAOs



Media DAOs





Case Study: Compound and Uniswap



Characterize governance protocols

- They are **active and regularly used**, with a steady flow of proposals.
- The majority of the **proposals receive significant support**.



Analysis of token concentration

- A small group of **10 voters holds a significant voting power**.
- Proposals only required** an avg. of 3–5 voters to obtain at least **50% of the votes**.



Analysis voting cost

- We reveal a **huge variation in voting costs**.
- Voting costs can be unfairly expensive for small token holders**, which has fairness implications for the decision-making process.

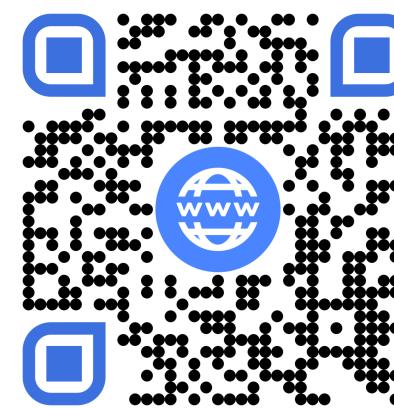


Voting pattern of voters

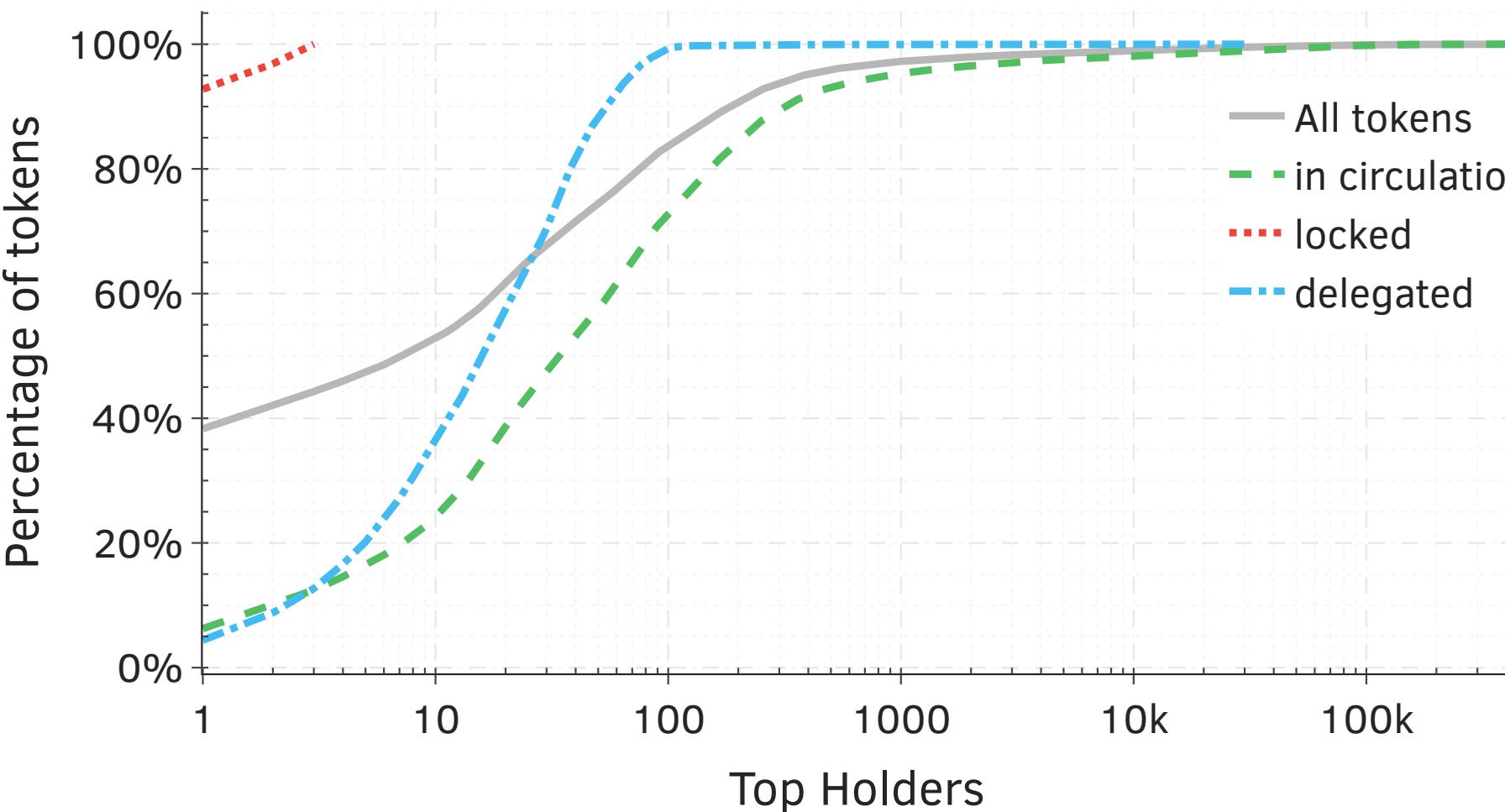
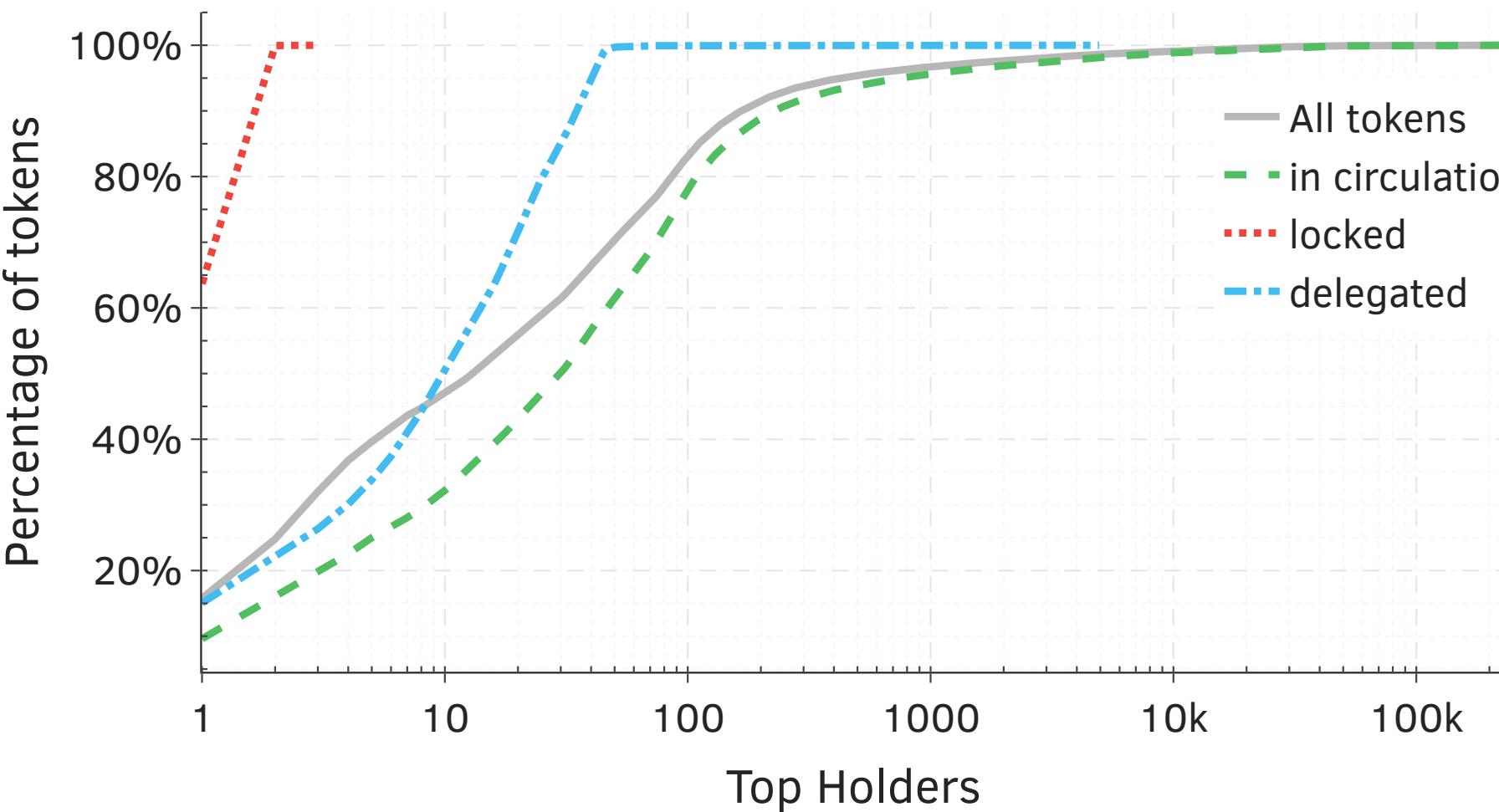
- We discover **potential voting coalitions** among the top voters in **Compound** & **UNISWAP**
- This could exacerbate concerns of **voting concentration**.



- It leads to real-world consequences.
- Smaller voices are drowned out.
- Participation might decrease.
- Open doors for vulnerabilities.



The Problem of Governance Token Concentration



Users actively vote on proposals

- **88.63% in favor**, on average.

Voting costs vary significantly

- From \$0.03 to \$294.02, detrimental to small token holders with an **average cost of \$6.82 per vote**.
- **Normalized costs per vote unit** reveal an average of **\$598.97**, posing fairness concerns.

Voting power is concentrated

- **10 voters holding 50.53% and 35.73%** of all tokens for **Compound** and **Uniswap**, respectively.
- On average, **proposals only required 3–5 voters to pass**.

Powerful voters potentially form coalitions

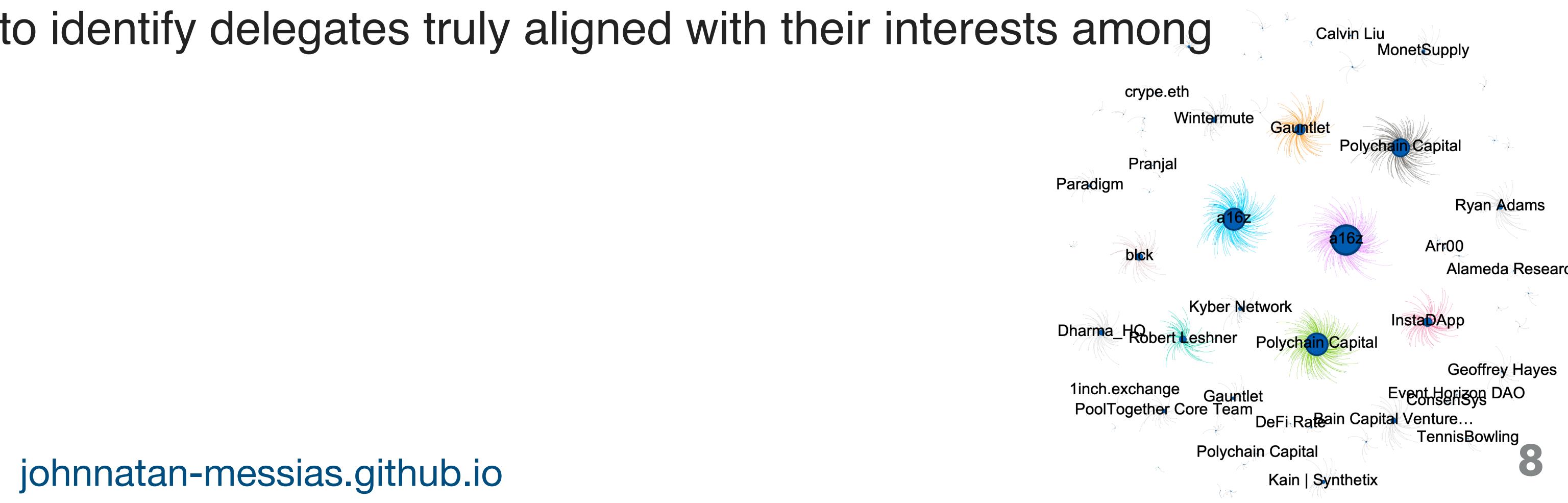
- It raises concerns about **voting concentration**.

Understanding Blockchain Governance: Analyzing Decentralized Voting to Amend DeFi Smart Contracts – arxiv.org/abs/2305.17655



How Does Delegation Typically Work Today?

- **DAO vs. Traditional Elections:** Unlike traditional systems (nationality-based voting power), DAOs require active delegation of voting power (to self or others).
- **Key Question:** **Amongst all participants, who should token holders choose as their delegate?**
- **Platform Influence:** Dashboards displaying DAO information (delegated tokens, voting records) can inadvertently bias choices towards highly-ranked participants.
- **Consequence:** Potential "*rich get richer*" dynamic, concentrating power and undermining decentralization.
- **User Challenge:** Difficult for token holders to identify delegates truly aligned with their interests among numerous options.





Tally: a Platform Designed To Support DAOs

Key Features of Tally 🍀

- **Token Launch:** It provides tools for deploying tokens, ensuring scalable distribution and seamless integration with EVM chains.
- **Governance Management:** It enables on-chain proposal creation, voting, and execution. It supports frameworks like OpenZeppelin Governor and offers features such as delegate registration and transparent voting power management.
- **Staking Solutions:** Its staking system allows protocols to distribute fees to token stakers, aligning economic incentives between protocol usage and token holder rewards. It supports features like liquid staking tokens (LSTs) and integrates with restaking protocols.
- **Tally Protocol:** It introduces a liquidity layer for governance tokens, enabling token holders to earn staking rewards while maintaining voting rights.

The screenshot shows the Compound governance interface on the Tally platform. At the top, it displays "Ethereum", "ERC20", and "10,000,000 Supply". The main header says "Compound" with a logo. Below it, a sub-header states: "Compound is an algorithmic, autonomous interest rate protocol built for developers, to unlock a universe of open financial applications." On the left, there are three summary boxes: "Delegates 13.68K", "Proposals 398", and "Treasury \$ 8.4M". The "Proposals" box notes "There are active proposals". On the right, there's a "My voting power" section with a note to "Connect your wallet to see your voting power and start delegating" and a "Connect Wallet" button. Below these are sections for "Proposals" (with one entry: "[Gauntlet] - COMP Rewards Recommendations (Part ...)" status "ACTIVE" May 21st, 2025 by Compound Governor), "Contracts and parameters", and "Notifications".

Used by ★



UNISWAP



era

and others...



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The screenshot shows the Tally platform interface for the Compound Governor. The top navigation bar includes links for Home, Proposals (which is active), Community, Stake, Treasury, More, and Connect wallet. A button for '+ New proposal' is located in the top right. The main content area is titled 'Onchain' and lists several proposals:

Proposal	Votes for	Votes against	Total votes
[Gauntlet] - COMP Rewards Recommendations (Part - 1) ACTIVE May 21st, 2025 Compound Governor	554.58K	0.71	554.58K 27 addresses
WOOF! <> Compound 2025 ⓘ PENDING EXECUTION May 18th, 2025 Compound Governor	797.21K	0	798.09K 24 addresses
Initialize cWRONv3 on Ronin EXECUTED May 14th, 2025 Compound Governor	700.94K	0	700.94K 46 addresses
[Gauntlet] Supply Cap Recommendations (04/28/25) pushed b... EXECUTED May 5th, 2025 Compound Governor	520.07K	0	520.07K 23 addresses
Initialize cWETHv3 on Unichain EXECUTED May 2nd, 2025 Compound Governor	650.94K	0	650.94K 58 addresses
Add weETH as collateral into the cUSDCv3 on Mainnet EXECUTED May 1st, 2025 Compound Governor	701.17K	0.04	701.17K 54 addresses
Add weETH as collateral into cUSDSv3 on Mainnet EXECUTED May 1st, 2025 Compound Governor	701.17K	0.05	701.17K 57 addresses

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The screenshot shows the Tally platform's interface for the Compound protocol. The main area displays a grid of delegates, each with a profile picture, name, COMP amount, and a "Delegate" button. To the right, there are sections for "Who are the delegates?", "Top Delegates", and "Details".

Delegates (Top 10):

Delegate	COMP	Description
a16z	361.02K COMP	No bio provided
bryancolligan	198.03K COMP	No bio provided
0xE95...1318	170K COMP	No bio provided
Geoffrey Hayes	101.01K COMP	No bio provided
Event Horizon DAO	94.46K COMP	A public-access voter block which onboards new voters and delegates to DAOs by g...
Gauntlet	90.07K COMP	No bio provided
MonetSupply	85K COMP	delegate, risk analyst @ BA Labs (Block Analitica), defi lending and stablecoin ...
ArrOO	80K COMP	Long time Compound delegate. Creator of Governor Bravo, borrow caps, proposer wh...

Who are the delegates?

Delegates create and vote on proposals. Token holders can update their delegate at any time.

Learn more

Top Delegates

Details

Category	Value
Total Supply	10M
Delegated Tokens	2.87M
Quorum (Compound Governor)	400K



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The screenshot shows the Tally platform's interface for the Compound protocol. The main navigation bar includes Home, Proposals, Community (which is active), Stake, Treasury, More, and a Connect wallet button. The 'Community' section displays a list of delegates for the Compound protocol. Each delegate entry includes a profile picture, the delegate's name, their COMP staking amount, and the number of accounts they are trusted by. There are also 'Delegate' buttons and social media links (Twitter). A modal window is open for the delegate 'al0z', listing their focus areas: All Focus Areas, Public Goods, Decentralization, Treasury Management, Working Groups, Grants Programs, Community Outreach, and Protocol. Below the modal, it says 'Trusted by 550 accounts'. To the right, there is a chart titled 'Who are the delegates?' showing the distribution of COMP supply among top delegates. The chart has a legend with colored dots corresponding to the delegates listed: a16z (purple), bryancolligan (teal), Ox7E95...1318 (red), Geoffrey Hayes (blue), Event Horizon DAO (yellow). The chart shows the percentage of COMP supply held by each delegate. A sidebar on the right provides details about the total supply, delegated tokens, and the Quorum (Compound Governor).



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Delegates

Sort by: Voting Power

Sort by: Received Delegations

Sort by: Random

Who are the delegates?

Learn more

Top Delegates

Details

Delegate	COMP	Accounts Trusted
a16z	361.02K COMP	350 accounts
bryancolligan	101.01K COMP	27 accounts
Ox7E95...1318	170K COMP	10 accounts
Geoffrey Hayes	90.07K COMP	41 accounts
Event Horizon DAO	94.46K COMP	28 accounts
Gauntlet	85K COMP	41 accounts
MonetSupply	80K COMP	14 accounts
ArrOO	80K COMP	10 accounts

Ranking Order Can Influence User Choices



Google how many pages users look at when searching on Google

All Images Videos Short videos Web Forums News More Tools

AI Overview

Most Google users primarily focus on the first page of search results, with a significant majority (over 91%) not going beyond. While the first page is the most heavily utilized, the second page does see some traffic, though less than the first. It's also important to note that the specific pages users see can vary based on their location, search history, and other factors.

Learn more

Here's a more detailed breakdown:

First Page Dominance:

Over 91% of users don't go past the first page of search results.

Second Page Engagement:

Show more

It's crucial to be on the first page of the search results. According to one survey, 93.4% of all Google users will only look at the first page when choosing the result that they want to select. A mere 6.6% will continue on and check the results that are on the second page. 29 Mar 2024

contentcustoms.com https://www.contentcustoms.com · 2024/03/29 · do-user... : About featured snippets · Feedback

Do users actually look at the second page of search results?

People also ask :

How many visits does Google search have? ▾

What percentage of Google searches go past the first page? ▾

How many pages does Google search? ▾

What Can We Do About It? 🤔

A Proactive Solution: Interest-Aligned Delegation Matching



- **Address a critical challenge in DAO governance:** Optimizing delegation matching!
- **Like in traditional democracy:** voters vote for a politician when they have their interests aligned.

Why not do the same with token delegation in DAOs?

- **Goal:** Provide governance systems with tools to:
 - Users delegate to voters who are better aligned with their interests.
 - Reduce delegation bias.
 - Improve transparency of voting power distribution.
- **Example:** A "*Delegation Advisory*" system, similar to voting advisories in democratic elections.
- **Enhanced Decision-Making:** Lead to more secure, decentralized, and effective DAO governance.

Roadmap



Data Acquisition

- On-chain data (Ethereum & other archive nodes).
- Text-based data: Off-chain discussions (Forums, Discord).
- Other relevant data platforms (e.g., Nansen, Messari, Tally).



Voting Behavior Analysis

- Analyze how voters engage on proposal discussions.
- Extract topics of interest for each voter.
- Publish results in an academic paper.



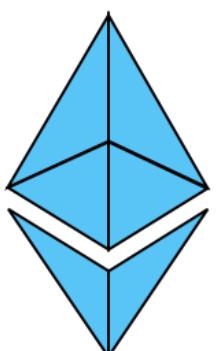
Implement Delegation Matching Algorithm

- Design and build a MVP of delegation matching system.
- Implement a simulation environment framework to test the system.



Test and Evaluate

- Deploy the matching algorithm by partnering with delegation platforms / DAO projects.
- Evaluate the performance via A/B testing and/or simulations.



ethereum



ARBITRUM

OPTIMISM

zkSync **era** ■



How can we improve DAOs?



- ▶ What metrics can accurately quantify the level of decentralization in a DAO?
- ▶ How to provide incentives for people to vote?
 - ▶ Can they game the system? If there is a chance they will.
- ▶ How to avoid/mitigate voting buying, intimidations, or coercion?
- ▶ How can DAOs achieve privacy for their participants while maintaining some form of transparency?
- ▶ How can DAOs leverage emerging technologies (e.g., multi-chain) for better scalability and security?
- ▶ How can we rigorously analyze and verify DAO governance models?
 - ▶ How can we automate testing and experimentation in DAOs?
- ▶ How can we design user-friendly interfaces for DAO participants?

Contact

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