Analyzing the Voting Patterns of Delegates in Arbitrum Proposals

(Analysis of Delegates Voting Patterns in Arbitrum Proposals)

Description of the main task: The "Analysis of Delegates Voting Patterns in Arbitrum Proposals" project aims to investigate the voting behaviors of delegates within the Arbitrum governance framework. Through rigorous statistical analysis of a comprehensive dataset, we seek to uncover consistent patterns and correlations in delegate voting across various proposals. The approach prioritizes systematic methodology and thorough documentation, aiming to provide valuable insights into delegate participation and decision-making dynamics.

Description of the sub-task - “Voting Patterns Based on Type of Proposals”: The sub-task "Voting Patterns Based on Type of Proposals" involves analyzing how delegates engage with different types of proposals within the Arbitrum governance framework. By categorizing proposals into various types, such as basic, single-choice, ranked, approval, and weighted, the analysis aims to uncover insights into voting behaviors and participation rates across these categories. The objective is to identify any patterns or trends unique to each proposal type, which can inform governance decisions and improve the effectiveness of the voting process within the Arbitrum ecosystem.

Table Of Content:

Introduction:

As of the data collection date on March 1, 2024, there were a total of 144 closed proposals within the Arbitrum DAO on the Snapshot platform.
In the course of our analysis, it was observed that two proposals shared identical titles, with one of them including the [REAL] keyword in the title. To discern the test proposal, the decision was made to exclude the proposal without the [REAL] keyword, considering it as a test proposal. Notably, this test proposal belonged to the basic type.
After eliminating the test proposal, the dataset now consists of 143 unique proposals spanning various types.
This refined dataset provides a more accurate representation for further examination of delegates' voting patterns in Arbitrum DAO proposals.

Summary:

The analysis investigates the voting patterns and behaviors of voters on Snapshot Proposals, focusing on various types of voting schemes employed on the Snapshot platform. By examining these different types of voting mechanisms, the aim is to gain insights into how voters engage with proposals and make decisions within the Snapshot ecosystem.

Key Insights and Analysis Done:

The dataset provides valuable insights into the voting patterns within Arbitrum DAO, allowing for a comprehensive examination of various proposal types. The following key statistics highlight the distribution and engagement across different proposal types:

Proposal_Type	Number_of_Proposals	Number_of_Voters	Number_of_Votes
basic	114	144266	2637014
single-choice	19	109614	770386
ranked-choice	7	75893	222479
approval	2	34431	66725
weighted	1	23345	23345

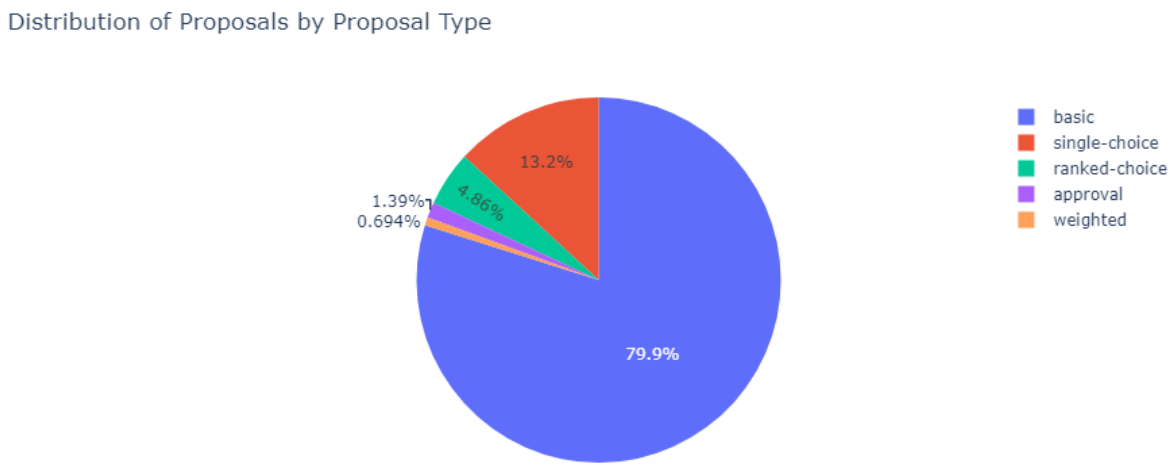
- **Total Proposals:** The dataset encompasses a total of 143 unique proposals across different types.

- **Voter Engagement:** Across all proposal types, there are 152,977 unique voters. The data shown in the table above has the total count of voters is 387,549 but this count takes into account the potential overlap of voters participating in multiple proposals.

- **Total Votes:** The cumulative votes cast reached an impressive 3,719,949, underscoring the substantial engagement within the Arbitrum DAO community.

This comprehensive breakdown, considering the unique voters and potential overlaps, lays the foundation for a detailed analysis of each proposal type's voting dynamics. It facilitates a deeper understanding of the preferences and behaviors exhibited by delegates within the Arbitrum ecosystem.

Distribution of Proposals by different Proposal Types(E-voting patterns):



Source: [Graph Link]

The distribution of proposals within Arbitrum DAO showcases a varied landscape across different types. Here are the key insights:

1. **Basic Type:**
    - Number of Proposals: 115
    - Percentage: 79.9%

2. **Single-choice Type:**
    - Number of Proposals: 19
    - Percentage: 13.2%

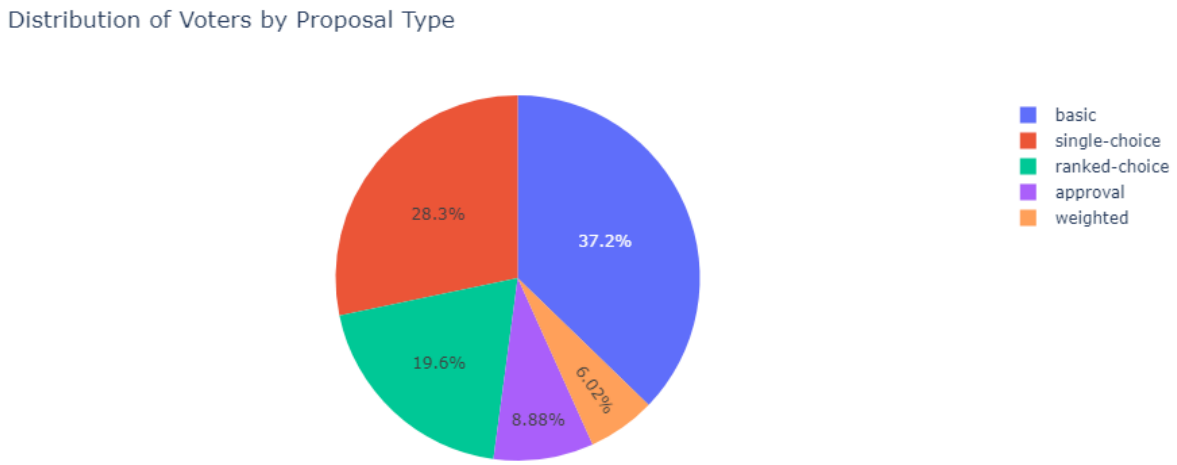
3. **Ranked-choice Type:**
    - Number of Proposals: 7
    - Percentage: 4.86%

4. **Approval Type:**
    - Number of Proposals: 2
    - Percentage: 1.39%

5. **Weighted Type:**
    - Number of Proposals: 1
    - Percentage: 0.694%

These statistics highlight the dominance of the Basic type, constituting nearly 80% of all proposals, while Single-choice and Ranked-choice types also contribute significantly to the overall proposal diversity. Approval and Weighted types, although fewer in number, add unique dimensions to the overall proposal ecosystem.

Distribution of Voters across different Proposal Types:

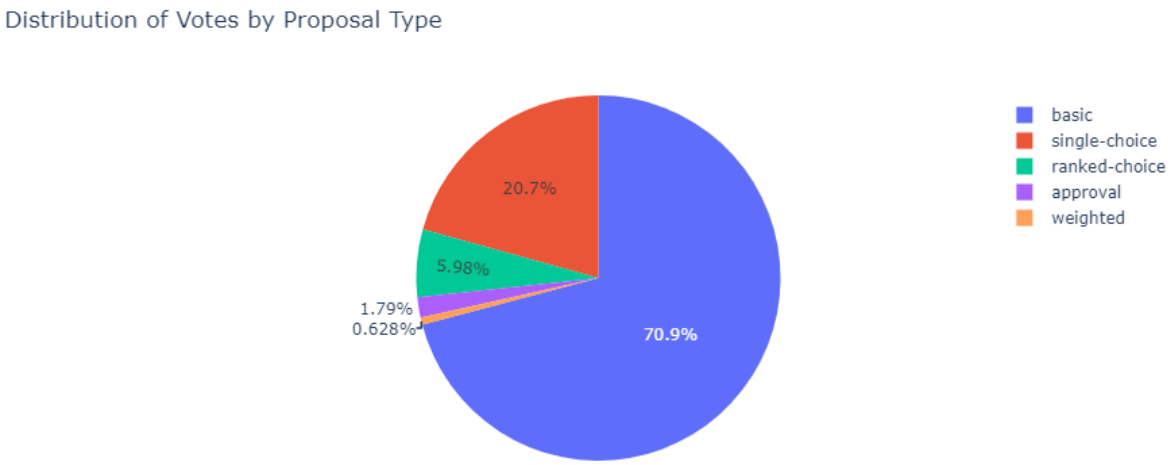


Source: [Graph Link]

The pie chart above illustrates the distribution of voters based on proposal types. It showcases the percentage of voters engaged across different types. However, it's important to note that this data includes the overlapping participation of voters across various types. For instance, the

depicted 37.2% of voters who participated in basic type proposals also include individuals who participated in other types of proposals.

Distribution of Votes across different Proposal Types:



Source: [Graph Link]

The above pie chart shows the distribution of total votes received on Snapshot Arbitrun DAO Proposals across different types.
Examining the distribution of votes across different proposal types within Arbitrum DAO reveals intriguing insights into the community's preferences. Here's a breakdown of the total votes cast:

1. **Basic Type:**
    - Percentage of Total Votes: 70.9%

2. **Single-choice Type:**
    - Percentage of Total Votes: 20.7%

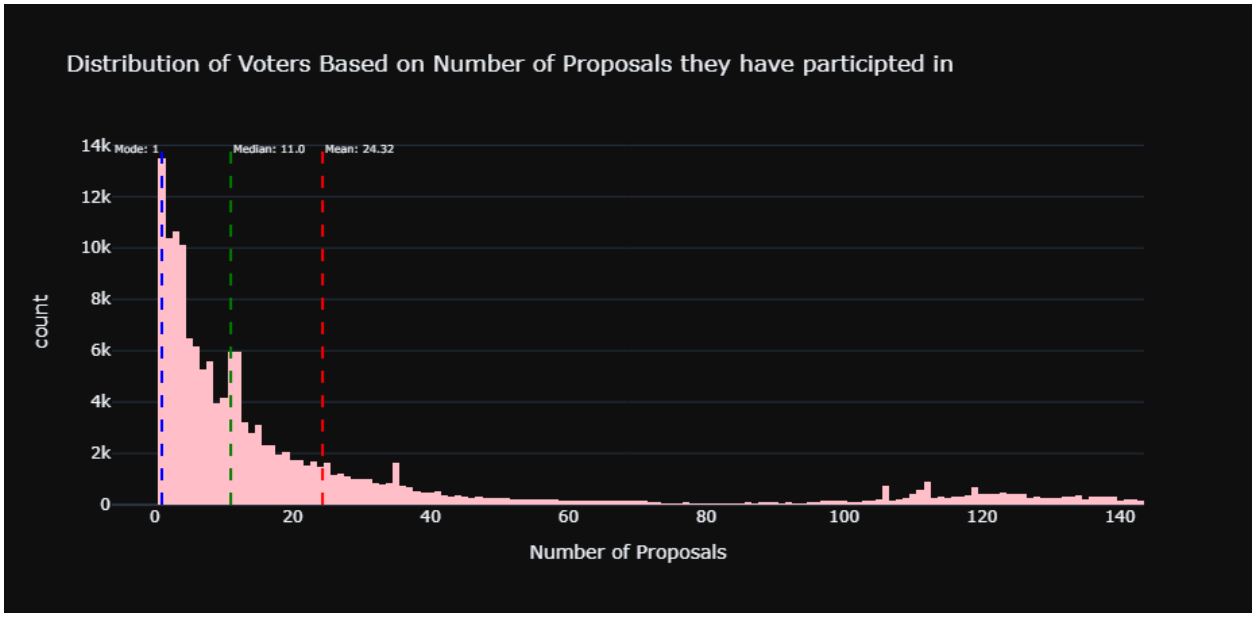
3. **Ranked-choice Type:**
    - Percentage of Total Votes: 5.98%

4. **Approval Type:**
    - Percentage of Total Votes: 1.79%

5. **Weighted Type:**
    - Percentage of Total Votes: 0.628%

These percentages provide a nuanced perspective on the voting patterns, showcasing the dominance of Basic type proposals in terms of total votes. Single-choice and Ranked-choice types also command substantial voting percentages, underscoring their significance within the community. Despite their lower numbers, Approval and Weighted types contribute to the overall diversity of voting behaviors.
Understanding the distribution of votes by proposal type is crucial for gauging the community's engagement and the impact of different proposal categories within the Arbitrum DAO ecosystem.

Analyzing Voter Engagement: Distribution of Voters Across Multiple Proposals Count



Source: [Graph Link]

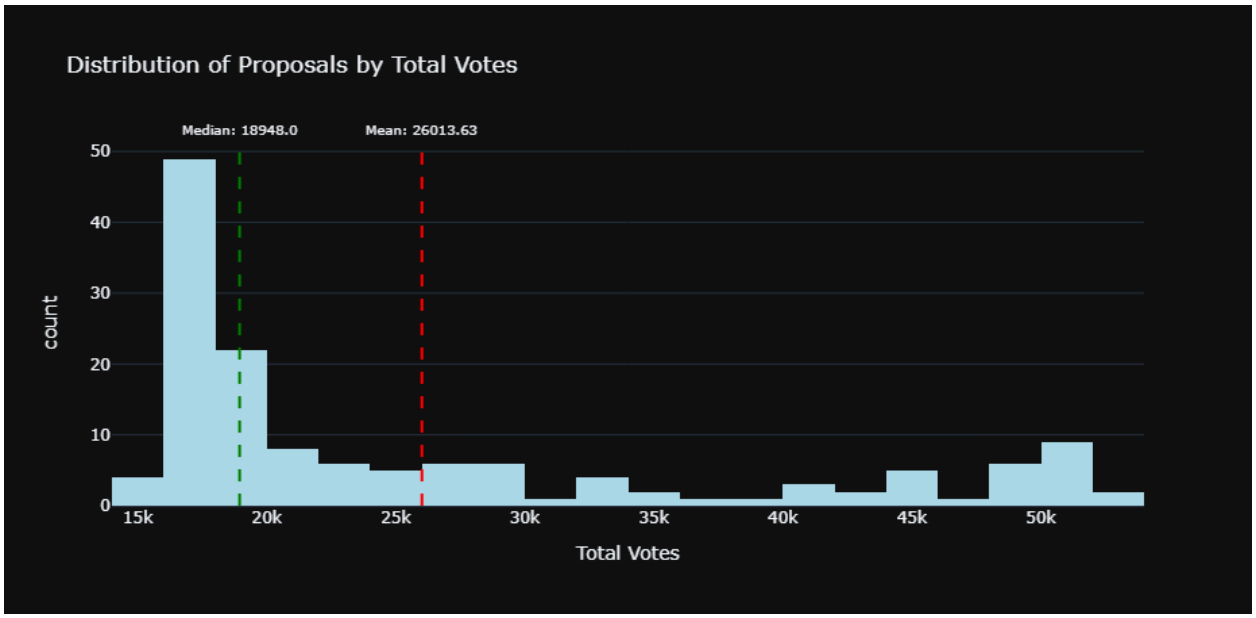
The histogram graph depicts the distribution of voters based on the number of proposals they have voted for. The x-axis represents the number of proposals voted for, while the y-axis displays the count of voters.

Insights:

- The majority of voters have participated in only one proposal, as evidenced by the peak at the value of 1. Therefore, the mode of the distribution is 1.
- The range of the distribution spans from 1 to 114, indicating that voters have engaged in a minimum of one proposal and a maximum of 114 proposals, all of which are unique proposals of basic type.

- The median value, situated at 5, represents the midpoint of the distribution, while the mean value, calculated at 18.28, indicates the average number of proposals voted for by voters.
- The distribution of voters exhibits a right-skewed pattern, characterized by a tail extending towards the higher end of the proposal count. This departure from normal distribution suggests a prevalence of voters engaging in a relatively low number of proposals, with fewer voters participating in a larger number of proposals.

Distribution of Proposals based on the range of total votes:



Source: [Graph Link]

Insights on Distribution of Proposals Based on Total Votes:
The graph illustrates the distribution of proposals categorized by the total number of votes received for each proposal. Here are further insights derived from the data:

1. **Most Common Vote Range:** The data reveals that the most prevalent range of total votes received by proposals is between 16,000 to 18,000 votes, with 49 proposals falling within this range. This suggests a clustering of proposals around a particular level of voter engagement.

2. **Central Tendency Measures:**

- The mean (average) number of votes across all proposals is approximately 26,013.63 votes.
- The median (middle value) of the total votes is 18,948.0 votes. This indicates that half of the proposals received fewer votes than this value, while the other half received more.

3. **Range of Total Votes:**
- The total number of votes received by proposals ranges from 14,000 to 54,000 votes. This wide range underscores the variability in voter engagement across different proposals within the ecosystem.

4. **Distribution Shape:**
- The distribution of proposals based on total votes appears to be right-skewed, with a larger number of proposals clustered towards the lower end of the vote range. This suggests that while a significant proportion of proposals receive a moderate number of votes, there are fewer proposals that attract exceptionally high levels of voter participation.

5. **Implications for Proposal Success:**
- Proposals with a higher number of votes are likely to have garnered greater attention and support from the community. This indicates that proposals within the higher vote ranges may have a higher likelihood of success in the governance decision-making process.

Identification of Voters Participating in All Proposals:

Out of a total of 143 unique proposals, 177 voters were identified to have participated in all 143 proposals.

Evaluating Influence on Proposal Outcomes: Voters Participating in All Proposals

To assess the influence of these voters, we randomly selected 2 proposals and examined their impact:

Voting Influence on 'UniDex STIP Proposal - Round 1':
- Total Voting Power of "UniDex STIP Proposal - Round 1": 122,522,924.73
- Total Voting Power of the 177 voters for "UniDex STIP Proposal - Round 1": 613,103.90
- Percentage of Influence of 177 voters: 0.50%

Voting Influence on 'Good Entry STIP Proposal - Round 1':
- Total Voting Power for "Good Entry STIP Proposal - Round 1": 186,620,015.72
- Total Voting Power of the 177 voters for "Good Entry STIP Proposal - Round 1": 613,103.90
- Percentage of Influence of 177 voters: 0.33%

Key Insights and Analysis:

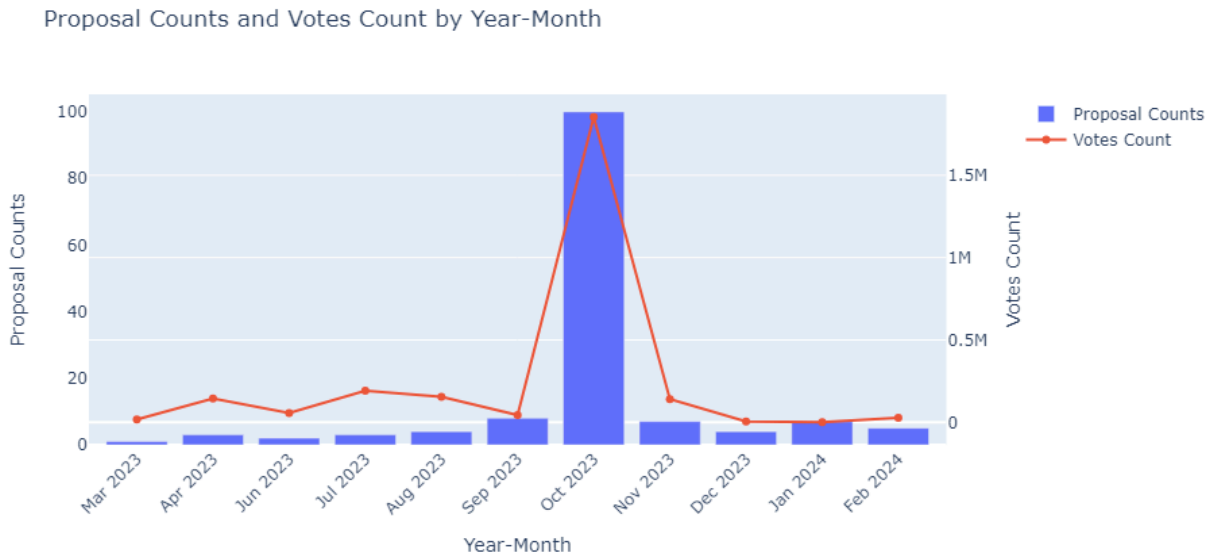
1. **Comprehensive Voter Participation:** The identification of 177 voters who participated in all 143 proposals indicates a dedicated and highly engaged subset of the voting community. Their consistent involvement across a wide range of proposals suggests a strong commitment to the governance process within the ecosystem.

2. **Limited Influence on Proposal Outcomes:** Despite their widespread participation, the influence of these 177 voters on individual proposal outcomes appears to be relatively modest. The percentage of voting power wielded by these voters in the randomly selected proposals ranged from 0.33% to 0.50%, indicating that their collective impact may be limited in shaping the final decision-making process.

3. **Implications for Decision Making:** While the comprehensive participation of these voters demonstrates their commitment to the governance process, the relatively low percentage of influence suggests that decision-making within the ecosystem is distributed among a broader base of participants. This decentralized approach to governance helps ensure that proposals are evaluated and decided upon based on the collective input of the entire community rather than the influence of a select few.

4. **Community Engagement and Participation:** The presence of such a dedicated group of voters participating in all proposals underscores the importance of fostering a culture of community engagement and participation within the ecosystem. By encouraging widespread involvement and providing avenues for meaningful participation, DAOs can ensure that decision-making processes reflect the diverse perspectives and interests of the entire community.

Correlation Analysis: Proposal Quantity and Vote Count Over Time (Months):



Source: [Graph Link]

Insights:

1. **Peak in Proposal Activity:** The graph reveals a notable spike in proposal submissions during October 2023, with a total of 100 out of 143 proposals being posted during this month. This suggests heightened activity or significant events within the ecosystem during that time period.

2. **Corresponding Increase in Votes:** Coinciding with the surge in proposal submissions, the month of October 2023 also witnessed the highest number of votes received. This indicates a correlation between the quantity of proposals and the level of voter engagement, as evidenced by the increased voting activity during this period.

3. **Temporal Scope of Data:** The analysis covers the time duration from March 2023 to February 2024, providing a comprehensive overview of voting patterns and proposal activity over a span of several months.

4. **Strong Positive Correlation:** The graph illustrates a consistently positive correlation between the number of proposals and the number of votes across each month. This suggests that as the quantity of proposals increases, so does the level of voter engagement, highlighting the interdependence between proposal submissions and community participation in the voting process.

Analysis of Unique Voters Across Proposal Types

The below given are the counts of unique voters across different types, but this count includes the voters who have also voted in other types of proposals.

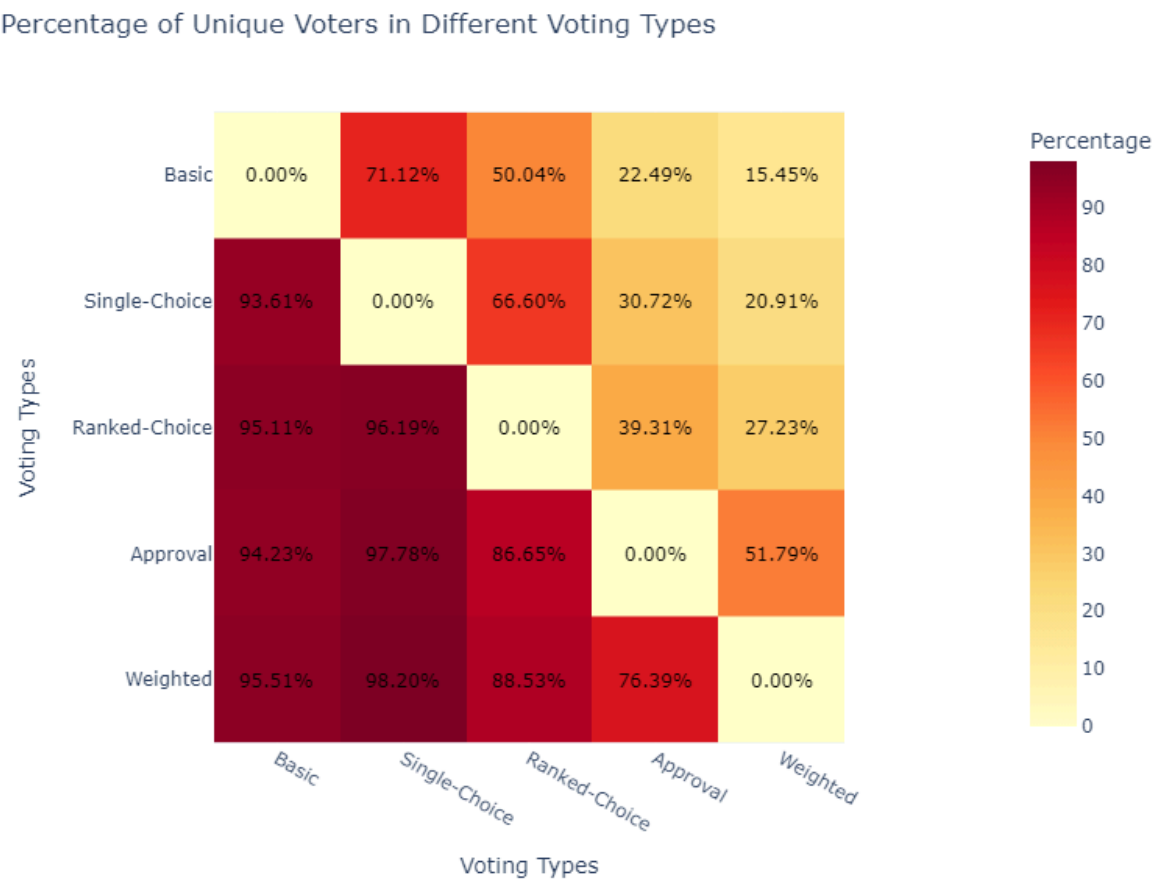
- Number of voters in Basic Type : 144266
- Number of voters in Single Choice Type : 109614
- Number of voters in Ranked Choice Type : 75893
- Number of voters in Approval Type : 34431
- Number of voters in Weighted Type : 23345

Upon analyzing the voters across different proposal types, the following counts of unique voters were found::

- Number of Unique Voters in Basic Type : 39470
- Number of Unique Voters in Single Choice Type : 31723
- Number of Unique Voters in Ranked Choice Type : 2739
- Number of Unique Voters in Approval Type : 734
- Number of Unique Voters in Weighted Type : 420

These figures represent the number of voters who have exclusively participated in the respective type of proposals, excluding those who have also voted in other types of proposals..

Analysis of Voter Overlap Across Different Proposal Types



Source: [Graph Link]

The heatmap above illustrates the percentage of overlap of voters across various proposal types. The density of color represents the extent of overlap, with darker shades indicating higher overlap and lighter shades indicating lower overlap.

Key Insights on Voter Overlap Across Different Proposal Types:

1. **High Overlap between Single Choice and Weighted Types:** The heatmap reveals a substantial overlap of voters between the single choice and weighted types, with 98.20% of voters from the weighted type also participating in single choice type proposals. This indicates a strong correlation or similarity in the voter demographics or preferences between these two types of proposals.

2. **Significant Overlap between Basic and Single Choice Types:** Another noteworthy observation is the considerable overlap between the basic and single choice types, suggesting that a large portion of voters who participate in basic type proposals also

engage with single choice type proposals. This could imply that these types of proposals attract similar voter bases or address related issues.

3. **Limited Overlap between Basic and Weighted Types:** In contrast, there is minimal overlap between the basic and weighted types, with only 15.45% of voters from the total voters of the basic type participating in weighted type proposals. This indicates distinct voter preferences or engagement patterns between these two types of proposals, potentially driven by differences in voting mechanisms or proposal content.

4. **Insights into Voter Behavior:** The analysis provides valuable insights into voter behavior and engagement across different types of proposals within the ecosystem. Understanding the extent of overlap between voter groups can inform strategic decision-making processes, such as targeting voter outreach efforts or tailoring proposal content to specific audience segments.

5. **Implications for Proposal Design and Governance:** By identifying patterns of voter overlap, DAOs and governance platforms can refine their proposal design and voting mechanisms to better align with the preferences and behaviors of the voting community. This can contribute to more inclusive and effective decision-making processes within the ecosystem.

Overall Conclusion:

The fundamental analysis conducted on the votes data of Arbitrum DAO proposals on Snapshot provides valuable insights into the voting patterns, behaviors, and engagement levels within the ecosystem. By examining various aspects such as proposal types, voter distribution, voting dynamics, and temporal trends, the analysis offers a comprehensive understanding of the governance processes and community dynamics within Arbitrum DAO.

Key Findings:

1. **Proposal Diversity:** The analysis reveals a diverse range of proposal types, with the Basic type dominating the landscape followed by Single-choice and Ranked-choice types. Although less common, Approval and Weighted types add unique dimensions to the proposal ecosystem.

2. **Voter Engagement:** The community demonstrates robust engagement, with a total of 152,977 unique voters participating across different proposal types. However, it's essential to consider potential overlaps in voter participation across multiple proposals to accurately gauge engagement levels.

3. **Voting Dynamics:** The distribution of votes across proposal types highlights distinct preferences and behaviors among voters. Basic type proposals receive the majority of votes, followed by Single-choice and Ranked-choice types, indicating varying levels of community interest and support.

4. **Influence of Voter Overlap:** Analysis of voter overlap across different proposal types reveals significant correlations and distinctions in voter behavior. Understanding these patterns can inform strategic decision-making and proposal design efforts to enhance community engagement and participation.

5. **Temporal Trends:** Temporal analysis indicates a correlation between the quantity of proposals and the level of voter engagement, with peak activity observed during certain months. This underscores the dynamic nature of governance processes and the importance of timing in proposal submissions.

Overall, the findings underscore the importance of community engagement, inclusivity, and transparency in DAO governance. By leveraging insights from this analysis, stakeholders and decision-makers can refine governance mechanisms, improve voter outreach strategies, and foster a more vibrant and participatory ecosystem within Arbitrum DAO.

Resources:-

Snapshot API Docs (For getting snapshot votes data): https://docs.snapshot.org/tools/api
Pandas (Python Library for Data Manipulation): https://pandas.pydata.org/docs/
Plotly (Python Library for Interactive Visualization): https://plotly.com/python/
Lighthouse (For Hosting Visualization Files): https://docs.lighthouse.storage/lighthouse-1
IPFS Pinata (For Hosting Dataset): https://black-decisive-cobra-689.mypinata.cloud/ipfs/
Github: https://github.com/Euphoria702/Voting-Pattern-Based-on-Types

Dataset:-

Link: Dataset Used