Report

# Introduction

The Nature Conservation Foundation (NCF), advances science-based and community-driven conservation across India. In collaboration with Bird Count India (BCI), it promotes citizen science through eBird, a global platform for documenting and sharing bird observations.

BCI conducts regular eBird challenges that set structured goals for birdwatchers, motivating participation while improving the quality and volume of bird monitoring data for research and conservation.

As part of this internship with NCF, the focus was to analyze participant engagement in eBird challenges, with the objective of understanding patterns of participation, factors influencing engagement, and overall contribution to long-term bird monitoring. This analysis provides insights into how citizen science initiatives can be strengthened to maximize participation, inclusivity, and scientific value.

# Methodology

This internship was conducted under the Data Analysis and Visualization domain, with the primary objective of examining participant engagement in the eBirding Challenge. The work spanned two months (June - August) and focused on analyzing and visualizing participation patterns across challenges, with engagement studied through weekly and monthly trend analysis and results presented using visual dashboards and analytical summaries for clarity and interpretability.

## Data Source

The data was obtained from **NCF’s birding challenge pages** ([<https://birdcount.in/tag/ebird-monthly-challenge/>](https://birdcount.in/tag/ebird-monthly-challenge/)), which host records of challenge announcements and participant results.

## Data Collection and Processing

* **Web Scraping:** Data was extracted using **Python (BeautifulSoup)** to automate retrieval of challenge details and results.
* **Data Cleaning & Structuring:** Extracted data was cleaned, standardized, and organized into required columns and categories with the assistance of **Ollama3 (local LLM)**, enabling faster structuring and organization.
* **Challenge Categorization:** Each challenge was classified into categories such as:
  + **List-based** (e.g., number of checklists submitted)
  + **Habitat-based** (e.g., wetlands, grasslands)
  + **Location-based** (e.g., rooftop, 100m radius, hotspots)
  + **Species-based** (e.g., cuckoos, brood parasites)
  + **Media-based** (e.g., photos, audio, video uploads)

## Tools and Techniques

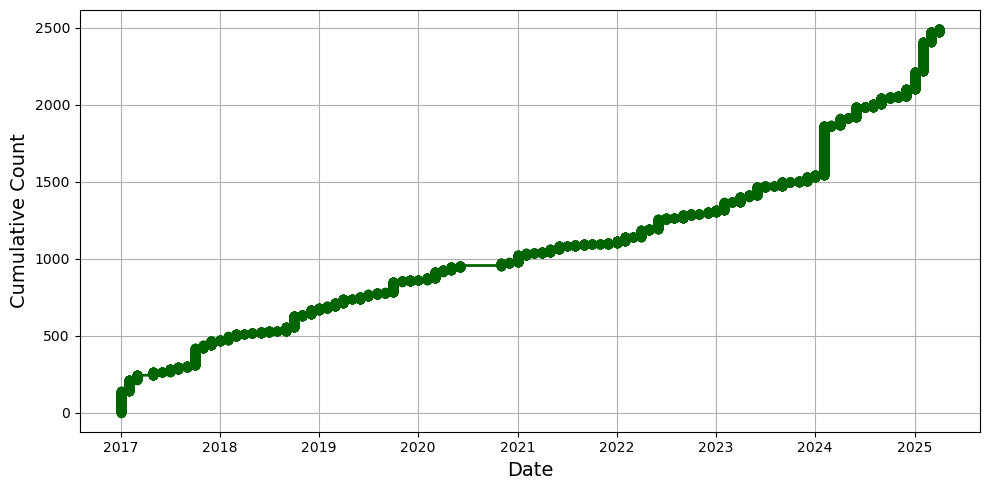
The analysis was carried out using:

* **Python (Pandas, Matplotlib, Seaborn, BeautifulSoup)** for data extraction, cleaning, and visualization.
* **Excel** for supplementary analysis and tabular summaries.
* **Ollama3 (local LLM)** for text-based data segregation and category mapping.

The methodology ensured that participant engagement was systematically analyzed, categorized, and visualized to provide insights into patterns of citizen science participation in eBird challenges.

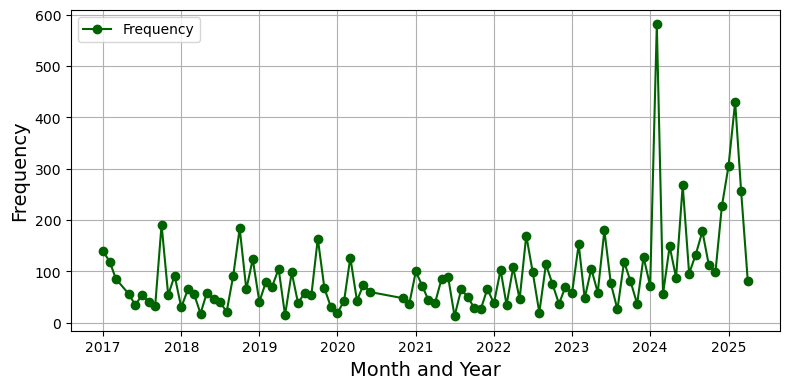
# Results and Discussions

## Cumulative New People Joining Over Time

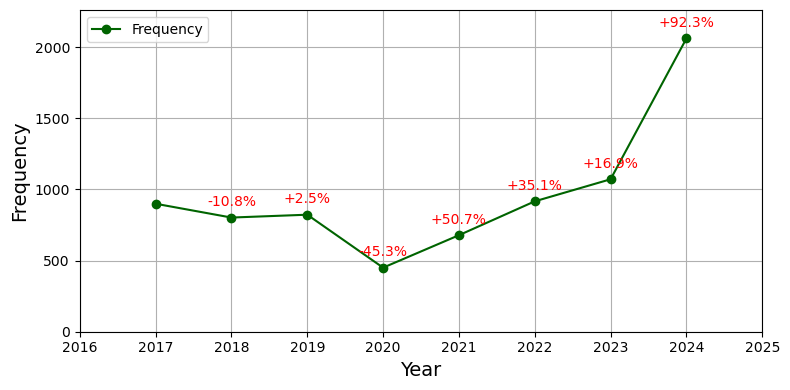


The cumulative count shows a consistent upward trajectory from 2017 to 2025, indicating steady participation growth over time. Notable inflection points, characterized by sharp increases (e.g., 2018, 2024, and early 2025), suggest periods of intensified engagement, possibly corresponding to specific campaigns, challenges, or outreach events. Between these bursts, the growth remains gradual but stable, reflecting sustained baseline participation. Overall, the data highlights a strong long-term trend of increasing engagement with distinct surges linked to targeted interventions.

## Participant Trends: Monthly

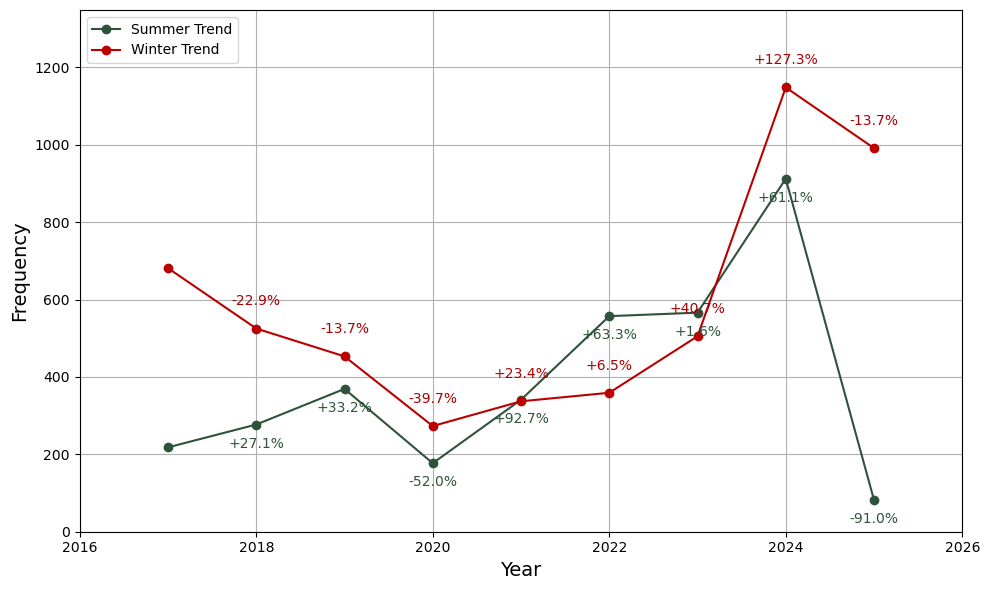
The line chart presents the monthly frequency of eBirding Challenge participations from 2017 to 2025. Frequencies were calculated as the total number of challenge completions per month, aggregated across all participants. The trend reveals fluctuations throughout the timeline, with relatively modest participation levels between 2017 and 2022, typically ranging between 20 and 150 entries per month. From 2023 onwards, a gradual upward trajectory is evident, culminating in a dramatic spike in early 2024, where participation peaked at nearly 600 entries in a single month—the highest in the dataset. Subsequent months in 2024 and 2025 also maintained higher engagement levels, with multiple months surpassing 200 entries. These results indicate a clear expansion in participation over time, particularly in recent years, suggesting both growth in the eBirding community and increasing success of engagement strategies implemented post-2023.

## Participant Trends: Yearly



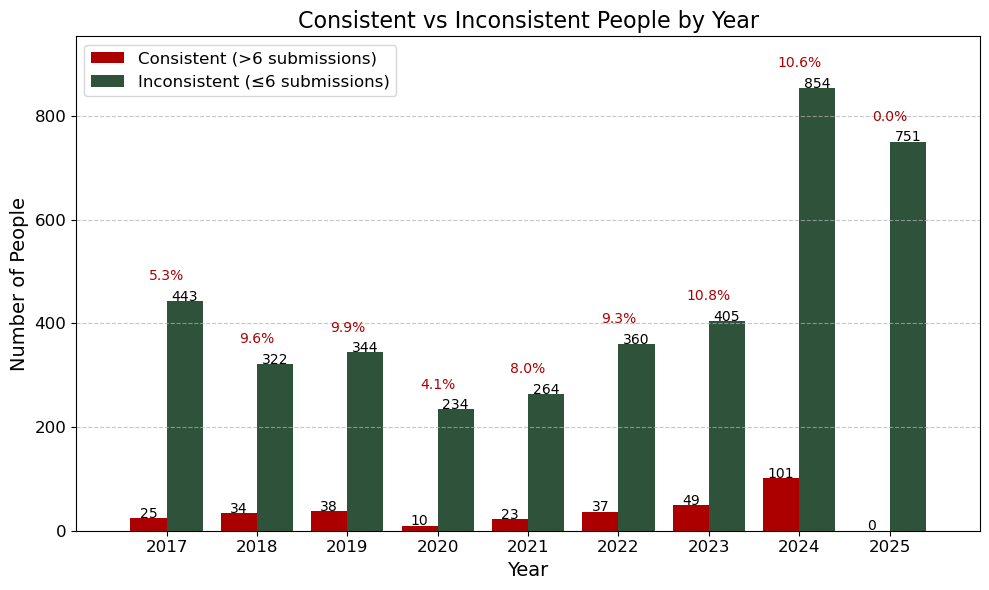
The yearly participation trend indicates fluctuations in engagement between 2017 and 2025. After a decline from 2017 (≈900) to a low in 2020 (≈450), participation steadily recovered, with significant growth observed from 2021 onward. The peak occurred in 2024, reaching over 2000, representing more than a fourfold increase compared to 2020 levels. While 2025 currently shows a decline relative to 2024 (≈1050 as of June), the figure already surpasses most pre-2023 values, suggesting that year-end totals may align with or exceed previous highs. These patterns suggest that engagement responds strongly to targeted initiatives, with 2024 standing out as a year of exceptional growth.

## Participant Trends: Seasonal (Summer v/s Winter)



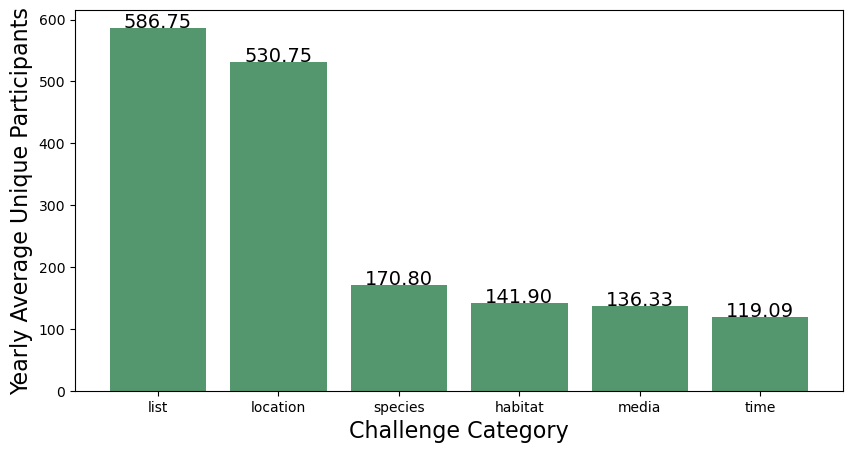
The line chart compares annual participation trends in eBirding Challenges across summer (April–September) and winter (October–March) seasons from 2017 to 2025. Frequencies were computed as the total number of participations per season, and percentage changes were calculated year-on-year to highlight relative growth or decline. The results show contrasting seasonal dynamics: winter participation initially declined between 2017 and 2020 (−22.9% in 2018 and −39.7% in 2020) before recovering steadily, with sharp growth in 2023 (+40.1%) and a dramatic peak in 2024 (+127.3%), reaching the highest winter participation level across the study period. Summer participation, while lower in absolute magnitude, exhibited stronger relative fluctuations, with significant growth in 2021 (+92.7%) and 2024 (+81.1%), but a sharp decline in 2025 (−91.0%). Overall, winter demonstrates a more consistent and dominant trend, while summer shows sporadic spikes followed by steep declines, reflecting seasonal variability in birdwatching opportunities and participant engagement.

## Participation consistency



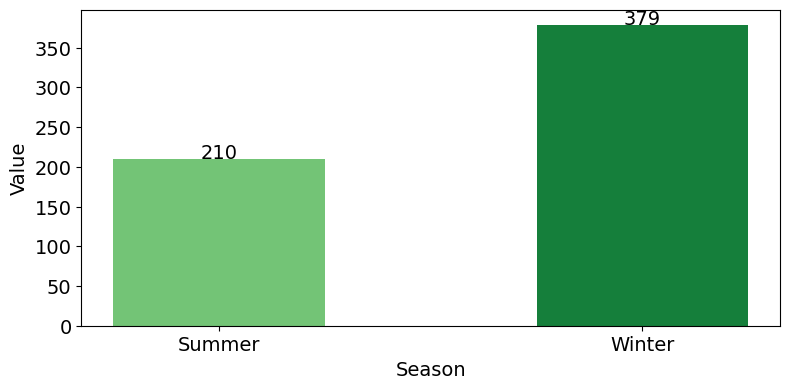
The analysis of participant consistency across years shows that while the total number of challenge participants has steadily grown, the proportion of consistent contributors (≥5 challenges per year) has remained low. Consistency ranged between 4–11% of participants, peaking in 2024 with 101 consistent birders (10.6%). Most participants submitted fewer than six challenges annually, highlighting high initial engagement but limited long-term retention. The dip in 2020 aligns with reduced overall participation, likely due to external disruptions.

## Yearly average category-wise unique participation

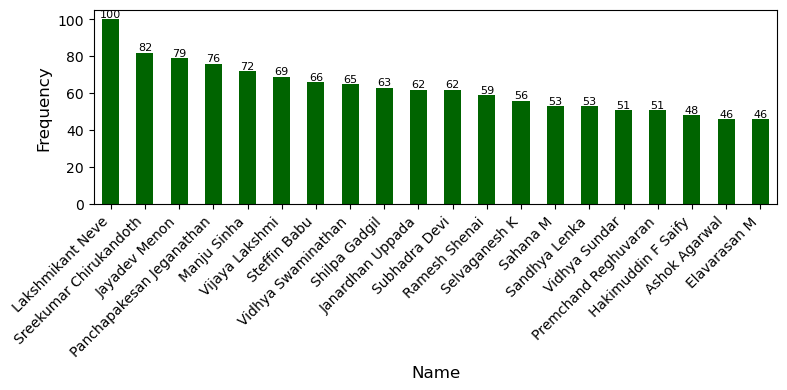


The bar chart illustrates the yearly average number of unique participants across different categories of eBirding Challenges. The analysis was conducted by grouping challenge data by category and calculating the average count of distinct participants per year from the available dataset. Results show that list-based challenges attracted the highest engagement, averaging 586.75 participants annually, followed closely by location-based challenges with 530.75 participants. In contrast, species-based (170.80), habitat-based (141.90), media-based (136.33), and time-based (119.09) challenges drew comparatively lower levels of participation. The disparity highlights a clear preference for simpler, list- and location-oriented formats, which likely offer greater accessibility and ease of participation, whereas more specialized challenges (e.g., species- or media-focused) see reduced but still meaningful involvement. This analysis provides insight into participant behavior and helps in evaluating which challenge formats drive broader engagement within the citizen science community.

## Yearly average seasonal unique participation



The bar chart illustrates the average number of unique participants in eBirding Challenges across summer and winter seasons, calculated for data from 2017 onwards. Seasonal categorization was defined as April–September for summer and October–March for winter. Participation levels were derived by counting the number of distinct individuals contributing during each season, followed by averaging values across years. Results show a significant seasonal disparity: an average of 210 unique participants in summer compared to 379 in winter. This indicates that winter months consistently attract a larger and more diverse participant base, possibly due to favorable birding conditions, migratory bird influx, or increased opportunities for observation. The methodological framework combining temporal filtering, unique participant counts, and seasonal averaging ensures robust insights into seasonal engagement dynamics.



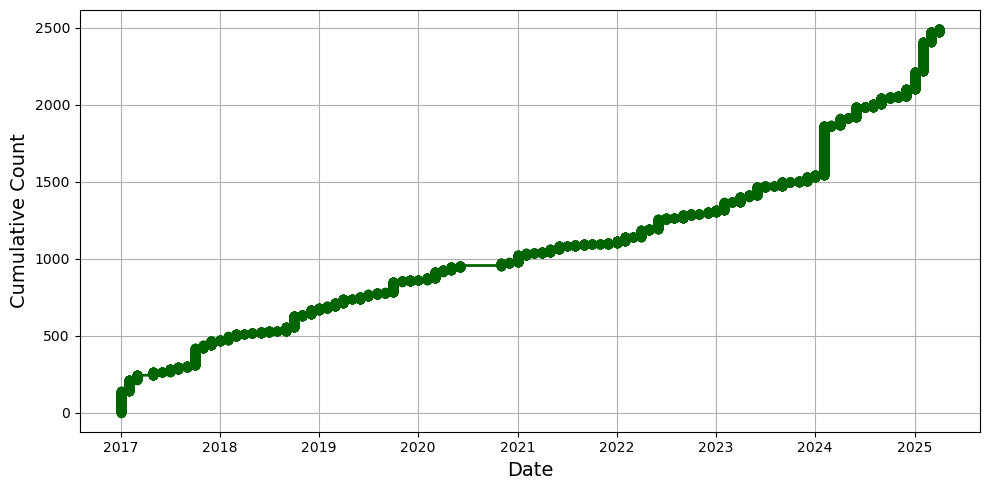
The above bar chart depicts the top 20 participants in terms of engagement frequency in eBirding Challenges. The data was derived from cleaned and structured participation records, and frequencies were computed as the number of challenges successfully completed by each participant during the study period. Lakshmikant Neve recorded the highest engagement, completing 100 challenges, followed by Sreekumar Chirukandoth (82) and Jayadev Menon (79). The distribution demonstrates a gradual decline in participation frequency across the ranked participants, with the lower end (Ashok Agarwal and Elavarasan M) completing 46 challenges each. This visualization highlights the presence of a highly active core group of birders contributing consistently, with engagement levels tapering among others. Such analysis aids in identifying key contributors and understanding patterns of sustained participation within the citizen science community.

# Conclusion

This internship provided valuable insights into patterns of engagement in the eBirding Challenges conducted by NCF and Bird Count India. The analysis highlights a steady long-term growth in participation since 2017, punctuated by notable surges in specific years such as 2018, 2023, and 2024—likely influenced by targeted outreach and well-designed challenge formats. Seasonal analysis revealed that winter consistently attracts more participants than summer, reflecting both ecological opportunities and participant preferences.

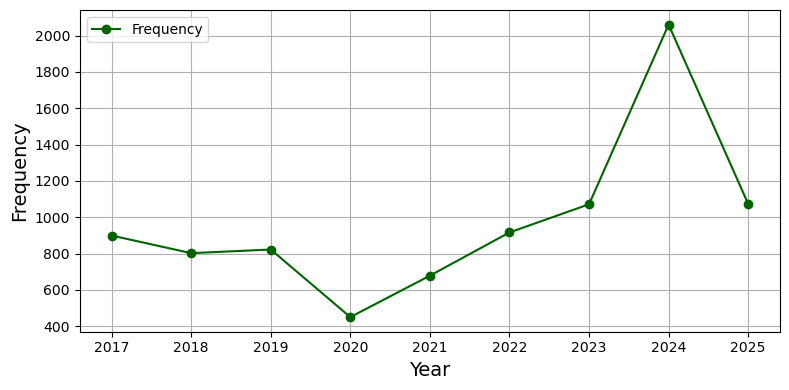
Despite the rise in overall numbers, the study found that consistency in participation remains low, with only a small fraction of birders contributing regularly across multiple challenges each year. Category-wise analysis further showed that list-based and location-based challenges draw the highest engagement, suggesting that accessible and straightforward formats resonate most strongly with participants. In contrast, more specialized categories such as habitat-, species-, media-, and time-based challenges attract fewer but still meaningful contributions, indicating potential niches for focused engagement.

Overall, the findings emphasize the importance of balancing accessibility with diversity in challenge design. By maintaining simple formats to encourage broad participation while periodically introducing targeted themes to deepen scientific value, NCF and BCI can sustain growth while enhancing inclusivity and retention. Strengthening long-term engagement—through strategies such as recognition of consistent participants, fostering community interaction, and designing seasonally adaptive challenges—can further maximize the impact of citizen science in advancing bird monitoring and conservation in India.



General Summary (Easy-to-Read Insights)

Participation in the birding challenges has been growing steadily since 2017. While there is regular, gradual growth most of the time, there are also some periods where participation jumps quickly—likely when special events or campaigns were run. Overall, the trend is positive, showing more and more people getting involved over the years, with especially strong growth in 2024 and 2025.



General Summary (Easy-to-Read Insights)

Birding participation has gone up and down over the years. It dropped to its lowest in 2020, then steadily increased, with a huge spike in 2024, the most active year yet. So far in 2025 (with only half the year completed), participation is already higher than most years before 2023, showing that the trend is still positive even if it hasn’t yet matched last year’s record levels.