PROJECT-IV REPORT

on

BibNet-Bibliometric Analysis Website

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under mentorship of

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CANDIDATE'S DECLARATION

I hereby certify that the work on the project entitled, " BibNet- Bibliometric Analysis Website", in partial fulfillment of requirements for the award of Degree of Bachelor's of Technology in School of Engineering and Technology at BML Munjal University, is an authentic record of my own work carried out during a period from July 2024 to December 2024 under the supervision of our mentors Dr. Kiran Sharma and Dr. Ziya Uddin.

SUPERVISOR NAME.
(Dr. Kiran Sharma)
(Dr. Ziya Uddin)

SUPERVISOR'S DECLARATION

This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

Faculty Supervisor Name:
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(Dr. Kiran Sharma) (Dr. Ziya Uddin)

ACKNOWLEDGEMENT

We extend our heartfelt gratitude to our mentors, Dr. Kiran Sharma and Dr. Ziya Uddin, for their invaluable guidance and unwavering support throughout this project. Their expertise, insightful feedback, and encouragement have been instrumental in shaping our work and helping us overcome challenges. We also express our sincere thanks to Dr. Maneek Kumar, Dean of the School of Engineering and Technology, for providing us with the resources and opportunities to undertake this project. Their support and leadership have been a source of inspiration and motivation for us.

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1. ABSTRACT

This project integrates bibliometric analysis with modern web development frameworks to deliver a dynamic, user-friendly platform for exploring academic research trends and impacts. Utilizing React for a responsive front-end, Django for a robust back-end, and MongoDB for efficient handling of large datasets, the system enables interactive analysis of user-uploaded bibliometric data. By combining these technologies, the website offers a seamless and scalable solution for visualizing research metrics, empowering users with actionable insights into academic literature.

2. INTRODUCTION

Our project explores the integration of bibliometric analysis with modern web development frameworks, focusing on React, Django, and MongoDB. Bibliometric analysis quantitatively assesses academic literature, providing valuable insights into research trends and impacts. React, a JavaScript library, offers a dynamic front-end experience, while Django, a Python web framework, ensures a secure and scalable back end. MongoDB, a NoSQL database, is ideal for managing large datasets. This website provides interactive & dynamic analysis for user uploaded bibliometric data.

3. LITERATURE REVIEW

The review examines twenty-one key research papers, highlighting methodologies, benefits, and challenges of using these technologies. By synthesizing these findings, the review aims to guide the development of a bibliometric website that enhances user experience and data analysis capabilities.

A comprehensive literature survey reveals significant advancements in bibliometric analysis across various research fields, facilitated by powerful visualization tools. For instance, *Sohn et al. (2018)* conducted a study presented at the *IEEE/ACM International Conference*, which focused on technology trends using bibliometric networks and visualization techniques, employing tools such as *VOSviewer* and *Gephi*.

In a more recent investigation by *Ozkan et al. (2022)*, a bibliometric analysis of Agile software development was performed, illustrating research patterns through Bibliometrix (R) and VOSviewer at the *International Informatics and Software Engineering Conference* . Additionally, *Bayram et al. (2020)* provided a tertiary analysis of Agile and Lean software development research using VOSviewer and Sci2 Tool, underscoring the growth of methodologies in this area.

Moreover, *Pang et al. (2020)* proposed a framework for evaluating social media marketing through bibliometric analysis, utilizing BibExcel and Gephi to enhance the understanding of marketing tactics in contemporary studies. *Valiollahi et al.*

(2023) focused on artificial intelligence research trends, forecasting future directions using *VOSviewer* and *Sci2 Tool* at the *International Conference on Web Research*. Studies on information literacy and data science research have been notably enriched by tools like *Bibliometrix (R)* and *VOSviewer*, showing the versatility of these programs across disciplines.

Research on COVID-19 literature has also benefited, as demonstrated by *Sulai et al. (2021)*, who employed *Bibliometrix (R)* and *VOSviewer* for their analysis at the *IEEE Health Informatics Conference*, highlighting the pandemic's impact on scientific inquiry. Concurrently, *Jombo et al. (2023)* presented trends in cloud computing in agriculture, utilizing *VOSviewer* and *BibExcel*, illustrating the applicability of bibliometric methods within agricultural sciences.

Furthermore, studies examining AI in healthcare were reported by *Wang et al. (2021)*, showcasing *VOSviewer* and *Gephi* to underscore significant trends in health informatics.

The importance of modern bibliometric tools is further emphasized in studies focusing on emerging technologies, such as the analyses of IoT and mobile app development research by *Chen et al. (2021)* and *Zhou et al. (2023)* respectively, both leveraging *VOSviewer* and *Gephi* to visualize significant findings.

These diverse applications reflect the versatility and capability of bibliometric analysis software, which include renowned tools like *CiteSpace*, developed by *Chen*

(2006) to identify emerging trends and analyze research focal points in scientific literature.

Cytoscape, designed for visualizing complex networks, originally created by *Shannon et al. (2003)*; *VOSviewer*, developed by van *Eck and Waltman (2010)* for creating and visualizing bibliometric maps; *Bibliometrix*, a comprehensive R-tool for bibliometric analysis introduced by *Aria and Cuccurullo (2017)* ; and *Publish or Perish*, created by *Harzing (2007)* to facilitate various citation metrics analysis. Collectively, these studies demonstrate the expansive reach and effectiveness of bibliometric visualization tools in fostering insights and guiding future research directions across various domains.

The integration of bibliometric tools like CiteSpace, Cytoscape, VOSviewer, Bibliometrix, and Publish or Perish has revolutionized research visualization and trend analysis. CiteSpace, pioneered by Chen (2006), identifies emerging scientific trends through co-citation analysis. Cytoscape, introduced by Shannon et al. (2003), specializes in network visualization for systems biology. VOSviewer, developed by van Eck and Waltman (2010), creates bibliometric maps for co-authorship or keyword studies. Bibliometrix, launched by Aria and Cuccurullo (2017), leverages R for extensive bibliometric insights, while Publish or Perish, designed by Harzing (2007), aids citation metrics extraction, fostering versatile applications across domains.

4. PROBLEM STATEMENT

With the exponential growth of academic research, it has become increasingly challenging for researchers, institutions, and policymakers to identify trends, measure impact, and evaluate contributions within the vast body of scientific literature. Existing bibliometric tools often lack interactivity, scalability, and user-friendly interfaces, making it difficult to analyze and visualize large datasets effectively. This project aims to address these challenges by developing a modern web-based platform that integrates bibliometric analysis with interactive visualizations, enabling users to upload, process, and explore bibliometric data seamlessly.

5. METHODOLOGY

Technologies Used

The project employs a full-stack development approach, integrating a range of technologies:

1. **Frontend:** The user interface is built using React.js, providing users with an intuitive platform for uploading CSV files and visualizing data through dynamic, interactive graphs.
2. **Backend:** Django is used to manage server-side logic. It handles the uploading and processing of data, as well as the communication between the frontend and the database.
3. **Database:** MongoDB, a NoSQL database, stores the parsed CSV data. Its flexibility in handling unstructured data makes it an ideal choice for managing the variety of information within the uploaded CSV files.

Data Flow

The following steps outline the flow of data within the system:

1. **File Upload:** Users upload a CSV file through the React-based frontend. The interface facilitates the uploading process, allowing users to input data from Scopus directly into the system.
2. **CSV Parsing and Validation:** Once the file is uploaded, it is passed to the Django backend, where it is parsed. The Django framework reads the file and

processes it, ensuring that data types are correctly assigned to each field (e.g., strings for text fields like author names, and integers for numerical fields like citation counts).

3. **Data Storage**: After parsing and validating the CSV data, the backend stores the records in MongoDB. MongoDB's document-based model allows each row of the CSV to be mapped to a document in a collection. This model provides the flexibility to store complex and potentially nested data structures typical of research articles.
4. **Data Processing:** Once the data is stored, it is made available for further analysis and visualization. The backend retrieves relevant subsets of the data from MongoDB using queries that filter, aggregate, or sort the records based on user-defined criteria, such as specific authors, years, or citation counts.
5. **Data Visualization:** The processed data is sent to the React frontend for visualization using libraries like Chart.js, rendering:
   - Bar Charts: Publications per year or top-cited authors.
   - Line Graphs: Trends in publication output or citations over time.
   - Pie Charts: Distribution of keywords or research topics.

6. WEBSITE OVERVIEW

6.1 UPLOADING DATA

Accessing BibNet

- Detailed steps to navigate to BibNet:
- Open your web browser.
- Enter the URL: http://localhost:3000/.

Uploading Data

1. Navigate to the "Home" tab to select your desired file for upload. Click "UPLOAD" to Upload file.

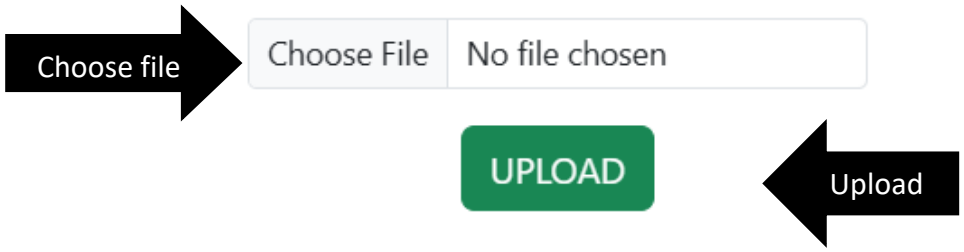


Fig-1 : Uploading data on BibNet

- File format should be csv.

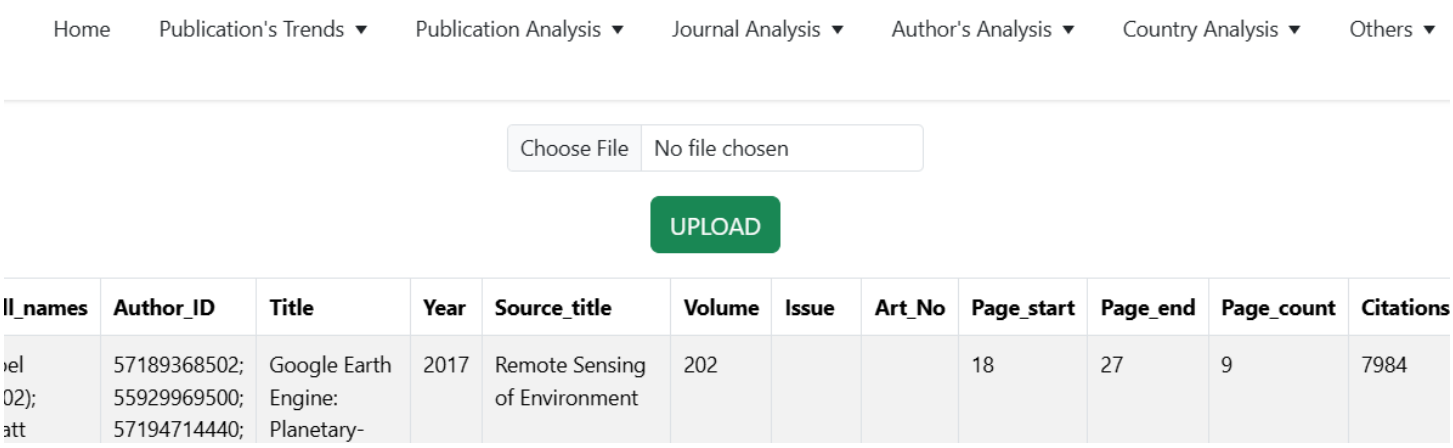


Fig 2 : Home tab

6.2 REVIEWING DATA

- **Navigating the Publication's Trends Tab:**

  - Overview
  - Year-wise publication trend
  - Decade-wise publication trend
  - Citation Analysis

Fig 3 : Overview page on Publication's Trend tab

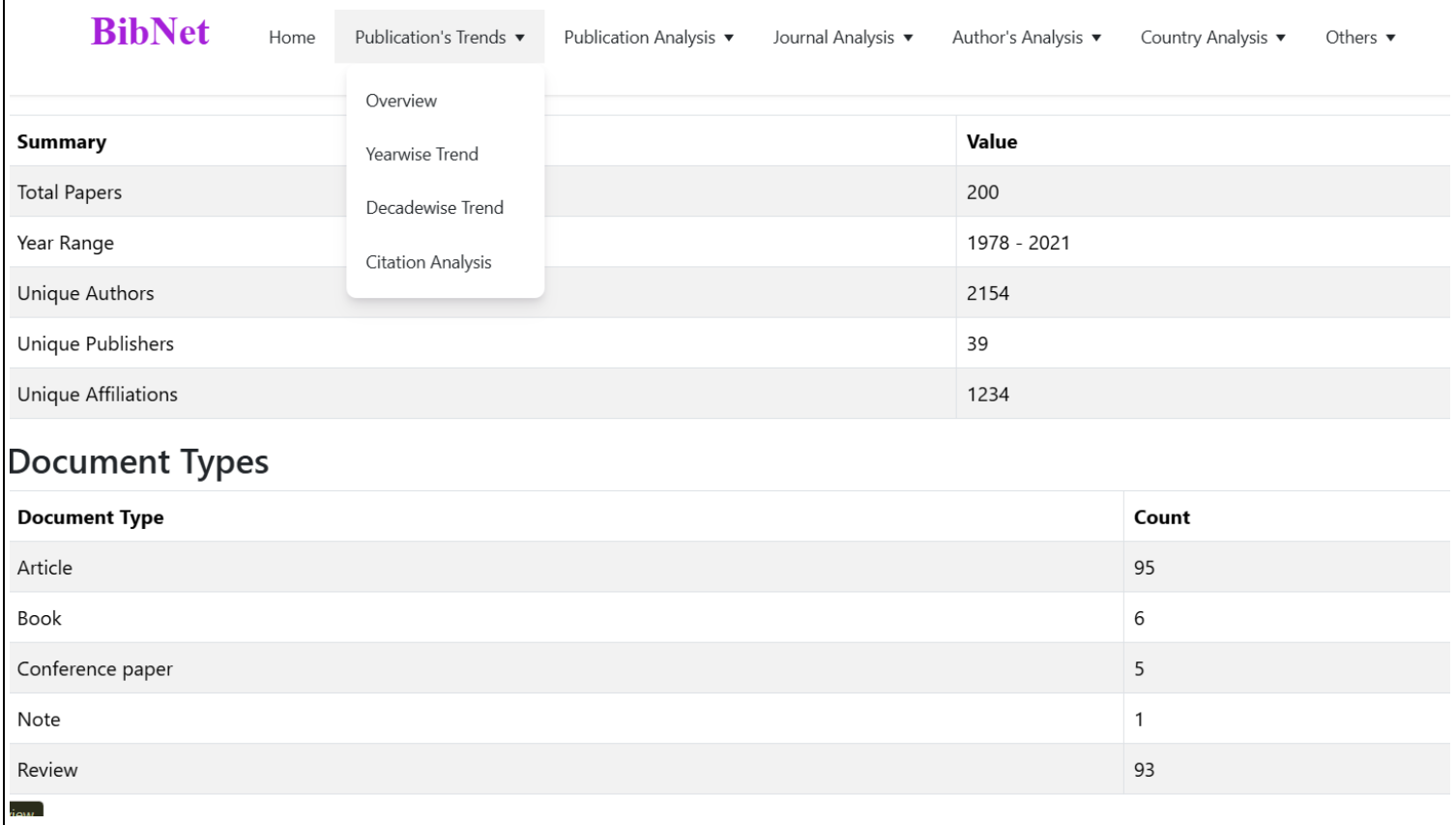


Fig-4: Summary- Overview page

Summary	Value
Total Papers	200
Year Range	1978 - 2021
Unique Authors	2154
Unique Publishers	39
Unique Affiliations	1234

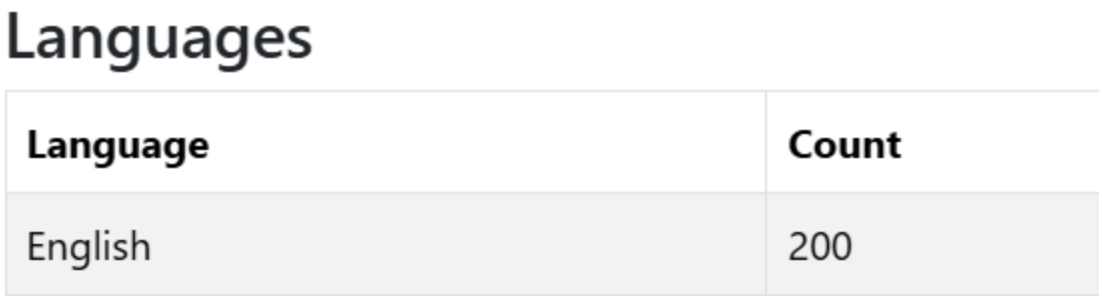
The Document Type section gives you overview of the types of documents listed in the uploaded, like article, book, etc.

Fig-5: Document Type - Overview page

Document Type	Count
Article	95
Book	6
Conference paper	5
Note	1
Review	93

The Language Type section gives you the language distribution & the count of the papers in that language of the uploaded literature.

Fig-6: Summary- Language page



Languages

Language	Count
English	200

6.3 YEARWISE TREND ANALYSIS:

This tab displays the average, median & cumulative year-wise trend of the publications across the data corpus.

Fig-7: Yearwise Trend page

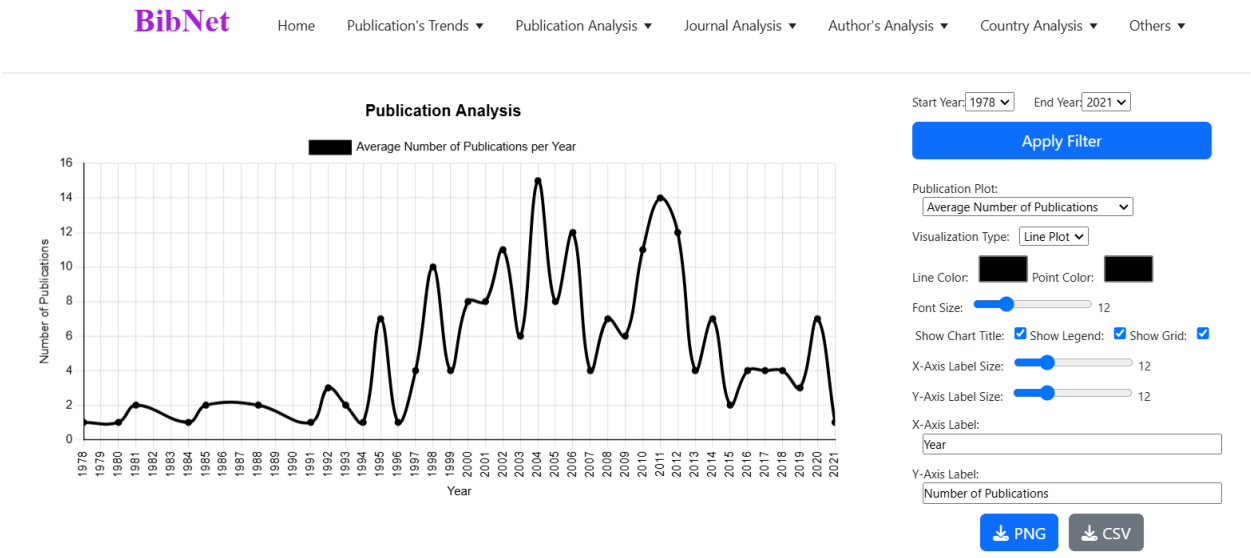
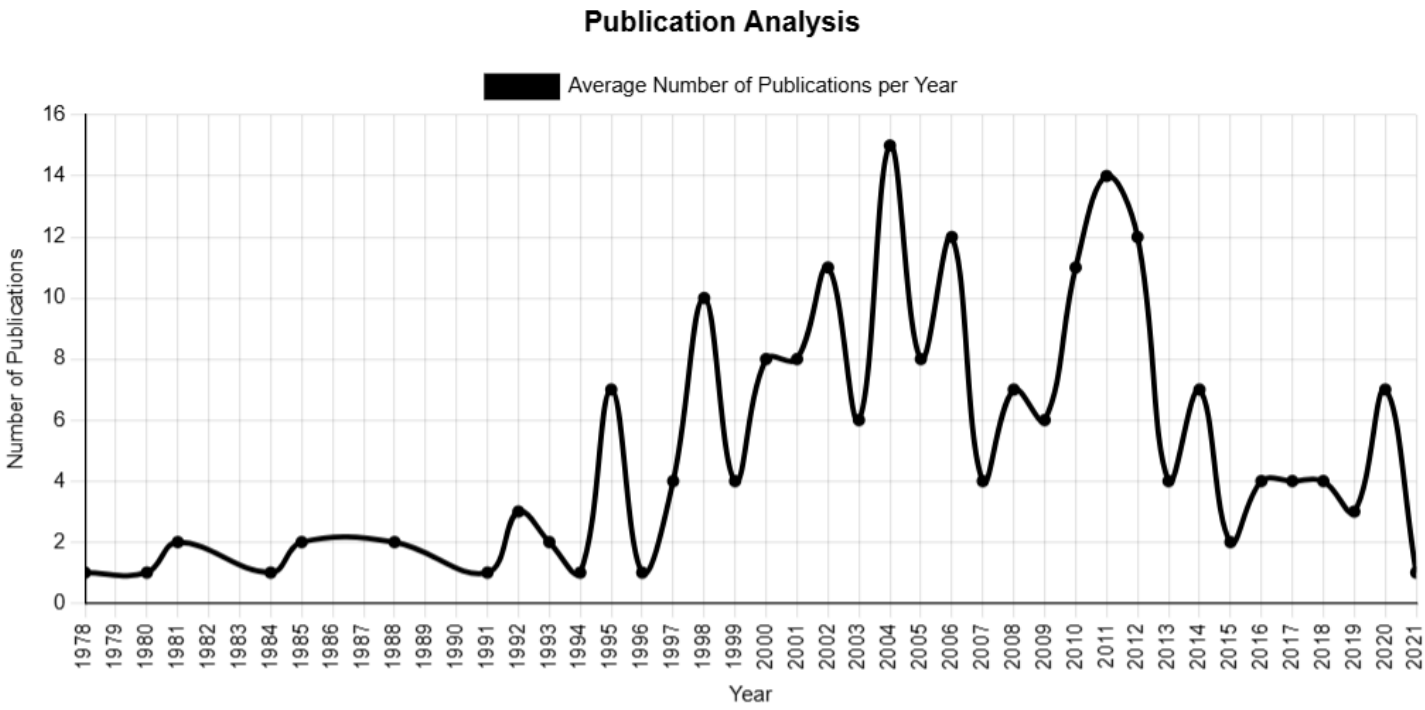


Fig-8: Chart Area- Yearwise Trend page

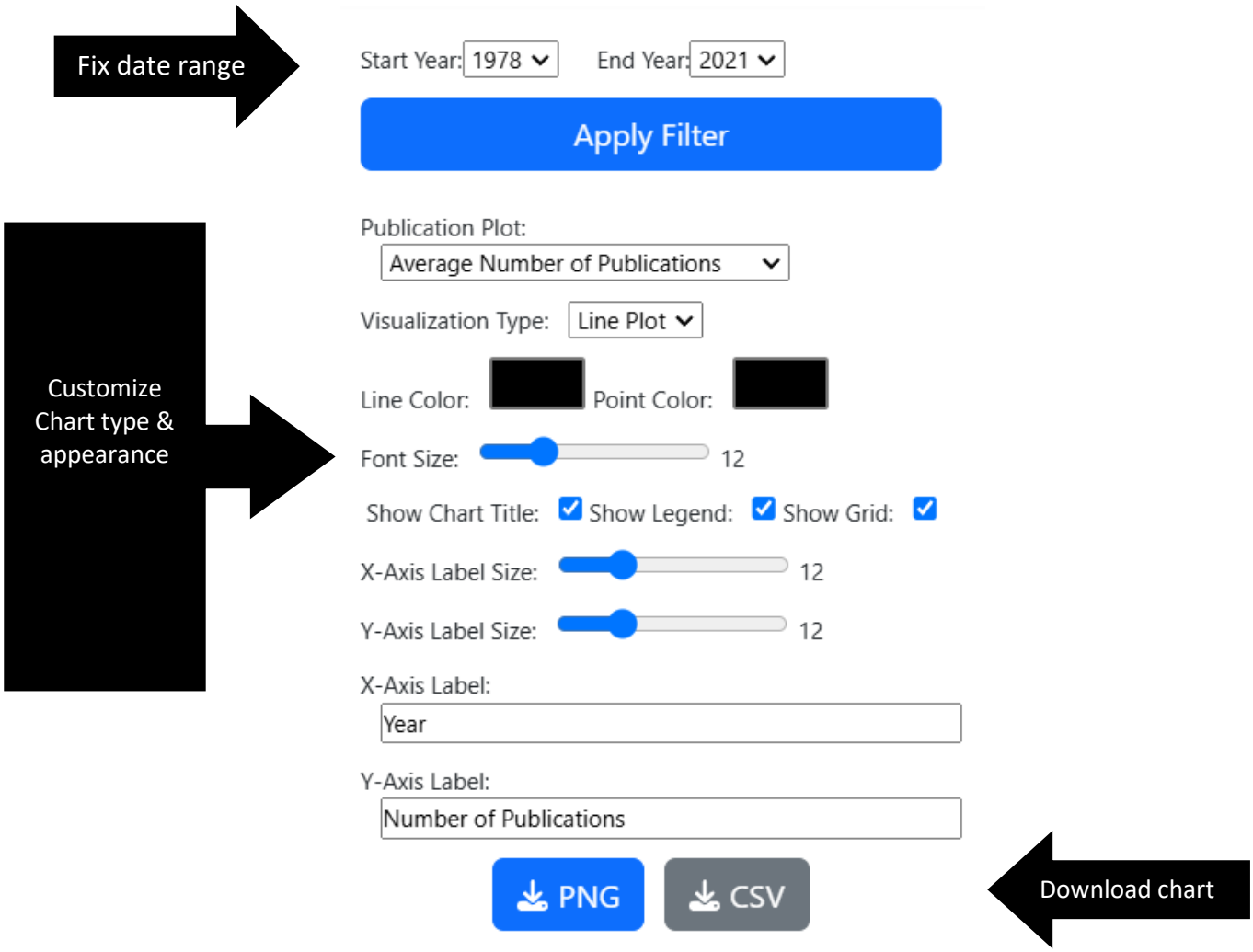


Select chart type [Average, Cumulative, Median].

Fig-9: chart options- Yearwise Trend page

Adjust chart orientation to horizontal/ vertical and choose from start and end year filters for analysis. Click on “Apply Filter” button to apply the changes and choose the number top publishers to display. User can change chart color and border color. Adjust font size & axis labels. Enable or disable grid, chart titles & legend visibility. Click " PNG / CSV" to save the chart as a PNG or CSV file respectively.

Fig-10: Toolbar- Yearwise Trend page



6.4 DECADEWISE TREND ANALYSIS

This tab displays the Decadewise Trend analysis which allows the user to choose from document specific decades to show the yearwise publications. User can do decadewise trend analysis which allows to choose from document specific decades to show the yearwise publications.

Fig-11: Decadewise Trend page

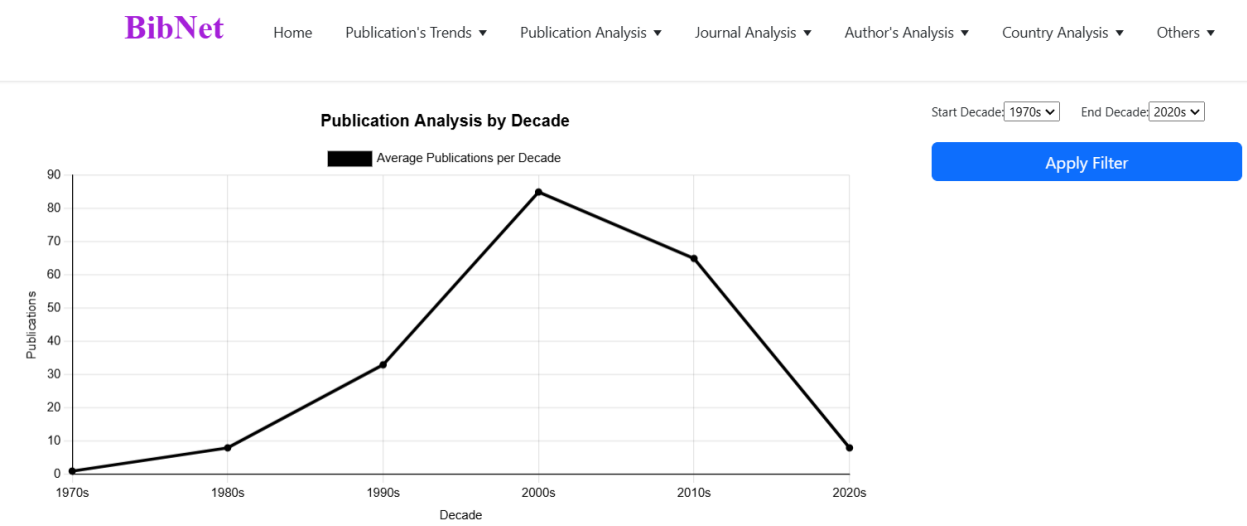
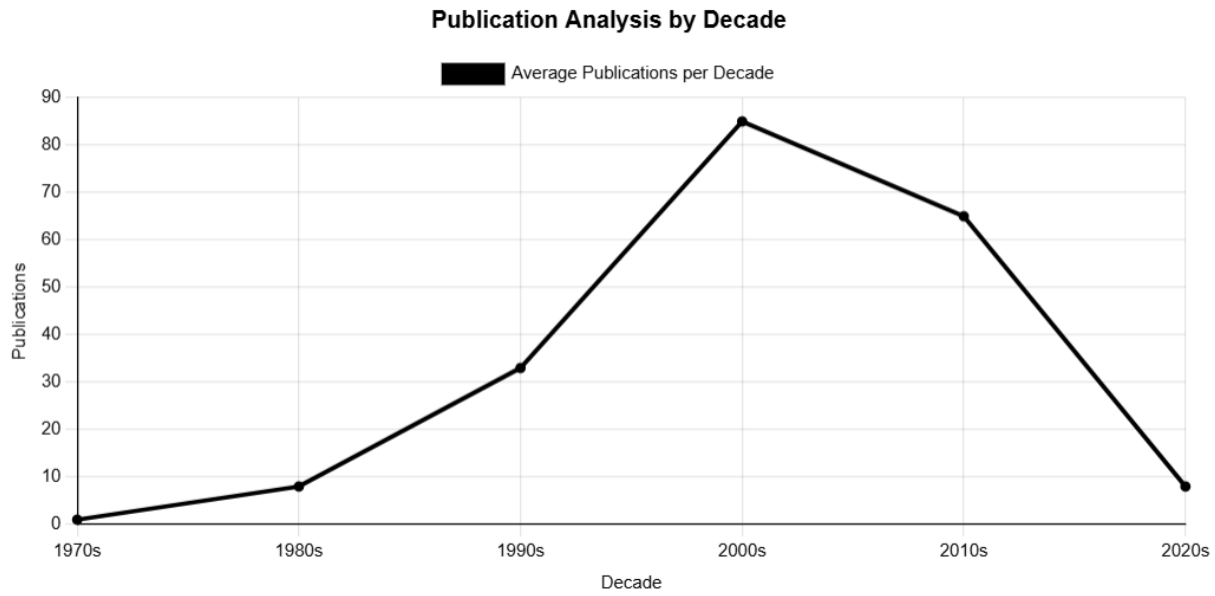


Fig-12 : Chart Area- Decadewise Trend page



Choose from start and end decade filters for analysis. Click on “Apply Filter” button to apply the changes. User can choose from start and end decade filters for analysis.

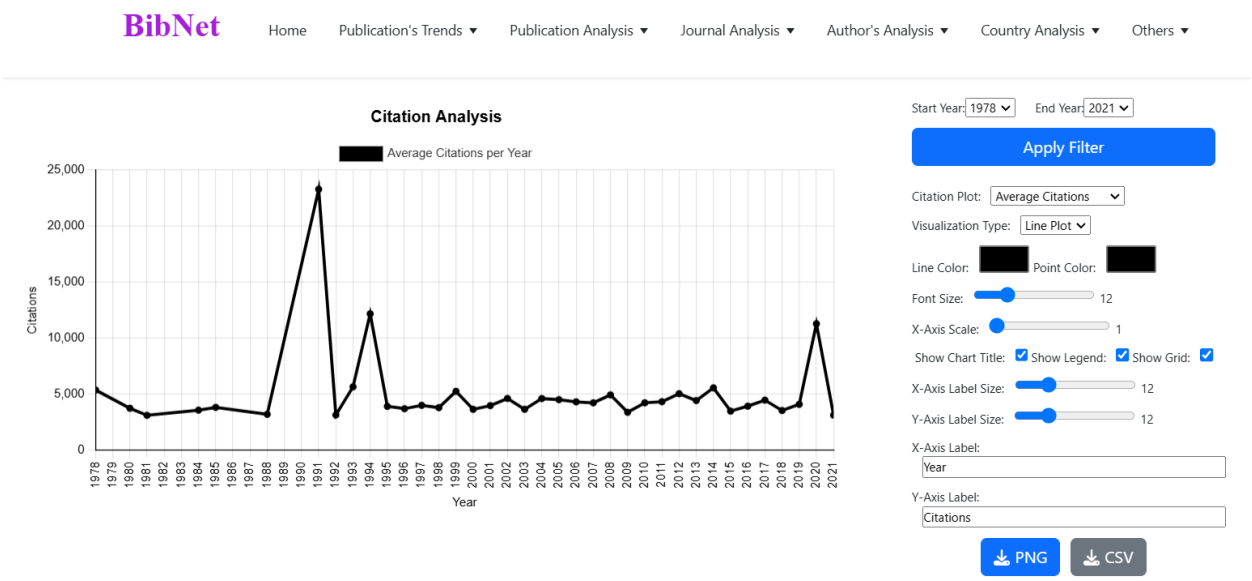
Fig-13 : Toolbar- Decadewise Trend page

The start and the end range of the decade will be customized from the year range of user uploaded document for streamlined selection.

6.5 CITATION ANALYSIS:

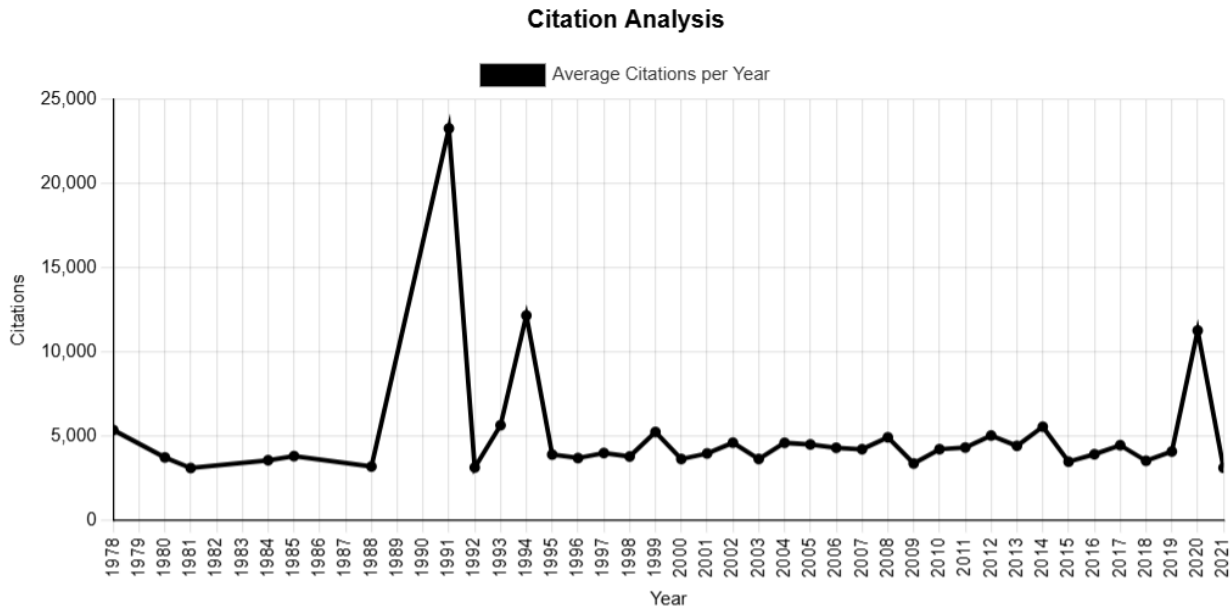
Navigate to the Citations Analysis page:

Fig-14 : Citation Analysis page



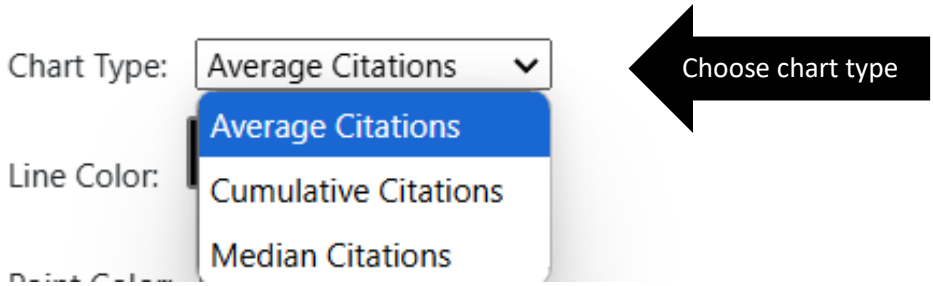
User can do citation analysis with a fully customizable chart which is downloadable. Users can perform citation analysis using a fully customizable chart that is downloadable. This allows for flexible, professional presentation and sharing of citation data.

Fig-15 : Chart Area- Citation Analysis page



Choose from options: average, cumulative, or median citations per year. You can select from either of the option to get your desired chart type which will be customizable as per your needs.

(Fig-5.2 : Chart options- Citation Analysis page)



User can apply filters for the selected analysis. Customization of citation charts include line and point color adjustments, font size , chart scale & appearance settings, adjusting X-axis and Y-axis labels, enable or disable grid, chart titles &

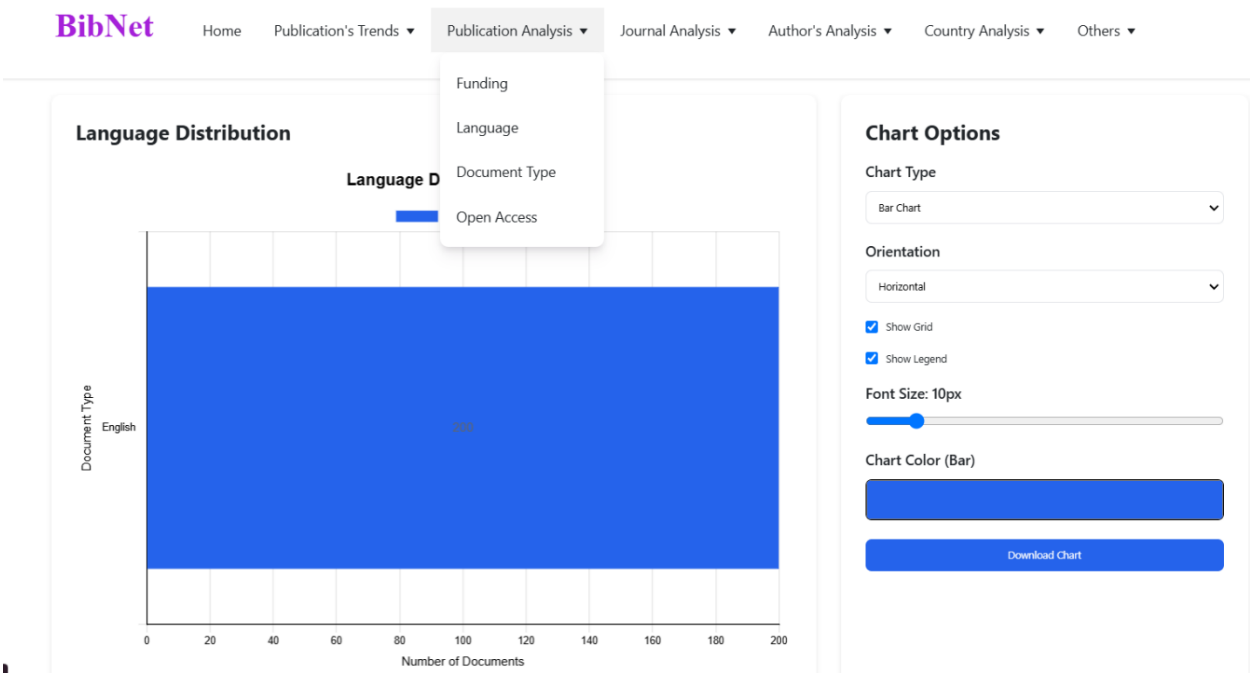
legend visibility. User can click " PNG / CSV" to save the chart as a PNG or CSV file respectively. Importing chart as CSV, user on clicking the “CSV” button, gets a CSV file with the chart details which they can open in any spreadsheet analysis tool like Google sheets or MS Excel an can select from the chart options offered for the data to replicate the exact same copy of the chart on their device.

Fig-16: Toolbar- Citation Analysis Page

6.6 PUBLISHER DATA ANALYSIS

- **Navigating the Publisher's Analysis Tab:**
  - Go to the " Publisher's Analysis " tab to view:
    - Funding
    - Language
    - Document Type , and
    - Open Access distribution of the publications

Fig-17 : Publisher's Analysis Tab



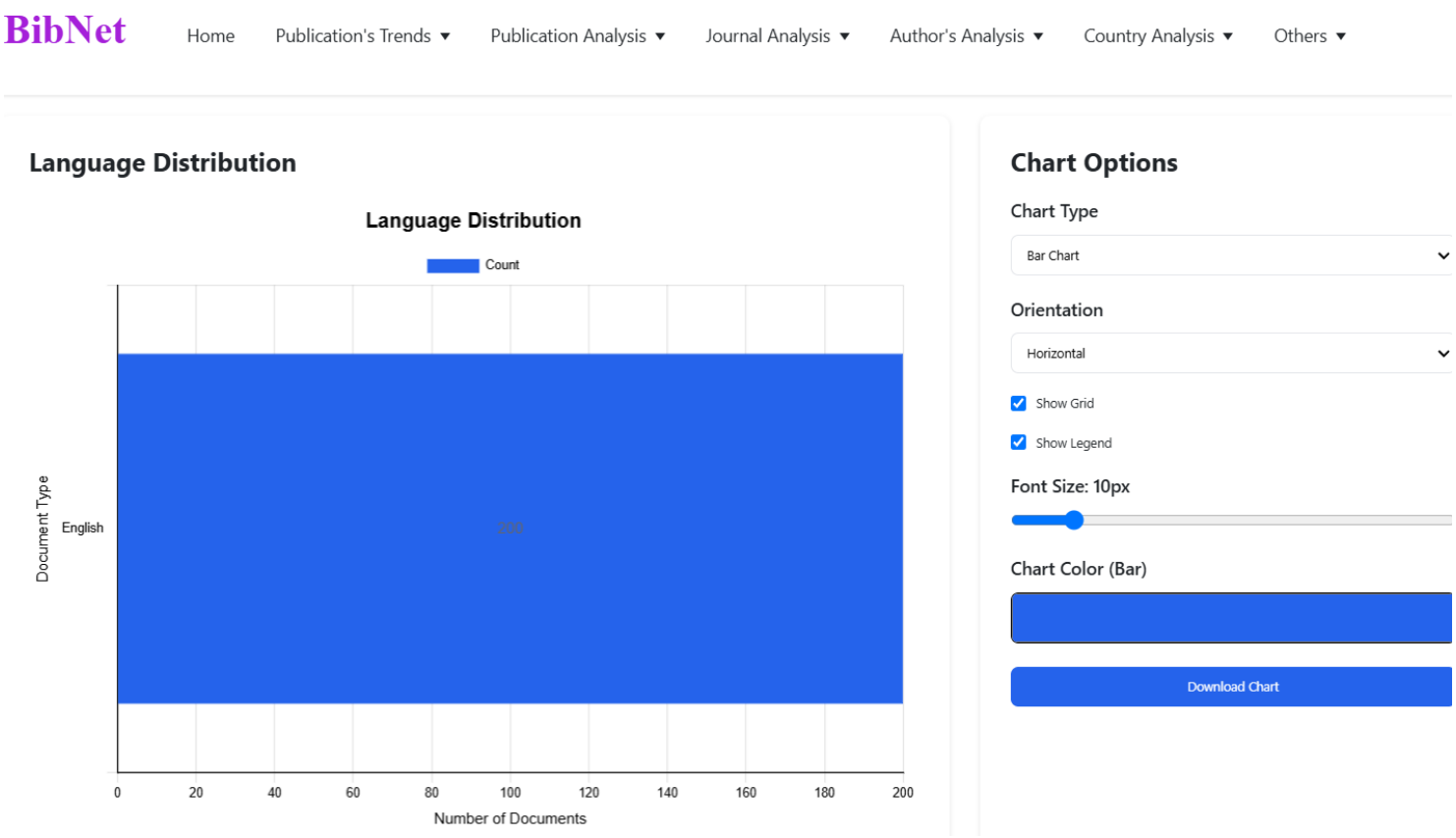
6.7 FUNDING ANALYSIS:

This tab displays the Funding distribution of the literature; provides funding distribution of documents among the uploaded data. User can do funding analysis to see the funding and non- funding distribution.

6.8 LANGUAGE ANALYSIS:

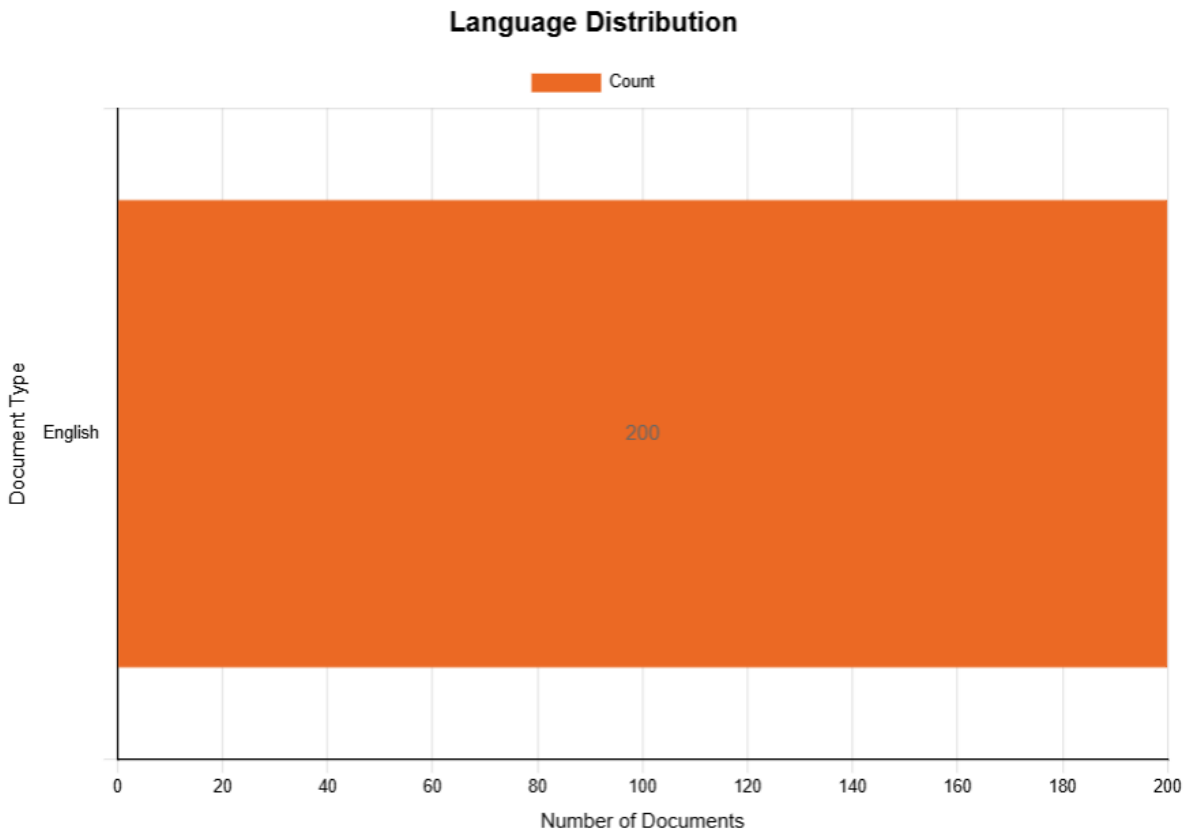
This tab displays the Language distribution across all the uploaded user data. Showcases the different languages with the number of documents they are used in.

Fig-18 : Language Tab



This tab offers a detailed view of the language distribution found in all the uploaded user data. It displays the various languages and the number of documents in which each language is used. This helps users easily grasp the linguistic diversity of their data.

Fig-19 : Chart Area- Language Tab



Customization of language charts user can make chart type adjustments, chart color adjustments, font size & appearance settings, adjusting chart orientation (horizontal/vertical) and enable or disable grid & legend visibility. User can click the "PNG / CSV" button to save the chart as a PNG or CSV file respectively.

(Fig-6.3 : Chart Options-Language Tab)

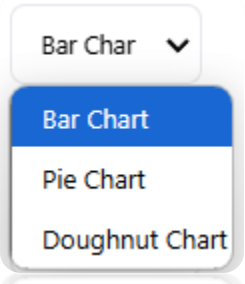
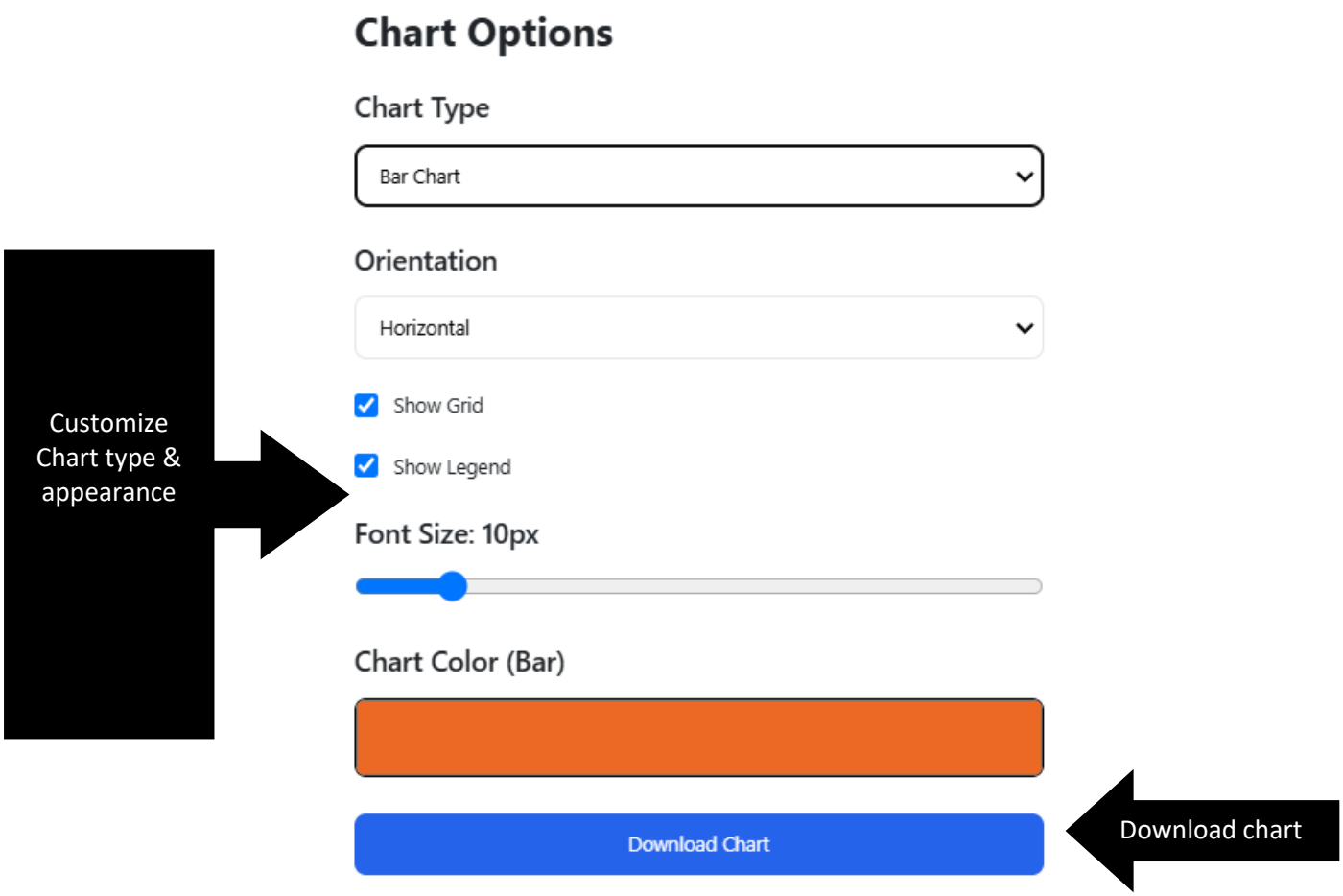


Fig-20:Toolbar- Language Tab



6.9 DOCUMENT TYPE ANALYSIS

This tab displays the Document Type distribution across the full uploaded corpus along with the document type count. User can do the document type analysis and see the distribution and count of different types of documents in their uploaded corpus.

Fig-21 : Document Type Tab

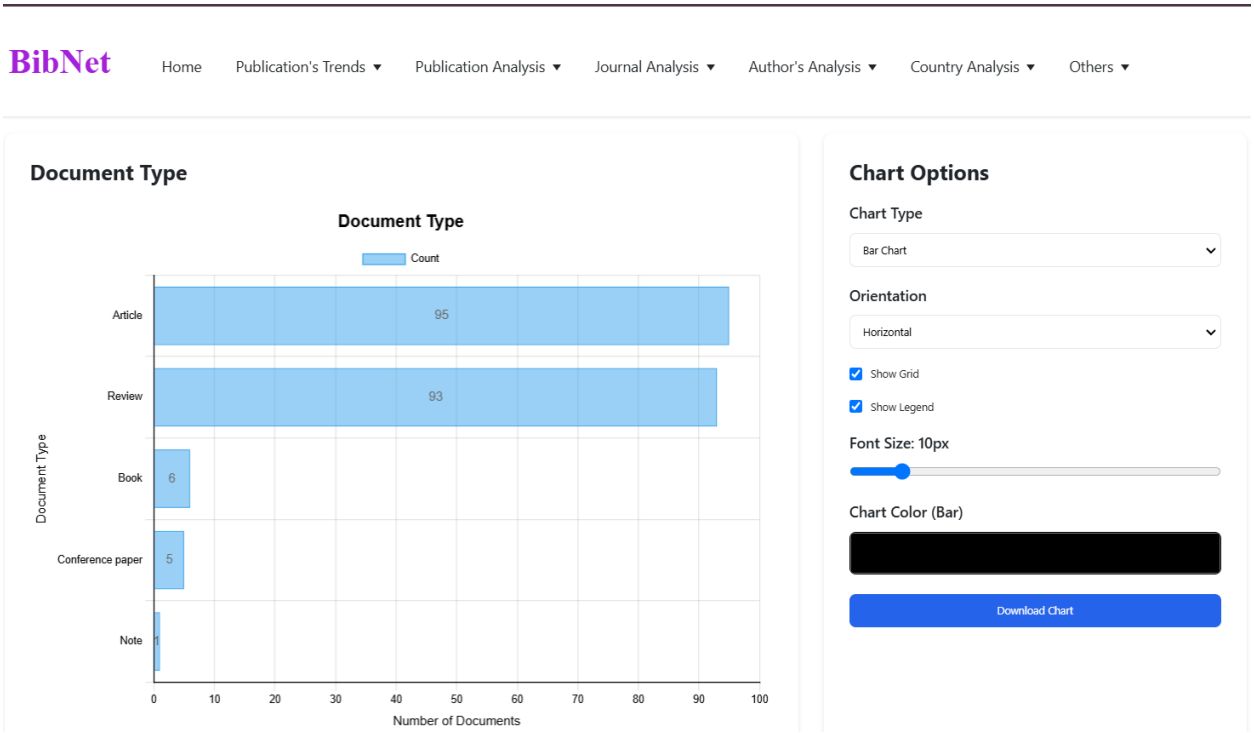
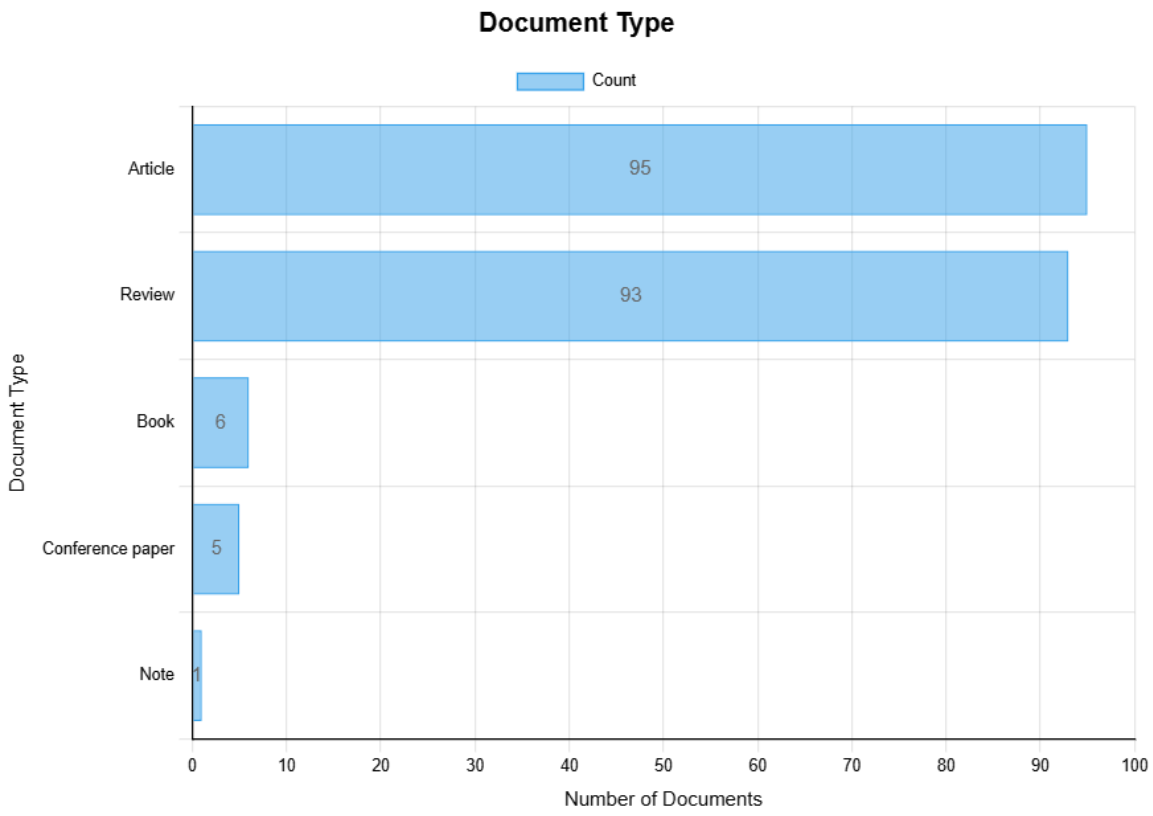
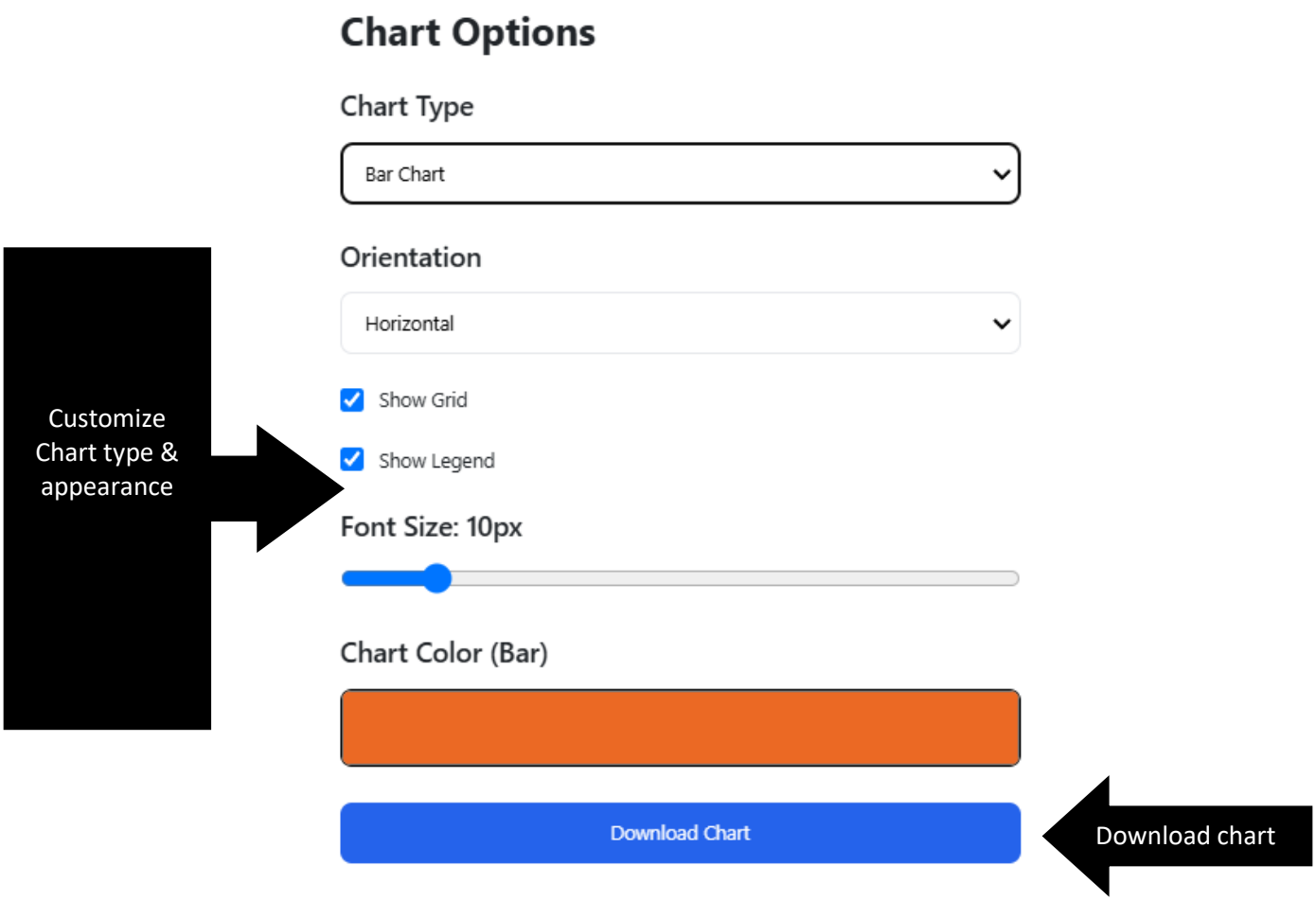


Fig-22 : Chart Area Document Type Tab



Customization of document type charts user can make chart type adjustments, chart color adjustments, font size & appearance settings, adjusting chart orientation (horizontal/vertical) and enable or disable grid & legend visibility. User can click the "PNG / CSV" button to save the chart as a PNG or CSV file respectively.

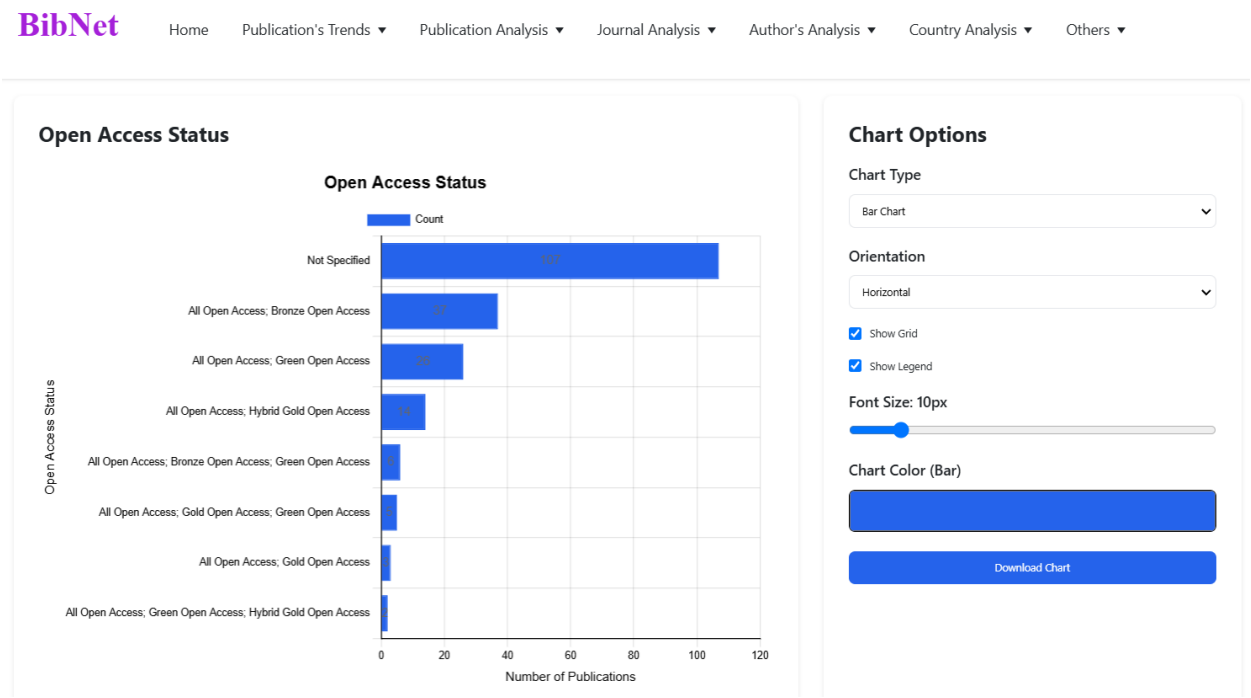
Fig-23 :Toolbar- Document Type Tab



6.10 OPEN ACCESS DISTRIBUTION ANALYSIS

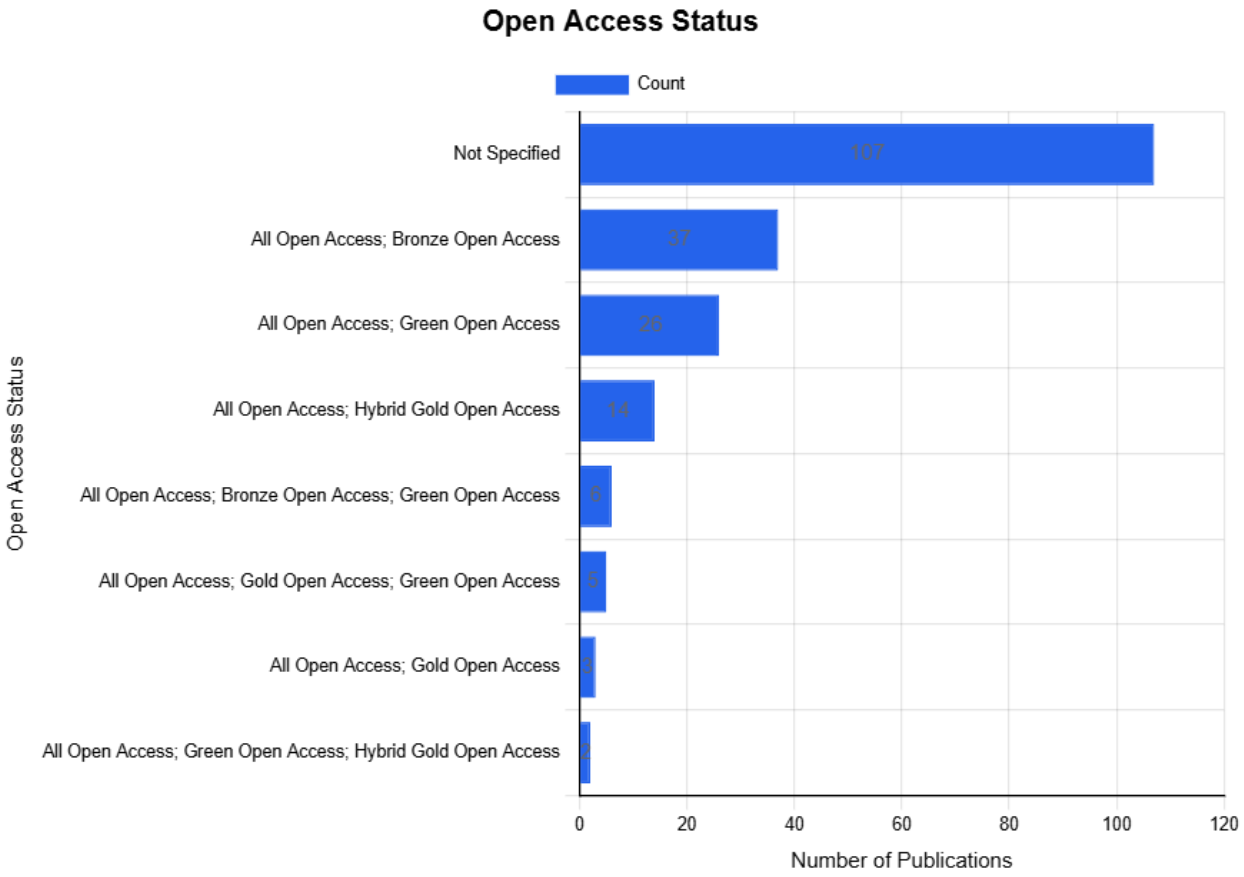
This tab displays the **Open Access** distribution across the whole document. User gets a chart depicting different types of open access documents along with their count across the uploaded corpus.Some showcased types include : “All”, “Bronze”, “Green”, “Gold” & “hybrid gold” open access.

Fig-24 Open Access Tab



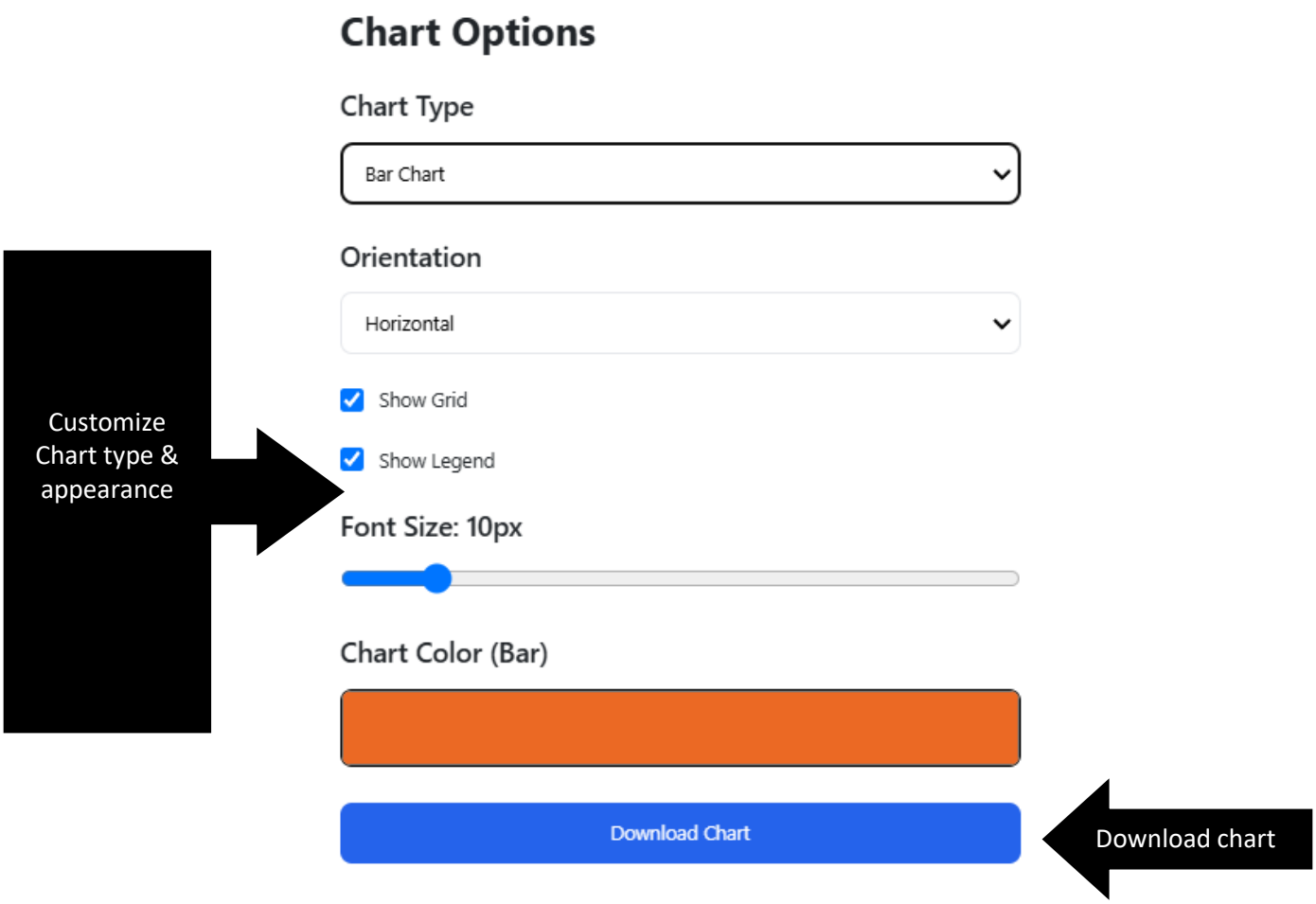
The user receives a chart illustrating the different types of open access documents along with their counts within the uploaded corpus. Categories include "All," "Bronze," "Green," "Gold," and "Hybrid Gold" open access. This visualization helps understand the distribution and prevalence of each type.

Fig-25- Chart Area- Open Access Tab



Customization of open access user can make chart type adjustments, chart color adjustments, font size & appearance settings, adjusting chart orientation (horizontal/vertical) and enable or disable grid & legend visibility. User can click the "PNG / CSV" button to save the chart as a PNG or CSV file respectively. Users can customize open access charts by adjusting the chart type, color, font size, and appearance settings. They can also modify the chart orientation (horizontal/vertical) and toggle the grid and legend visibility. To save the chart, users can click the "PNG / CSV" button to download the chart as a PNG or CSV file.

Fig-26- Toolbar Open Access Tab

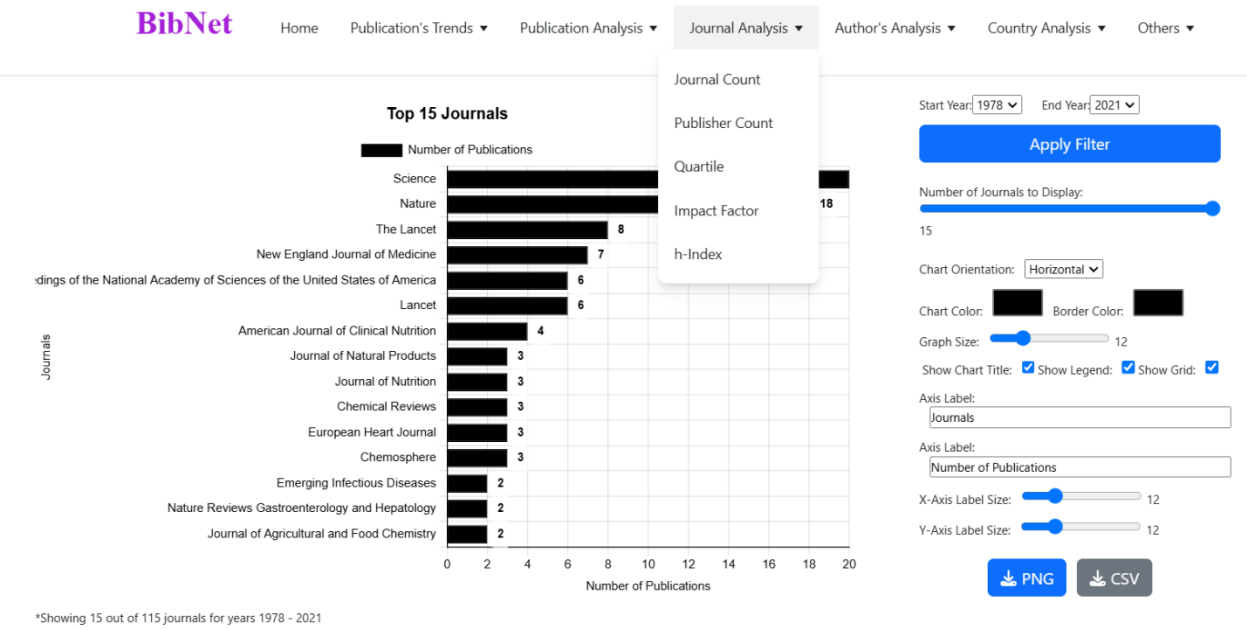


6.11 JOURNAL ANALYSIS

Navigating the Journal Analysis Tab:

- User can navigate to the " Journal Analysis " tab to view:
  - Journal Count
  - Publisher Count
  - Quartile
  - Impact Factor, and
  - *h*-Index

Fig-27 Journal Analysis Tab



Journal Count tab: This tab displays the **Journal Count** of the top journals across the whole uploaded corpus.

Fig-28- Chart Area- Journal Count Tab

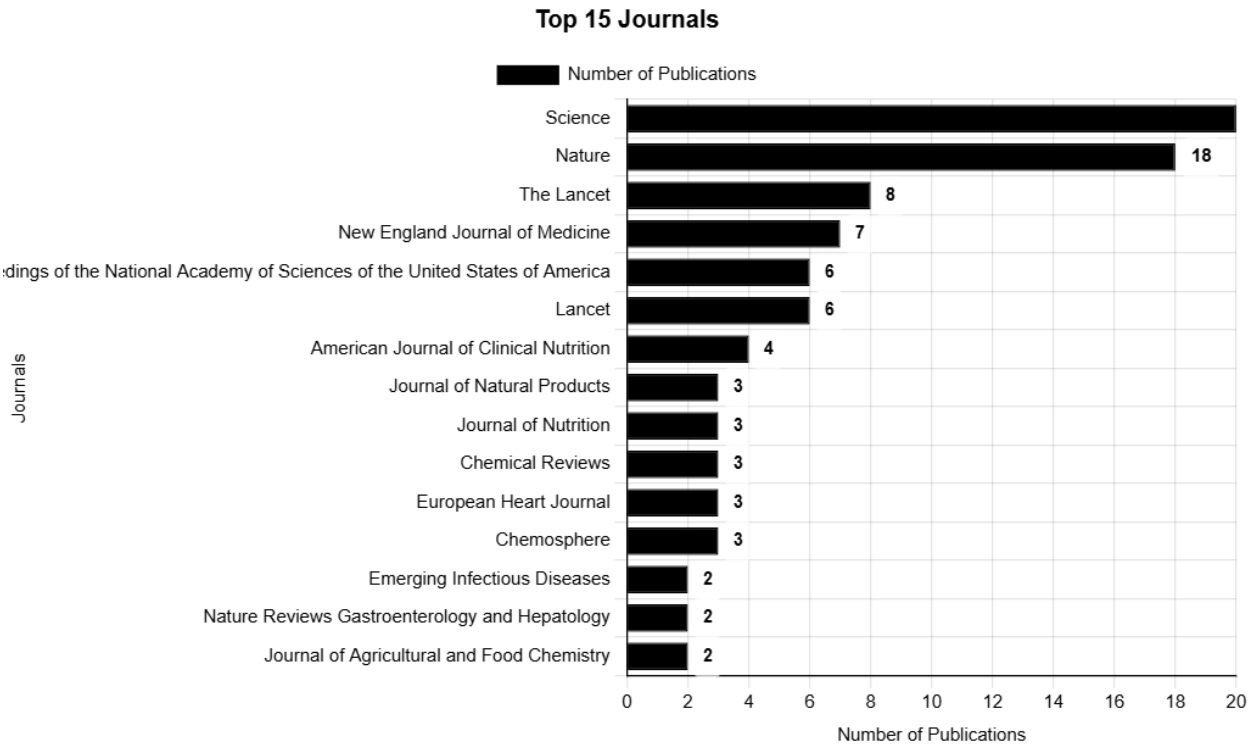
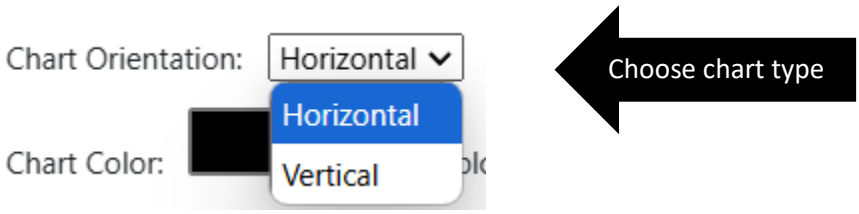


Fig-29- Chart Options- Journal Count Tab

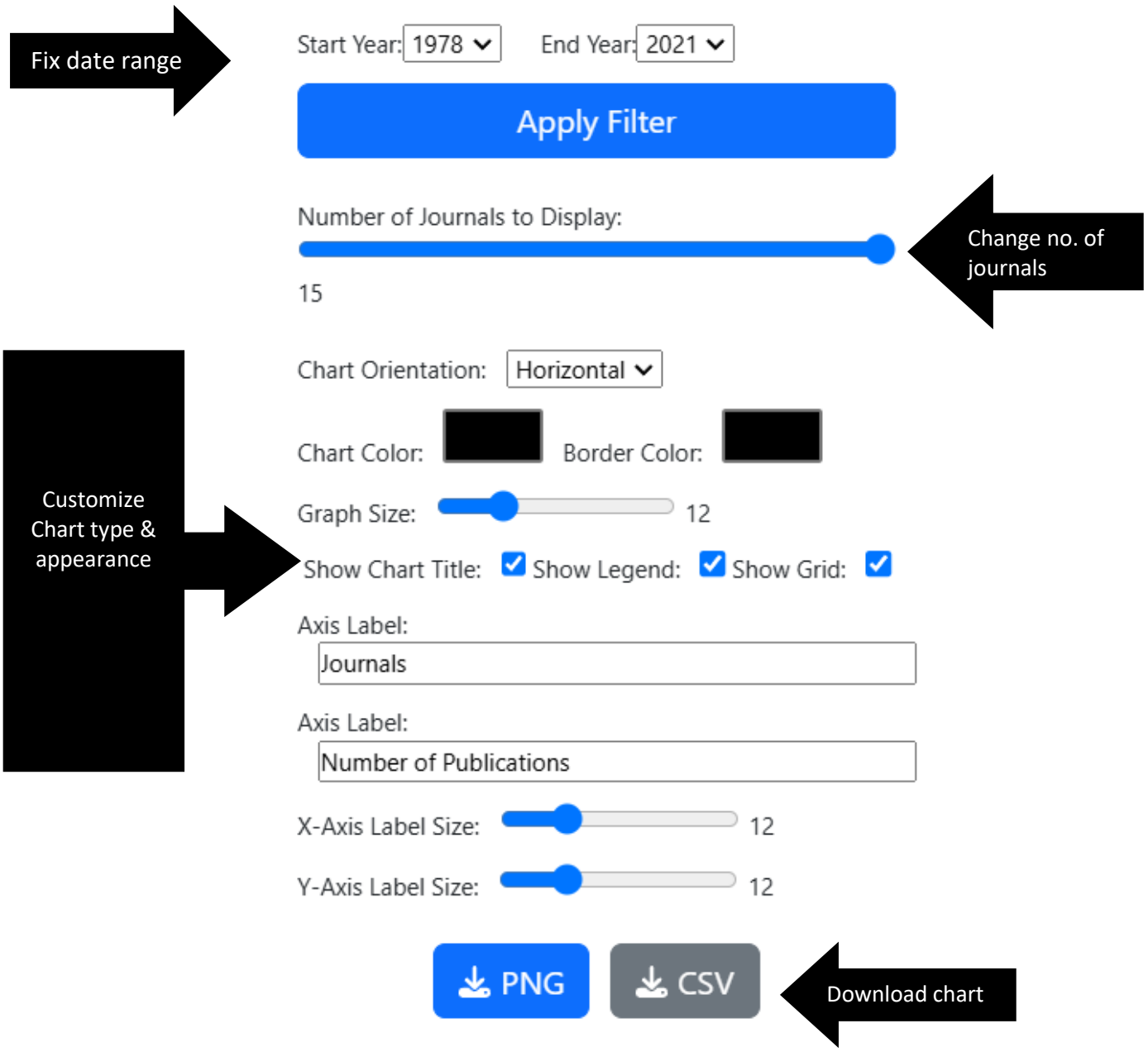


Users can select between horizontal and vertical bar charts and adjust the number of top journals displayed using a slider, with a maximum of 15 journals. They can apply various filters, customize the chart's appearance (such as line color, border color, graph size, and axis labels), and toggle the grid, chart titles, and legend visibility.

Users have the ability to choose between horizontal and vertical bar charts and adjust the number of top journals displayed using a slider, with a maximum of 15 journals. Various filters can be applied, and the chart's appearance can be customized by adjusting line color, border color, graph size, and axis labels. Additionally, users can enable or disable the grid, chart titles, and legend visibility.

Users can save the chart as a PNG or CSV file. Clicking the "CSV" button generates a CSV file that can be opened in spreadsheet tools like Google Sheets or Microsoft Excel, allowing users to recreate the chart on their device. This functionality provides a flexible way to visualize and customize citation data.

Fig-30- Toolbar-Journal Count Tab



Publisher Count tab: This tab displays the **Publisher Count** of the top publishers across the whole uploaded corpus. Users can use it to get the names of the top publishers in their selected date range.

Fig-31- Publisher Count Tab

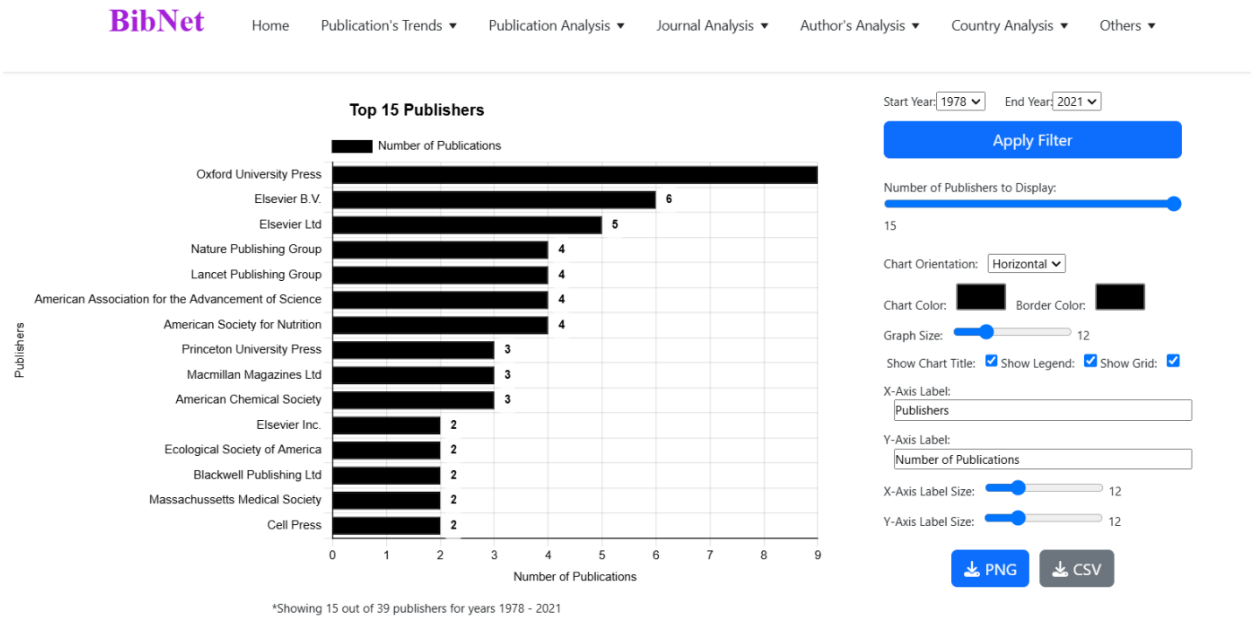


Fig-32- Chart Area- Publisher Count Tab

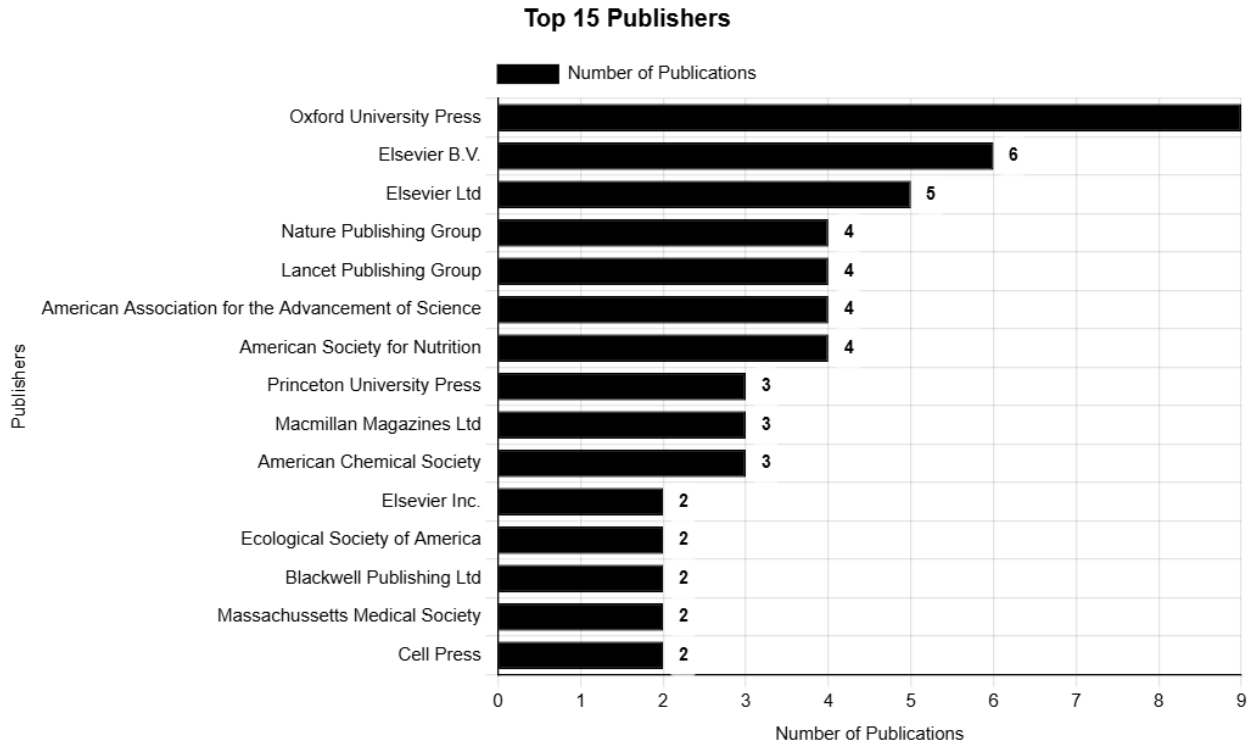
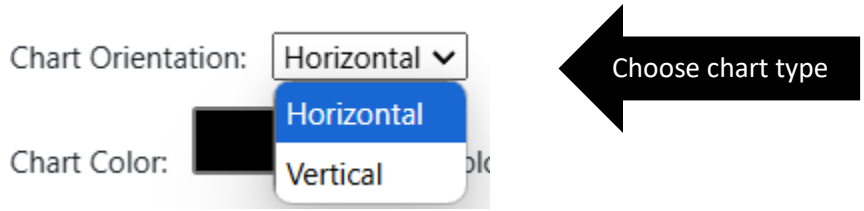


Fig-33- ChartOptions- Publisher Count Tab

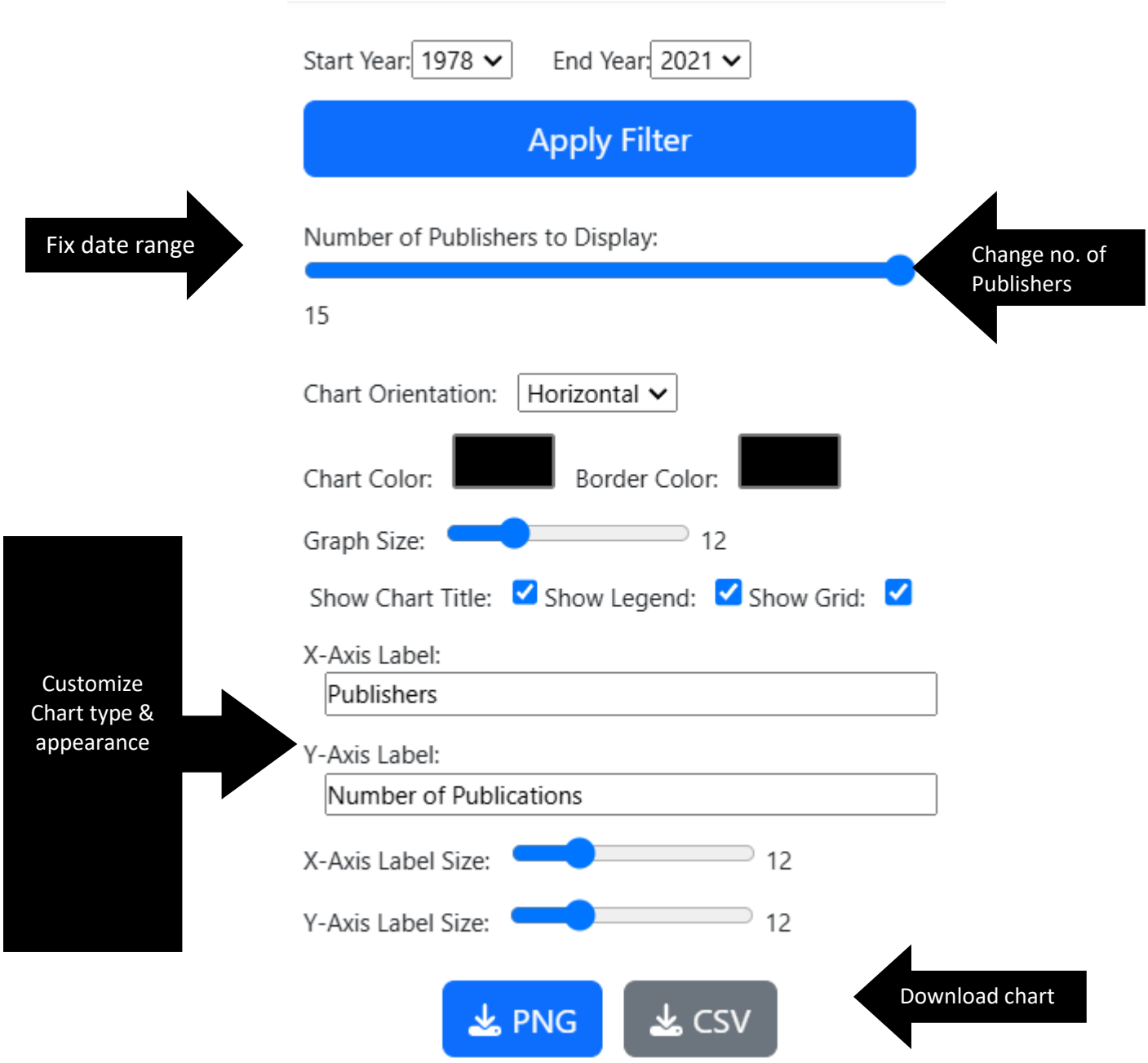


User can choose from horizontal/vertical bar chart. User can use the slider to change the number of top journals being displayed. (max:15) and apply filters for the selected analysis. Customization of citation charts includes line color, border color & graph size adjustments, adjusting X-axis and Y-axis labels enabling or disabling grid, chart titles & legend visibility.

User can click on the " PNG / CSV" button to save the chart as a PNG or CSV file respectively. On clicking the “CSV” button, user gets a CSV file with the chart details which they can open in any spreadsheet analysis tool like Google sheets or MS Excel an can select from the chart options offered for the data to replicate the exact same copy of the chart on their device.

Users have the option to select between horizontal and vertical bar charts. They can adjust the number of top journals displayed using a slider, with a maximum of 15. Filters can be applied to the chosen analysis. Customization options for citation charts include adjusting line color, border color, and graph size, as well as modifying X-axis and Y-axis labels. Additionally, users can enable or disable the grid, chart titles, and legend visibility.

Fig-34- Toolbar- Publisher Count Tab



QUARTILE ANALYSIS: This tab displays the Quartile distribution of the documents.

IMPACT FACTOR ANALYSIS: This tab displays the Impact Factor distribution of the documents.

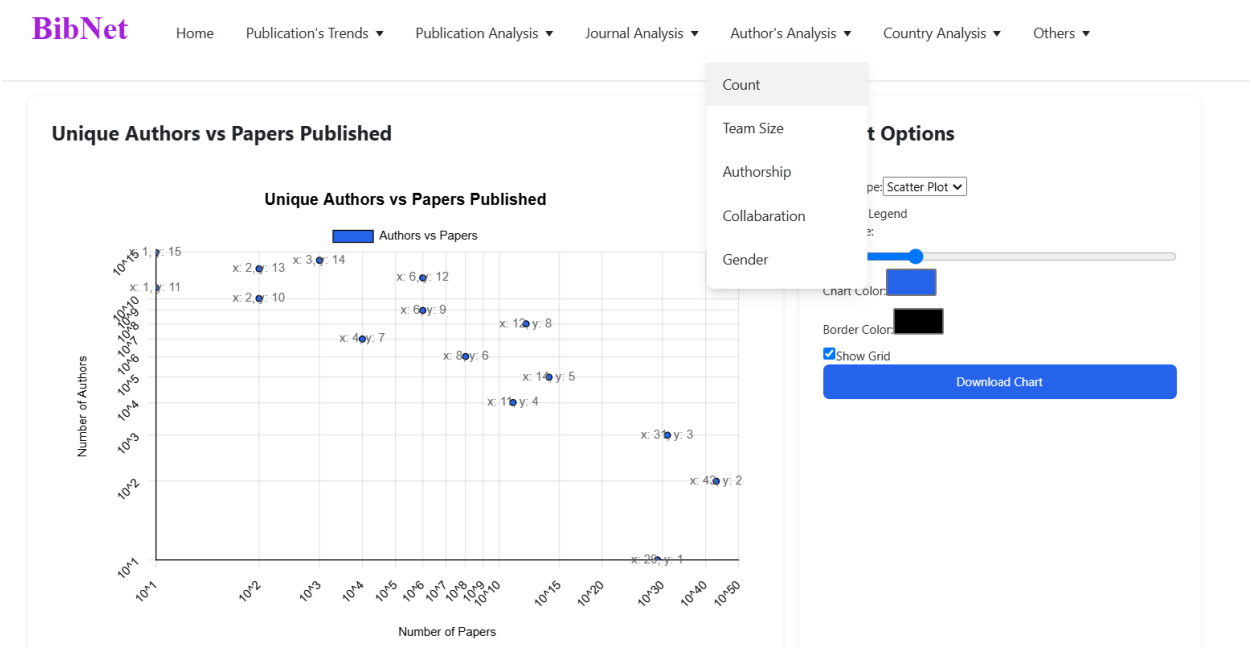
***h*-Index analysis:** This tab displays the *h*-Index distribution of the documents.

6.12 AUTHOR ANALYSIS

Navigating the Author Analysis Tab:

- Count
- Team Size
- Authorship
- Collaboration, and
- Gender

Fig-35- Author's Analysis Tab



Count analysis: This tab displays the Author Count of the uploaded data. Users can see a logarithmic representation of the number of unique authors present in their corpus matched with the number of papers they have authored over the span of their specific year selection. The fully customizable nature of the chart aids with this analysis.

Fig-36- Chart Area- Author Count Tab

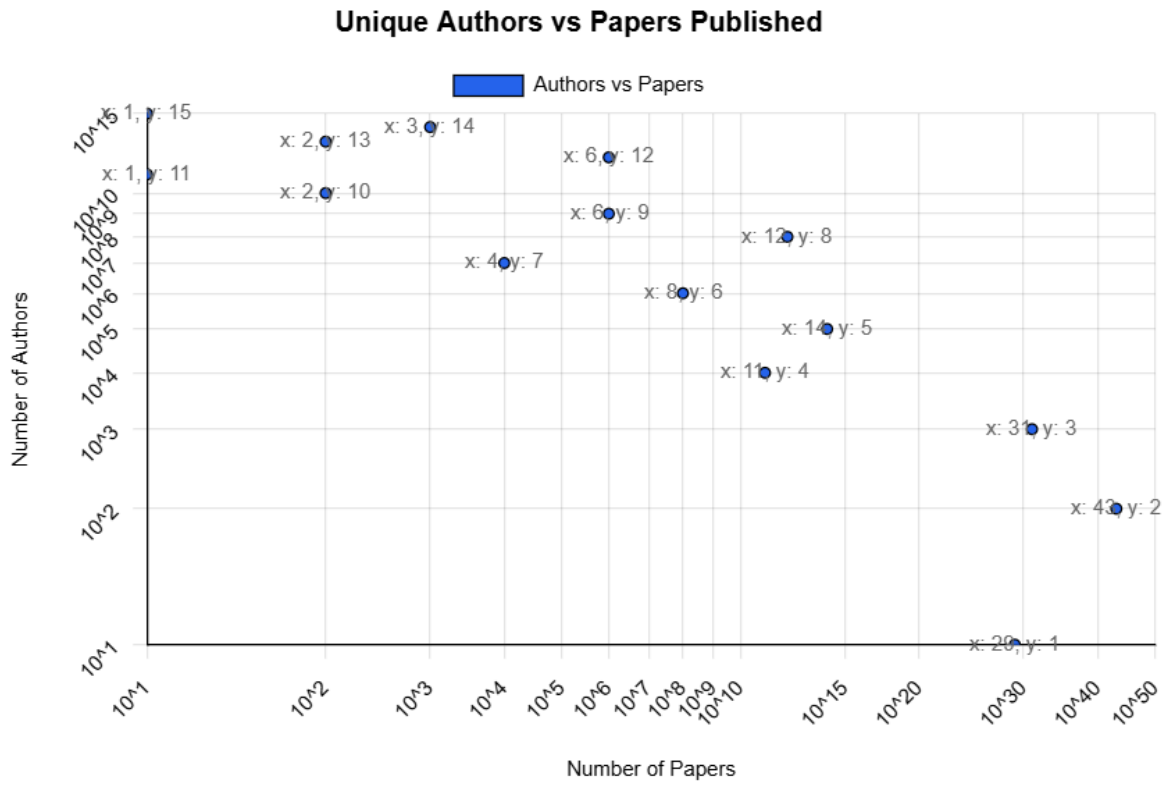
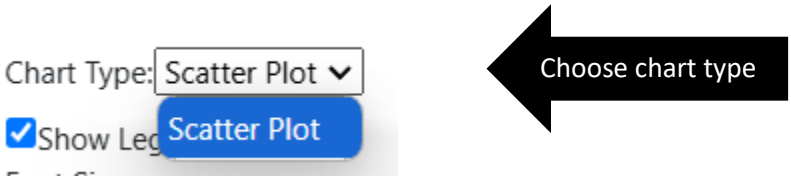


Fig-37- ChartOptions- Author Count Tab

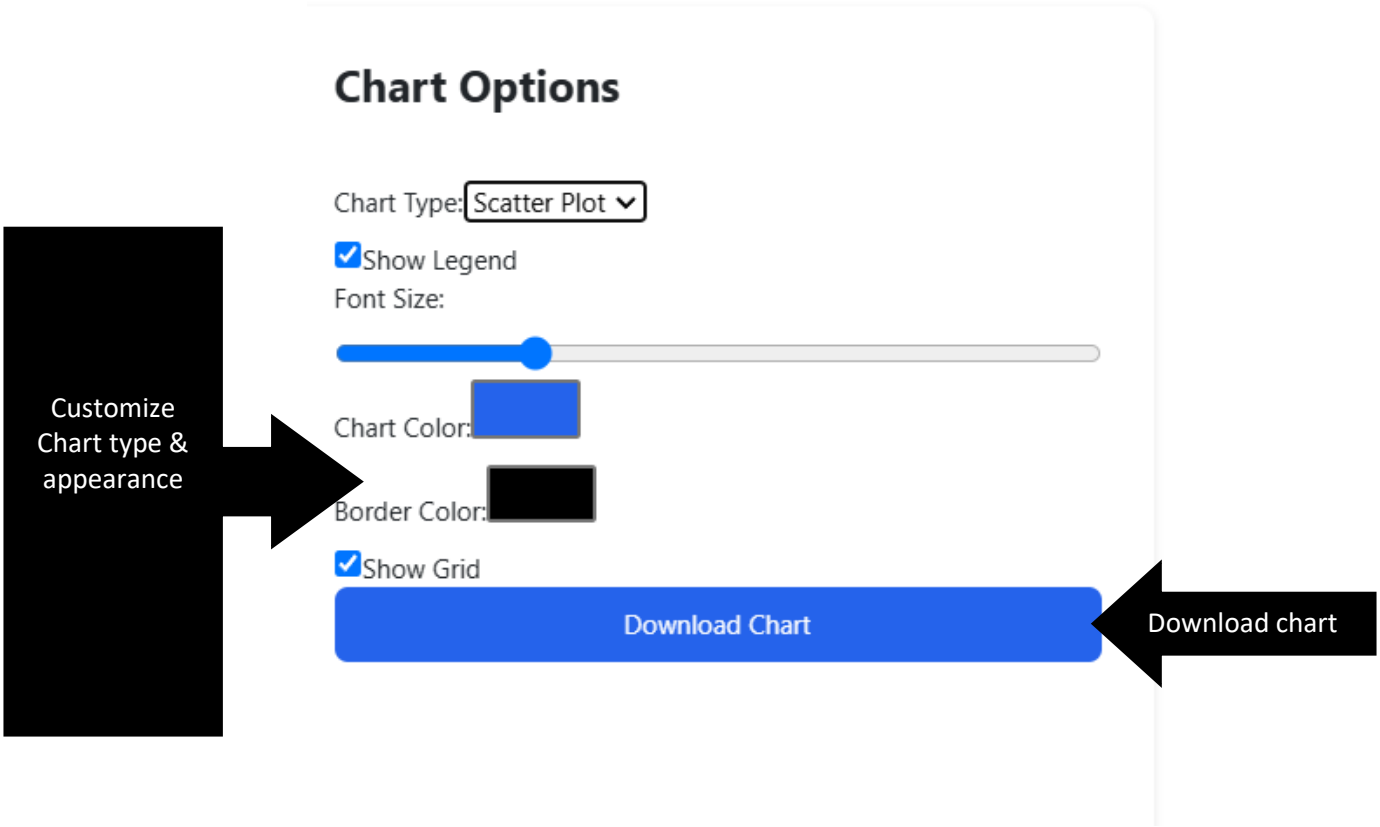


User can choose from scatter plot chart. Customizations include, changing line color, border color & graph size adjustments, adjusting X-axis and Y-axis labels, enabling or disabling grid, chart titles & legend visibility.

User can click on the "Download Chart / CSV" button to save the chart as a PNG or CSV file respectively. On clicking the “CSV” button, user gets a CSV file with the chart details which they can open in any spreadsheet analysis tool like Google

sheets or MS Excel an can select from the chart options offered for the data to replicate the exact same copy of the chart on their device.

Fig-38- Toolbar- Author Count Tab



TEAM SIZE ANALYSIS: This tab displays the Team Size analysis of the uploaded corpus.

AUTHORSHIP ANALYSIS: This tab displays the Authorship distribution of the uploaded corpus.

COLLABORATION ANALYSIS: This tab displays the collaboration distribution of the uploaded corpus.

GENDER ANALYSIS: This tab displays the Gender distribution of the uploaded corpus.

6.13 COUNTRY ANALYSIS

- Navigating the Country Analysis Tab:
    - Country Count
    - Country Collaboration
    - Inter-country Count
    - Intra-country Count

- Country count analysis: This tab displays the Country Count of the uploaded corpus.
- Country collaboration analysis: This tab displays the Country Collaboration of the uploaded corpus.
- Inter-country analysis: This tab displays the Inter-country distribution of the uploaded corpus.
- Intra-country analysis: This tab displays the Intra-country distribution of the uploaded corpus.

6.14 OTHERS

Navigating the Others Tab:

- Themes
- Report

Themes analysis: This tab displays the different Themes in the uploaded data.

Report analysis: This tab displays the overall analysis Report**.**

7. CONCLUSION

This project successfully integrates bibliometric analysis with modern web technologies to provide an interactive and scalable platform for analyzing academic research trends. By leveraging React for a dynamic front-end, Django for a robust back-end, and MongoDB for managing large datasets, the system demonstrates efficiency and usability in visualizing bibliometric data. The platform empowers users to gain meaningful insights into research metrics, fostering a deeper understanding of academic literature. This work highlights the potential of combining data science with web development to address real-world challenges and lays the groundwork for future advancements in bibliometric analysis tools.

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