Project Name

Impact of ChatGPT on Google Search

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Introduction or Project Overview

The emergence of conversational AI has transformed the way users search for information, with platforms like **ChatGPT** introducing a new style of direct, dialogue-based information retrieval. At the same time, **Google Search** has remained the world's most dominant search engine for over two decades. Understanding the interaction between these two technologies provides valuable insights into changing user behavior, global search patterns, and the growing influence of AI-driven tools.

This project, **Global Search Trends Analysis: ChatGPT vs Google Search**, focuses on performing a detailed exploratory analysis (EDA) of worldwide and country-level search interest data collected from **Google Trends**. The goal is to discover how user interest has evolved over time, how different regions compare in their adoption, and how major AI-related events influence global search activity.

The project involves:

- Cleaning and preprocessing Google Trends datasets for multiple regions
- Performing statistical and comparative analysis of ChatGPT vs Google Search
- Visualizing long-term worldwide search interest patterns (2004–2025)
- Studying country-wise variations and identifying top/bottom interest regions
- Analyzing correlation, YoY growth, CAGR, and pre-vs-post ChatGPT release trends
- Detecting outliers and generating insights on global adoption behavior

The insights generated from this project help:

- Understand how ChatGPT's rise has impacted traditional search interest
- Identify countries where AI-based tools are gaining rapid popularity
- Reveal global trends, regional differences, and adoption gaps
- Support researchers exploring digital behavior, AI adoption, and search patterns
- Offer valuable groundwork for advanced forecasting, trend modeling, or policy analysis

This work ultimately sheds light on the **global shift in information-seeking behavior**, highlighting how AI conversational systems like ChatGPT are beginning to reshape the landscape historically dominated by search engines like Google.

Problem Statement

The rise of AI tools like ChatGPT has introduced new ways for people to search for information, yet there is limited structured analysis comparing ChatGPT's growth with traditional Google Search. Search trends across regions are inconsistent, and without proper examination, it becomes difficult to understand how user behavior is shifting globally.
The key problems addressed in this project include:

1. Lack of clarity on global search trends
There is no organized comparison showing how ChatGPT's popularity has evolved alongside Google Search over time.

2. Inconsistent regional adoption data
Country-wise data contains missing values and varied interest levels, making it challenging to identify regions where ChatGPT is gaining momentum.

3. No clear understanding of ChatGPT's impact on Google Search
The effect of ChatGPT's launch on traditional search behavior has not been properly analyzed.

4. Difficulty identifying top and low-interest regions
It is unclear which countries rely more on ChatGPT or Google Search due to unprocessed and unranked datasets.

5. Lack of deeper analytical indicators
Metrics like YoY growth, CAGR, correlation, and dominance index are rarely applied to search trends, limiting understanding of global patterns.

Overview of the Dataset used

This project uses **Google Trends datasets** to compare search interest between **ChatGPT** and **Google Search** at both global and regional levels.
Although the datasets contain only a few columns, each file includes **around 250–260 rows**, giving sufficient data to analyze worldwide patterns.

Dataset Size

- **Rows per dataset:** ~250–260 entries
- **Number of files:** 4 CSV files
- **Time period:** 2004 – 2025
- **Data type:** Normalized search interest values (0–100)

1. overall.csv – Worldwide Monthly Trends

This dataset provides **month-wise global search interest** for both ChatGPT and Google Search.

Column	Description
Month	Timestamp (Year–Month) from 2004 to 2025
ChatGPT (Worldwide)	Global search interest for ChatGPT
Google Search (Worldwide)	Global search interest for Google Search

2. region_chatgpt.csv – Country-wise ChatGPT Interest

Contains ChatGPT search interest across different countries.
Most values are low or zero, except a few countries with high interest.

Column	Description
Country	Country name
ChatGPT (%)	Search interest score (0–100)

3. region_google-search.csv – Country-wise Google Search Interest

Shows how popular Google Search is in various countries.

Column	Description
Country	Country name
Google Search (%)	Search interest score (0–100)

4. region_compared.csv – Side-by-side Regional Comparison

Directly compares ChatGPT and Google Search for the same set of countries.

Column	Description
Country	Country name
ChatGPT (%)	ChatGPT search interest
Google Search (%)	Google Search interest

Project Workflow

Step 1: Importing Necessary Libraries
Libraries used:

- pandas – Data loading, cleaning, and manipulation
- numpy – Numerical operations
- matplotlib & seaborn – Data visualization
- os – Accessing dataset files in the Kaggle environment

Step 2: Data Loading and Basic Inspection

- Loaded multiple datasets from Google Trends:
  - overall.csv → Worldwide monthly search interest
  - region_google-search.csv → Country-wise Google Search interest
  - region_chatgpt.csv → Country-wise ChatGPT interest
  - region_compared.csv → Side-by-side interest comparison
- Displayed file structure using os.walk()
- Checked column names, dataset shapes, and datatypes
- Inspected missing values and initial inconsistencies

Step 3: Data Cleaning and Preprocessing
Key cleaning tasks performed:

1. Handling missing values
   - Dropped fully empty rows
   - Replaced blank entries with zero where needed
2. Cleaning percentage values
   - Removed % symbols and converted to integers
3. Fixing worldwide trend dataset
   - Converted "Month" column into datetime format
   - Replaced <1 values in ChatGPT with numeric 1
4. Standardizing country-level datasets
   - Renamed columns for consistency
   - Merged ChatGPT and Google datasets by country
5. Selecting necessary columns
   - Kept structured fields: Country, ChatGPT, Google Search

Step 4: Exploratory Data Analysis (EDA)
Performed detailed insights and visualizations:
a. Worldwide Search Trend Analysis

- Compared monthly interest for ChatGPT vs Google Search (2004–2025)
- Identified ChatGPT's spike after its launch
- Observed long-term fluctuations in Google Search interest

b. Country-Level Popularity

- Plotted country-wise search interest for both platforms
- Identified highest and lowest ChatGPT interest countries
- Analyzed regions where Google remains dominant

c. Regional Comparison

- Grouped bar charts to compare both metrics by country
- Heatmap to visualize ChatGPT–Google patterns across all regions

d. Overall Share

- Pie chart showing total global interest comparison between ChatGPT and Google Search

Step 5: Advanced Statistical Analysis

Performed deeper analytical insights beyond visualizations:

- YoY Growth (Year-over-Year) to understand yearly changes
- CAGR (Compound Annual Growth Rate) from 2004–2025
- Correlation analysis between ChatGPT and Google Search trends
- Pre vs Post ChatGPT launch comparison (before 2022 vs after 2022)
- Dominance Index to measure how far Google leads ChatGPT
- Ratio Analysis (ChatGPT : Google Search) to find regions where ChatGPT is catching up
- Outlier detection to identify unusually high or low interest regions
- Statistical summary of worldwide trends

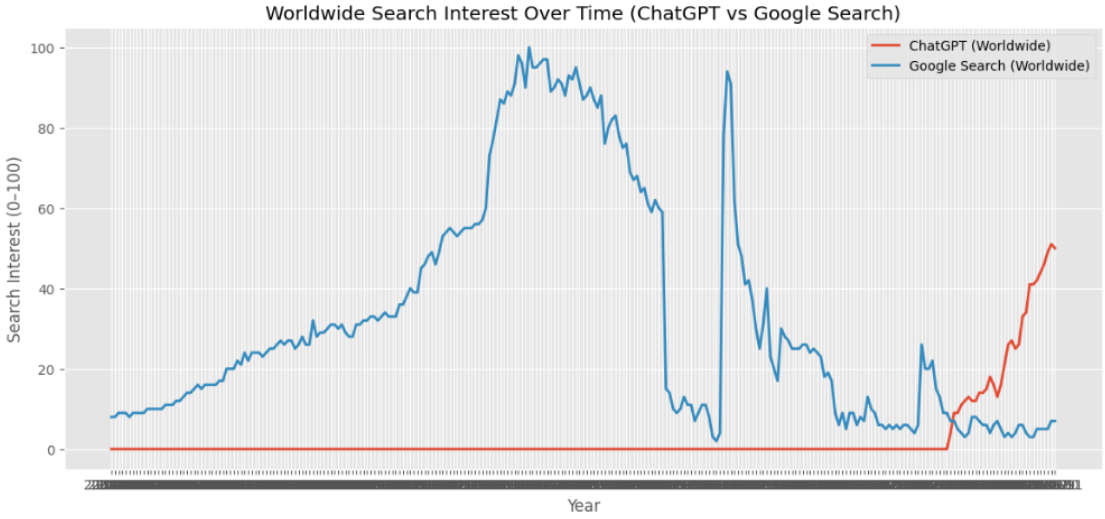
Step 6: Visualizations Created

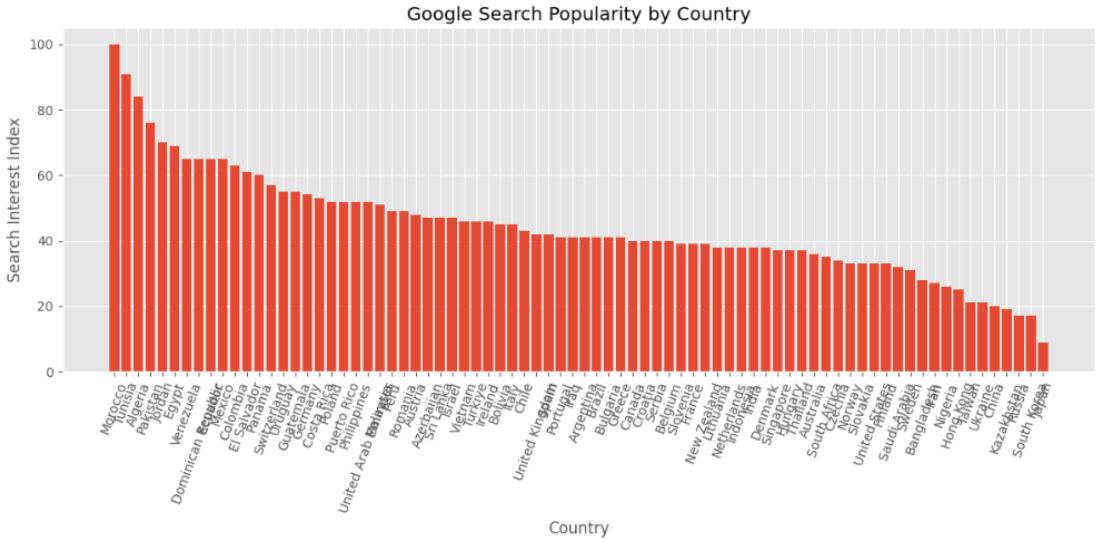
Multiple visual plots were generated:

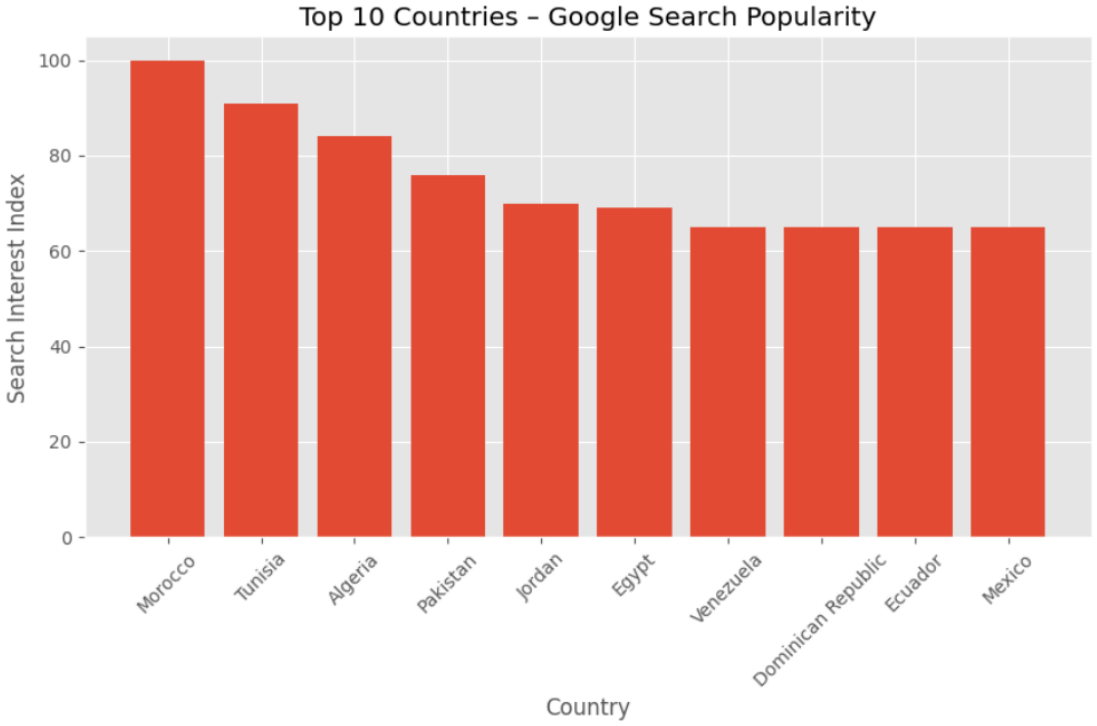
- Line charts
- Bar charts
- Grouped bar comparisons
- Pie charts
- Heatmaps
- Scatter plots

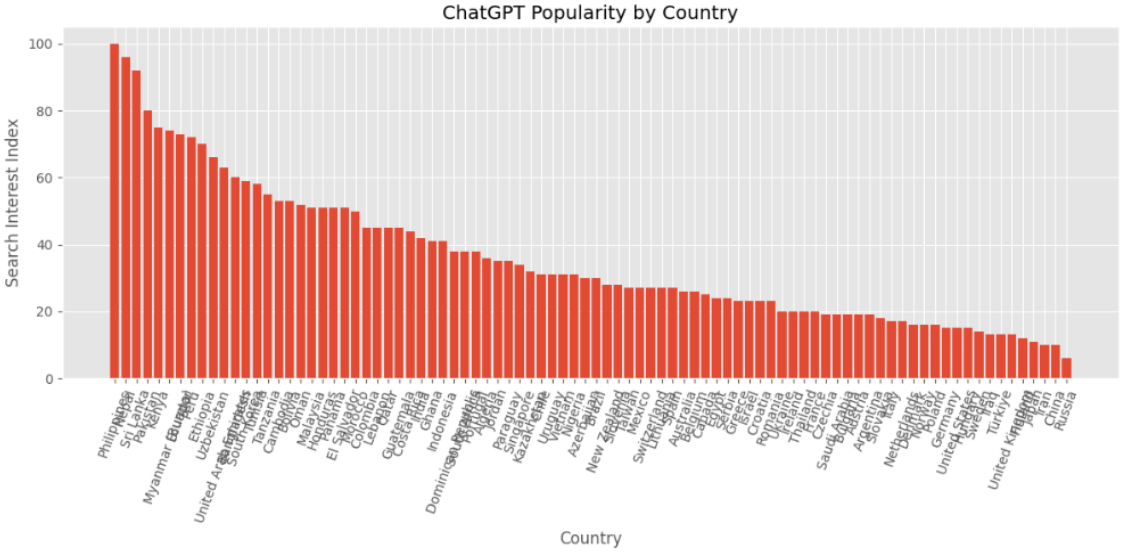
These visualizations helped identify global patterns, regional trends, and the changing relationship between ChatGPT and Google Search.

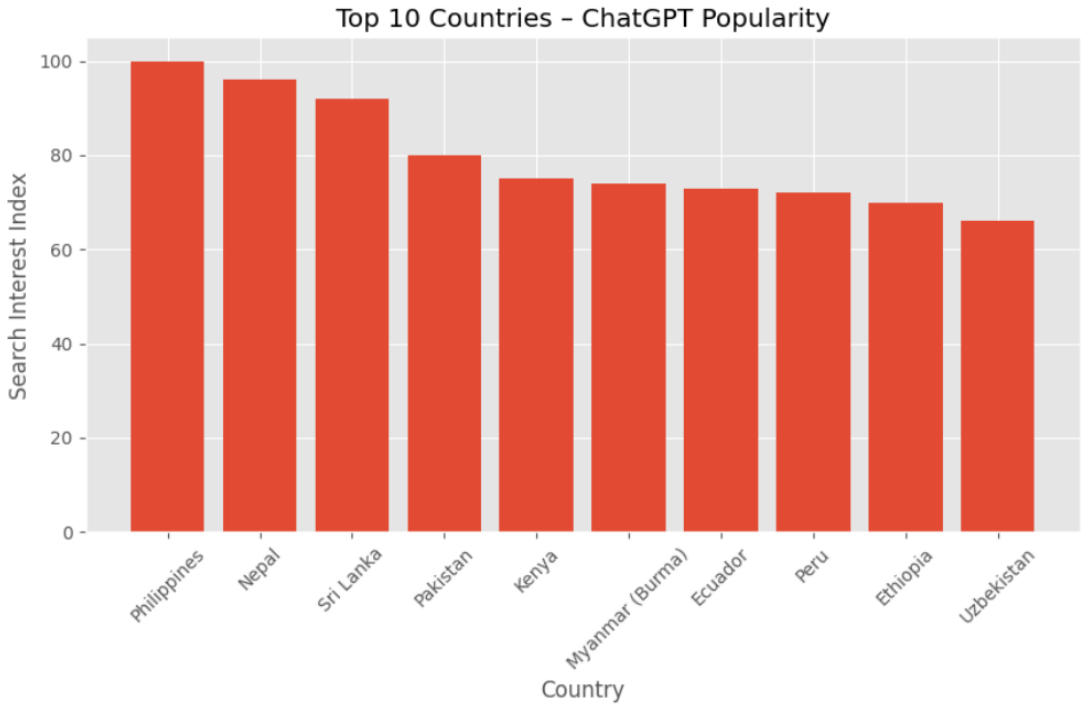
Results

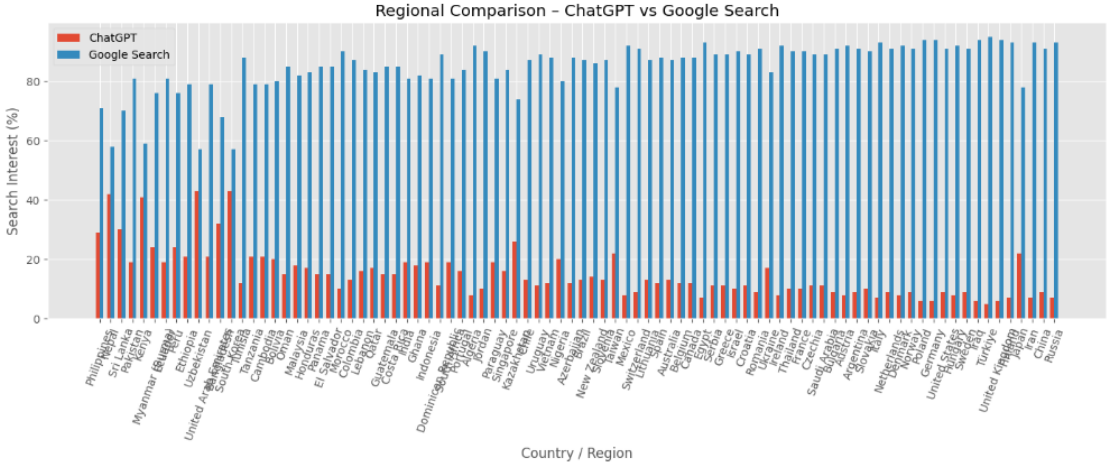

Worldwide Search Interest Over Time (ChatGPT vs Google Search)
ChatGPT (Worldwide)
Google Search (Worldwide)
Search Interest (0–100)
Year

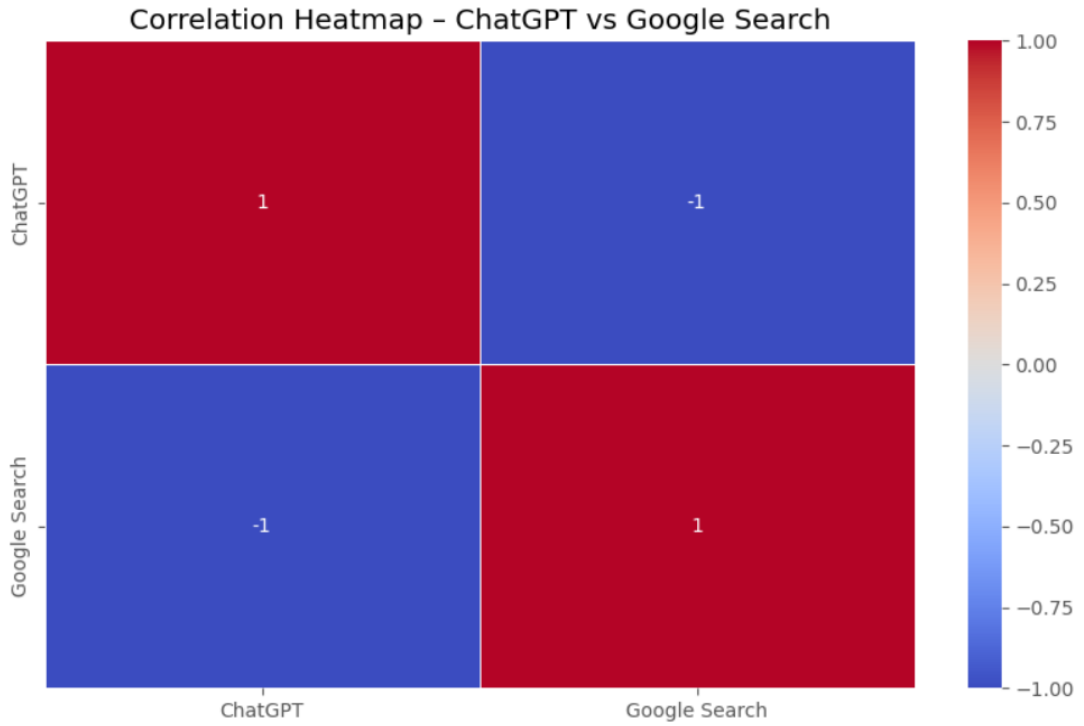

Google Search Popularity by Country
Search Interest Index
Country

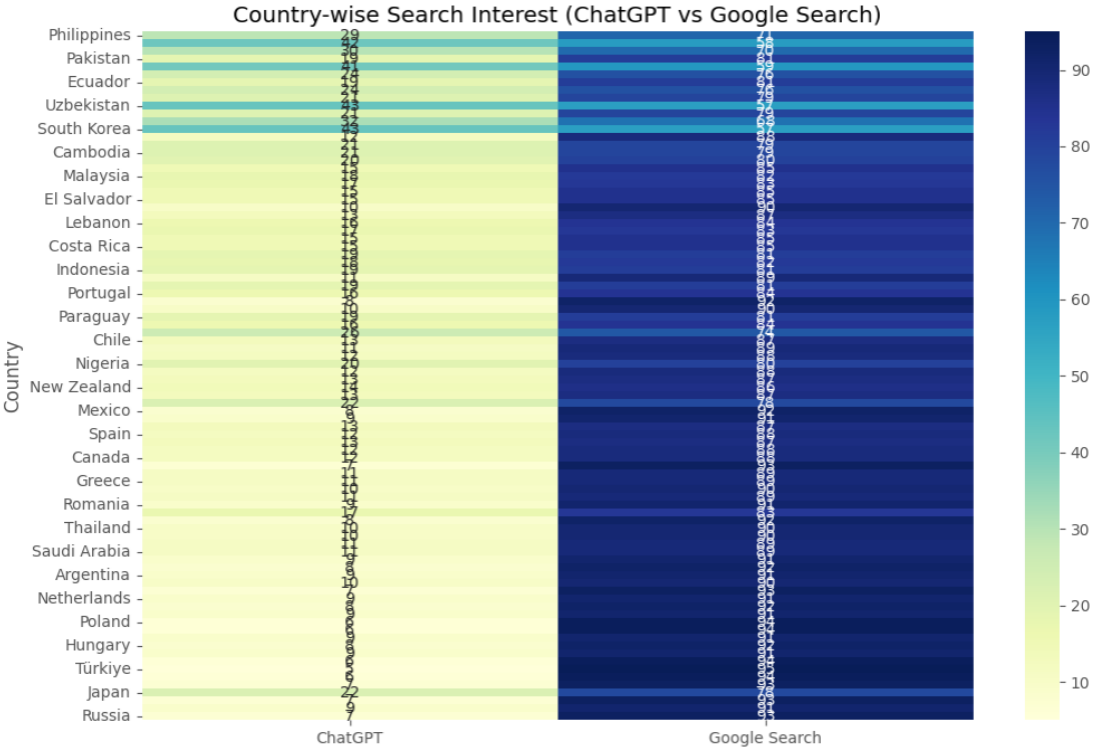

Top 10 Countries – Google Search Popularity
Search Interest Index
100
80
60
40
20
0
Morocco
Tunisia
Algeria
Pakistan
Jordan
Egypt
Venezuela
Dominican Republic
Ecuador
Mexico
Country

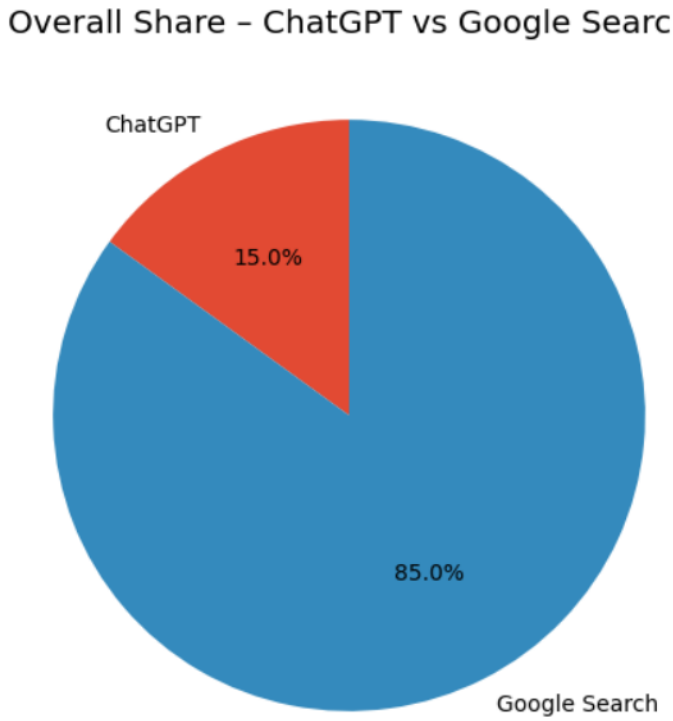

ChatGPT Popularity by Country
Search Interest Index
100
80
60
40
20
0
Country

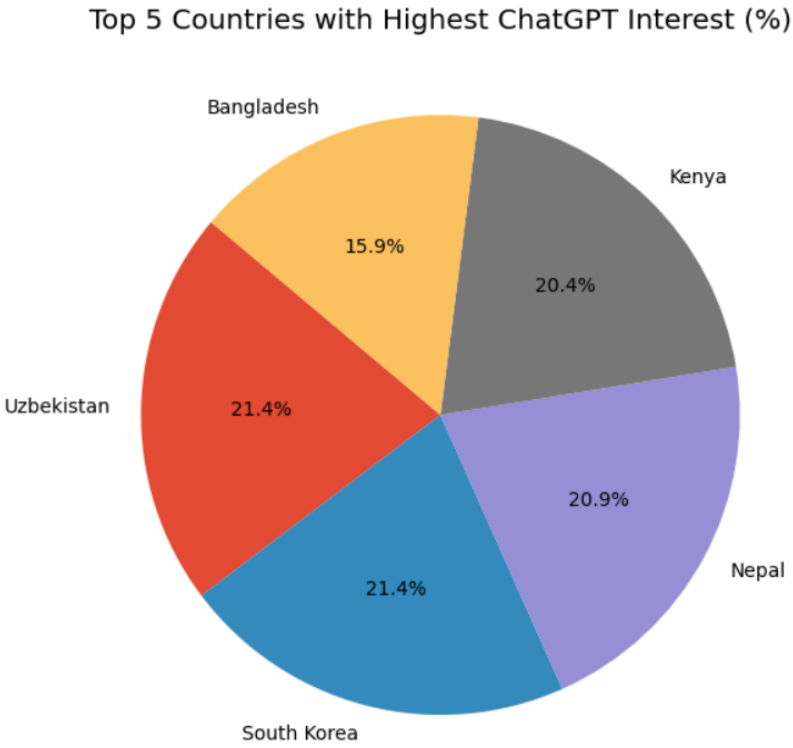

Top 10 Countries – ChatGPT Popularity
Search Interest Index
100
80
60
40
20
0
Philippines
Nepal
Sri Lanka
Pakistan
Kenya
Myanmar (Burma)
Ecuador
Peru
Ethiopia
Uzbekistan
Country


Regional Comparison – ChatGPT vs Google Search
ChatGPT
Google Search
Search Interest (%)
0
20
40
60
80
Country / Region


Correlation Heatmap – ChatGPT vs Google Search
ChatGPT
Google Search
1
-1
-1
1
ChatGPT
Google Search
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00


Country-wise Search Interest (ChatGPT vs Google Search)
Country
Philippines
Pakistan
Ecuador
Uzbekistan
South Korea
Cambodia
Malaysia
El Salvador
Lebanon
Costa Rica
Indonesia
Portugal
Paraguay
Chile
Nigeria
New Zealand
Mexico
Spain
Canada
Greece
Romania
Thailand
Saudi Arabia
Argentina
Netherlands
Poland
Hungary
Türkiye
Japan
Russia
ChatGPT
Google Search
90
80
70
60
50
40
30
20
10


Overall Share – ChatGPT vs Google Search
ChatGPT
15.0%
85.0%
Google Search


Top 5 Countries with Highest ChatGPT Interest (%)
Bangladesh
15.9%
Kenya
20.4%
Uzbekistan
21.4%
20.9%
Nepal
21.4%
South Korea

Conclusion

This project successfully demonstrates how Google Trends data can be analyzed to understand global search behavior and the growing impact of AI tools like ChatGPT. By comparing long-term worldwide trends and regional interest patterns, the study highlights how user information-seeking habits are shifting over time.

Key conclusions:

- **ChatGPT interest has grown rapidly** after 2022, reflecting the rising adoption of AI-based search and conversational tools.
- **Google Search continues to dominate globally**, especially in many developing regions, but some countries show increasing balance between the two.
- **Regional adoption varies significantly**, with countries like Nepal, the Philippines, Sri Lanka, and Kenya showing strong interest in ChatGPT.
- **Worldwide trends indicate a decline in Google Search interest** over the last decade, while ChatGPT shows positive YoY growth and a strong CAGR.
- **Correlation between ChatGPT and Google Search is weak**, suggesting users treat them as different tools rather than direct substitutes.
- **Outlier analysis identifies countries where AI adoption is unusually high**, indicating early adopters and tech-forward regions.
- **Data cleaning played a crucial role**, especially in handling percentage values, missing entries, and inconsistent formats across multiple datasets.

Future Scope:

This project lays the foundation for deeper research and advanced analytics, such as:

- **Trend forecasting** using time-series models (ARIMA, Prophet)
- **AI adoption prediction by region**
- **Comparative sentiment analysis** of user preferences toward ChatGPT vs Google
- **Correlation with real-world events** (product launches, policy changes, AI updates)
- **Building dashboards** for interactive trend exploration

GitHub Link

https://github.com/5umitpandey/chatgpt-google-search-analysis

https://github.com/sparshmanni/chatgpt-google-search-analysis