University of Sulaymaniyah

Collage of Science

Computer Department

Fourth Stage

Exploring Word Population Changes: 2000 – 2023 Analysis

(Data Science)

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2023-2024

Introduction

Overview : This project to analyze global population trends from 2000 to 2023 and Understanding population dynamics is crucial for making informed decisions in various fields such as urban planning, resource allocation, and policy formulation.

We *chose* this project that provides insights into population growth, distribution and insight aids governments, organizations, and policymakers in making informed and strategic decisions that align with the evolving demographic landscape.

Relevance to Society : because understanding population dynamics is crucial for achieving sustainable development, our project contributes to the knowledge base needed to create and implement development plans that are environmentally, socially, and economically sustainable, ensuring the well-being of current and future generations and by distribution patterns, planners can design and implement infrastructure projects that meet the demands of growing urban populations, reducing congestion, and enhancing overall livability and Population data is essential for planning healthcare and education services the project's findings can be utilized to anticipate healthcare needs, plan for medical facilities, and tailor educational strategies to accommodate changing demographics and economic planning and employment strategies cause population trends have a direct impact on the economy ,and the benefits include improved decision-making, sustainable development, optimized resource allocation, enhanced urban planning, and better delivery of essential services, ultimately contributing to the overall well-being and progress of society.

Problem statement

The main problem addressed by this project is the lack of a comprehensive understanding of global population dynamics, the available knowledge lacks a detailed examination of how global populations have been changing over the specified period. there is a gap in understanding the patterns, variations, and accelerations of population growth across different regions and nations. So our project involves understanding population growth, identifying influential factors, and recognizing disparities among countries and continents .

Methodology

The project utilizes Python programming and data analysis libraries to process and visualize population data. The chosen methodology involves exploring key population indicators, such as growth rates and continent-wise distribution, to derive meaningful insights.

Design Process

The design process includes data cleaning, exploratory data analysis, and the application of statistical techniques to uncover patterns and correlations within the dataset.

This is a pseudocode :

Step 1: Read data from CSV file

dataset = read_csv('world_population_data.csv')

Step 2: Data Exploration

Step 3: Select relevant columns

```
years = ['2000 population', '2010 population', '2015 population', '2020 population', '2022 population', '2023 population']
```

Step 4: Calculate statistics

```
mean_population, median_population = [], []
for year in years:
    mean_population.append(dataset[year].mean())
    median_population.append(dataset[year].median())

mean_area, median_area = dataset['area (km²)'].mean(), dataset['area (km²)'].median()
mean_density, median_density = dataset['density (km²)'].mean(), dataset['density (km²)'].median()
```

Step 5: Calculate range and variance

```
data_range = dataset['density (km²)'].max() - dataset['density (km²)'].min()
data_variance = np.var(dataset['density (km²)'])
```

Step 6: Correlation analysis

```
correlation_matrix = dataset[years].corr()
```

Step 7: Visualizations

... (scatter plot, population trends, pie chart, bar charts, etc.)

Step 8: Growth Rate Analysis

```
dataset['growth rate'] = dataset['growth rate'].str.rstrip('%').astype('float')
sorted_data = dataset.sort_values(by='growth rate', ascending=False)
top_10_growth_countries = sorted_data.head(10)
top_10_less_growth_countries = sorted_data.tail(10)
```

Step 9: Future Population Prediction

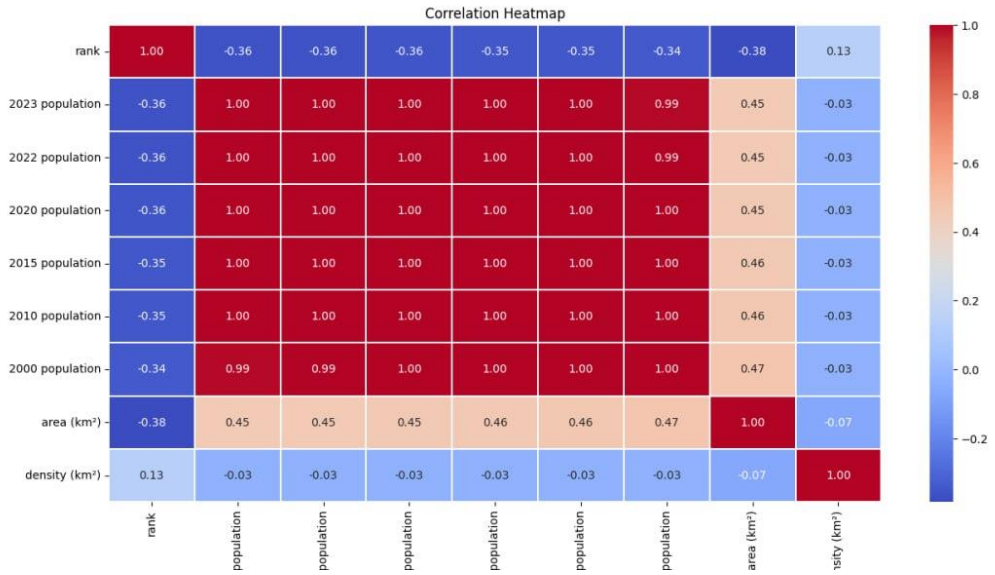
```
growth_rate_2010_2015, growth_rate_2015_2020 = 441024761, 414440842
growth = (growth_rate_2010_2015 + growth_rate_2015_2020) / 2
population_2023 = dataset['2023 population'].sum()
future_population_2028 = population_2023 + growth
future_population_2033 = population_2023 + 2 * growth
```

Step 10: Print results

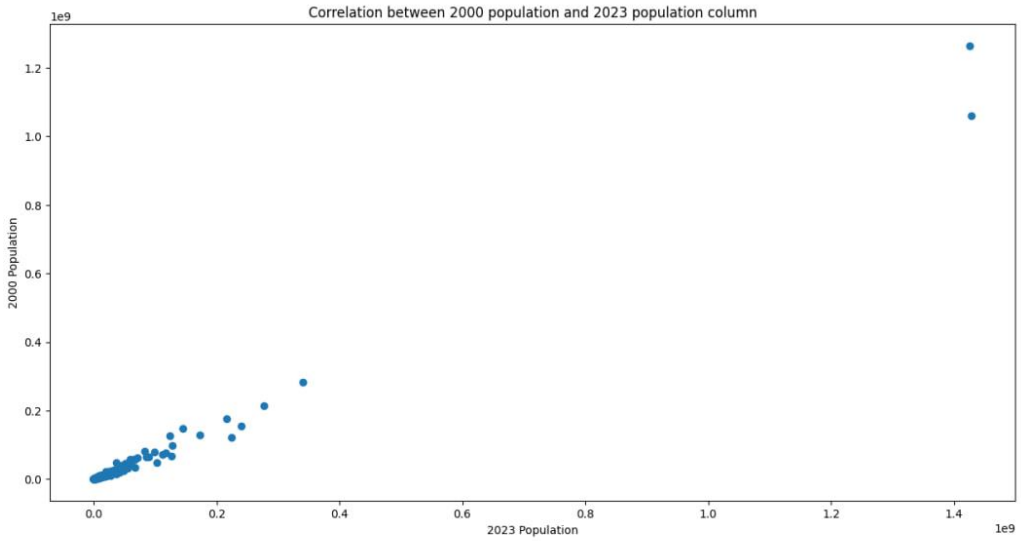
```
print("2023 Population:", population_2023)
print("Population 2028:", future_population_2028)
print("Population 2033:", future_population_2033)
```

Implementation

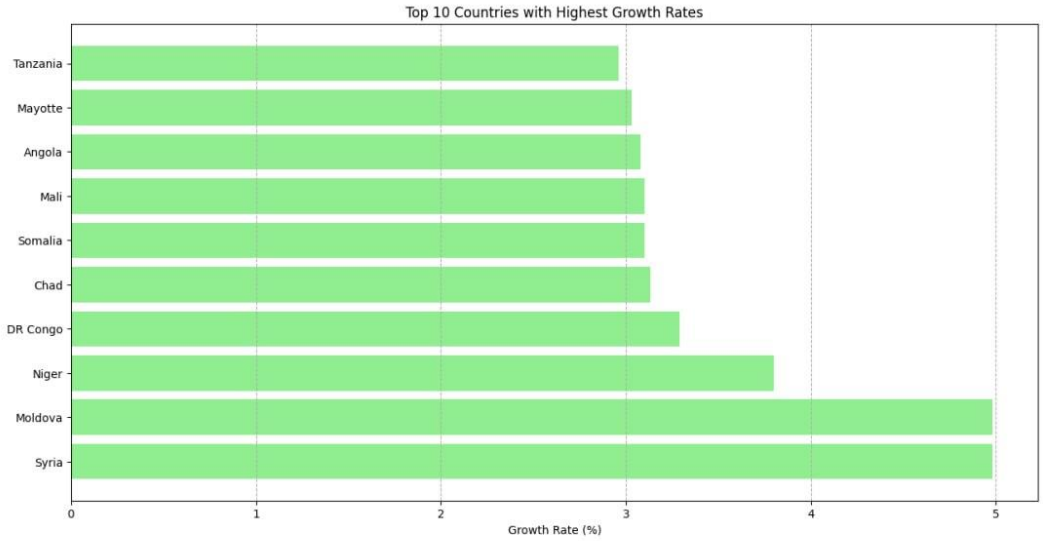
Correlatin Heatmap :



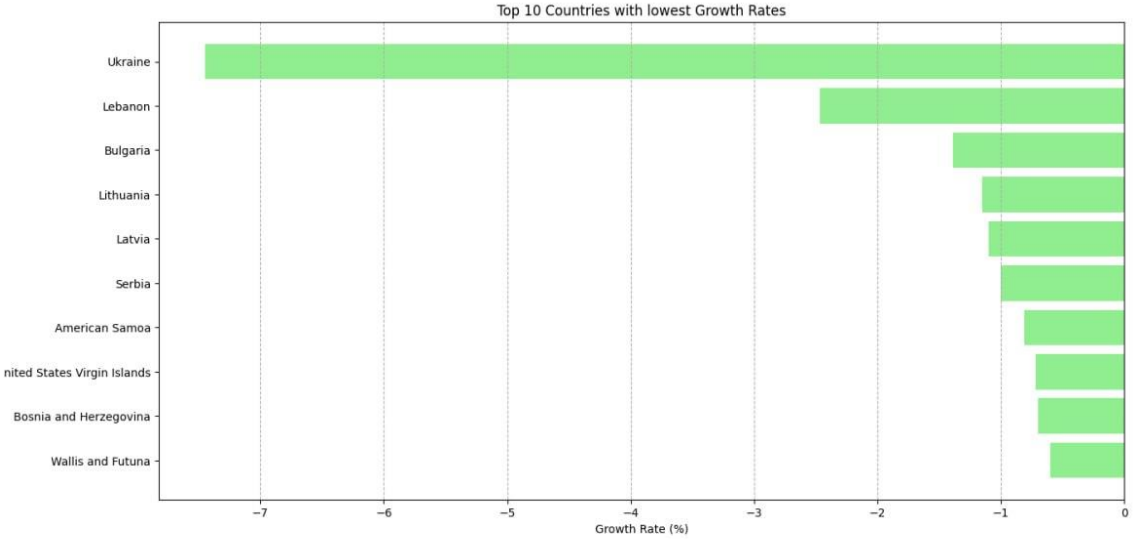
Correlation between 2000 & 2023 population column :



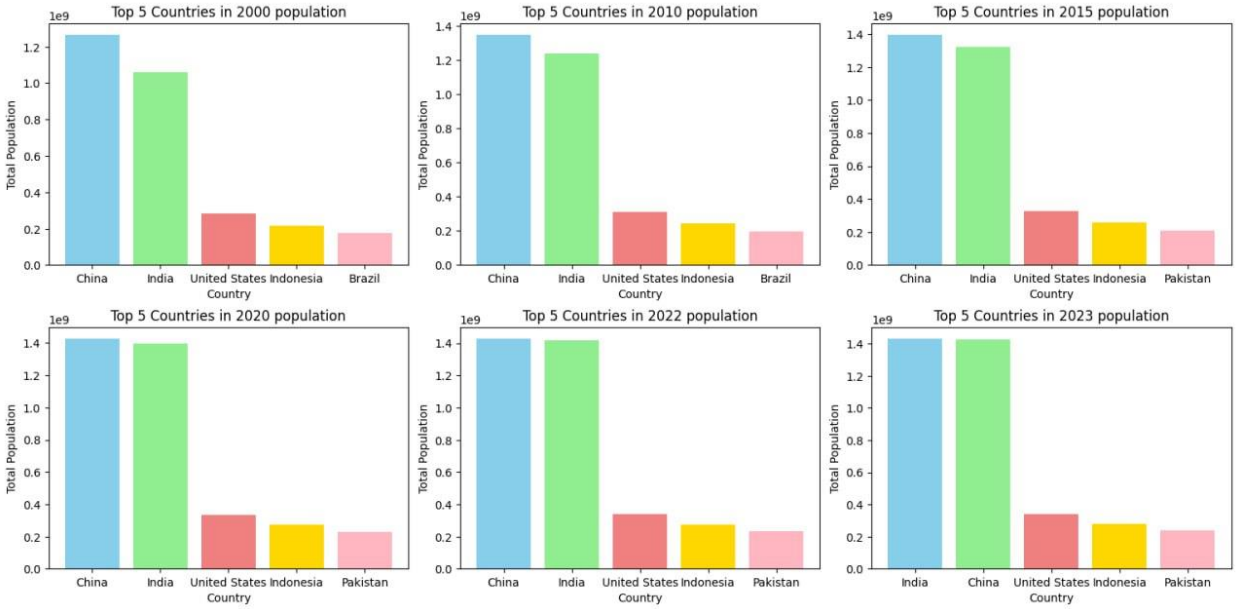
Top 10 columns with highest growth rates :



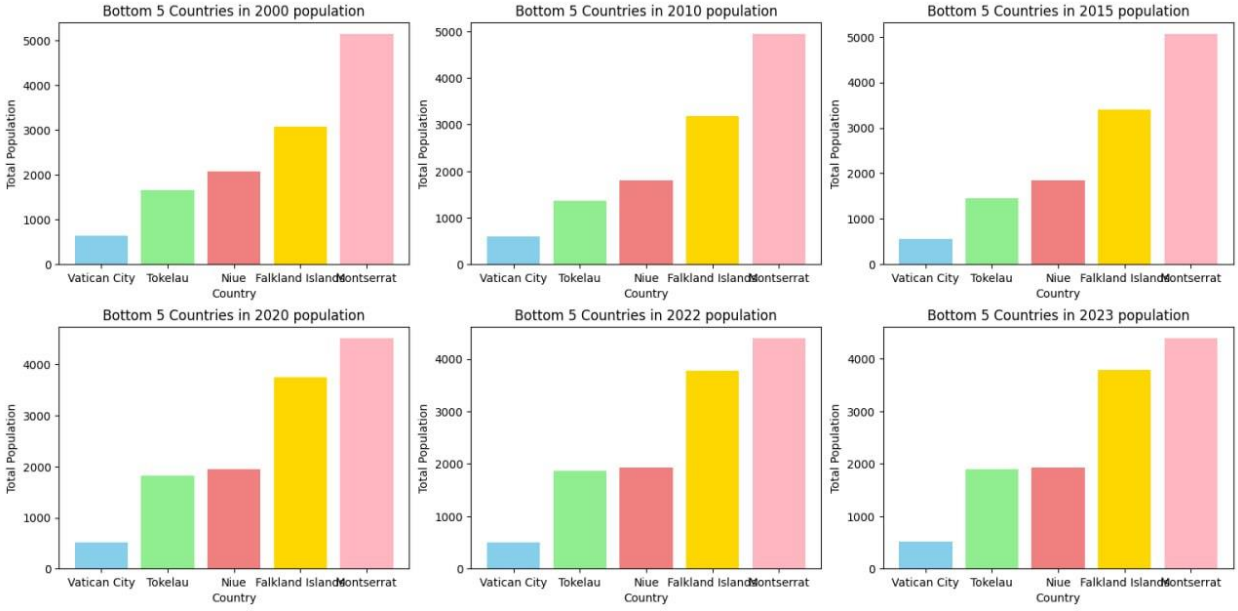
Top 10 columns with lowest growth rates :



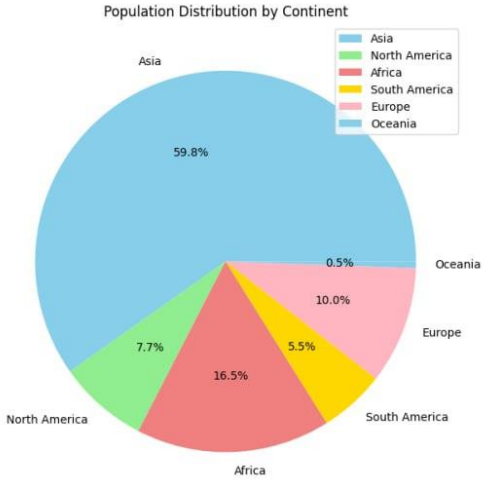
Top 5 countries for total population :



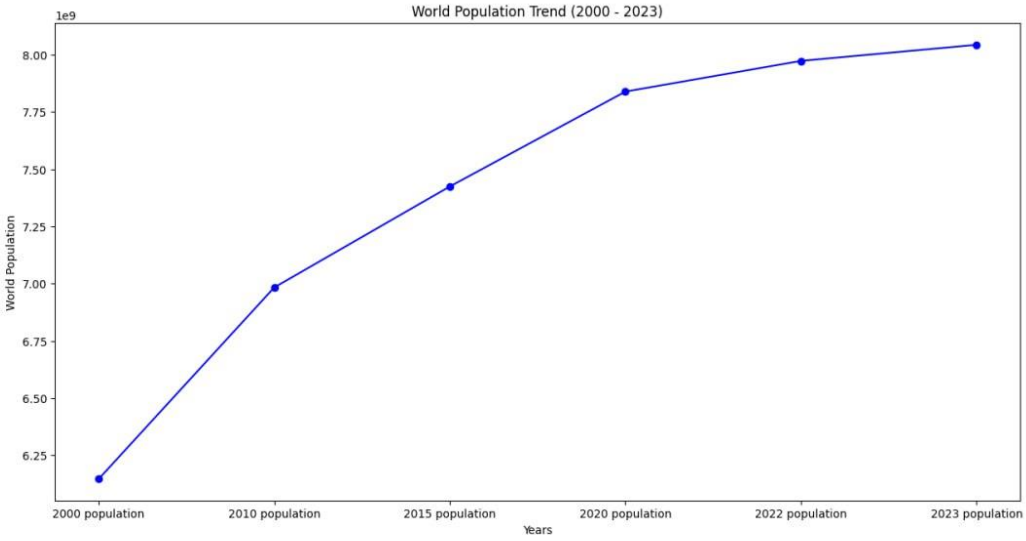
Buttom 5 countries for total population :



Population distibution by continent :



Word population trend (2000 _ 2023) :



Results Discussion

Overall, our project provides a comprehensive analysis of world population trends, distribution, and growth rates over the specified years, along with visualizations to aid in understanding the patterns in the data. And we know greatest range of population are in witch continent in difference years and we prediction to know how many numbers of people after 5 years in future .

Project Conclusion

In conclusion, this project lays the foundation for a comprehensive understanding of global population trends. Future developments can further refine and expand the analysis, making it a valuable resource for policymakers, researchers, and anyone interested in the dynamic field of populatio