Big Game Census Data Visualization Report

1. Introduction

- **Project Objective**: The goal of this project is to provide actionable insights by analyzing and visualizing census data for big game populations. This analysis will uncover population trends, geographic distributions, and habitat correlations to support effective wildlife management and conservation efforts.
- **Data Source**: The data comes from 2016 census estimates, which include population counts, species distributions, and demographic information across various regions. It is an essential resource for understanding species trends over time and by location.

2. Data Collection and Preparation

- **Data Loading**: The initial step was loading the dataset from an Excel file, chosen for its compatibility with Python's data analysis tools, specifically Pandas. This allowed seamless data handling and analysis.
    - **Code Example**:

        python

        data = load_data(file_path)
- **Data Cleaning and Transformation**:
    - **Handling Missing Values**: We identified missing values in several columns, particularly in numeric data, and filled these gaps using the mean value for each column to maintain consistency across the dataset. This approach ensured that missing data did not skew our analysis.
    - **Data Transformation**: After inspecting the dataset, we transformed it by renaming columns and adjusting data types to improve readability and alignment with analysis needs. For instance, date columns were converted to datetime formats where applicable.
    - **Code Example**:

        python

        data = clean_data(data)

3. Exploratory Data Analysis (EDA)

- **Descriptive Statistics**: Descriptive statistics provided a foundation for understanding the dataset, revealing measures like mean, median, minimum, maximum, and standard deviation across population and geographic data.
    - **Insights**: This analysis highlighted a broad range in population sizes across species, suggesting significant diversity in big game populations. It also provided an overview

of data variance, helping to identify any extreme values or outliers that could require further investigation.

- **Code Example**:

```
python

print(data.describe())
```

- **Correlation Analysis**:
  - **Method**: We used a correlation heatmap to visualize relationships between numerical attributes, providing insights into how factors like geographic location, population density, and species type interact. This helped pinpoint key variables that might influence population size or distribution.
  - **Key Insights**: The heatmap revealed notable correlations between specific regions and certain species populations, suggesting regional habitat preferences or the impact of environmental factors. For instance, population sizes for certain species were consistently higher in specific regions, indicating favorable habitat conditions.
  - **Code Example**:

```
python

sns.heatmap(data.corr(), annot=True, cmap='coolwarm')
```

4. Data Analysis and Visualization

Population Trends Over Time

- **Objective**: The aim was to explore how species populations have changed over time, which can provide valuable insights into growth or decline trends and inform conservation strategies.
- **Method**: Line plots were used to visualize population changes for each species across multiple years, making it easy to identify patterns such as population booms, stability, or declines.
- **Findings**: Species trends varied, with some populations showing consistent growth, likely due to effective conservation measures, while others showed declines, potentially due to habitat loss or environmental pressures.
- **Code Example**:

```
python

def plot_population_trend(data, species):
    species_data = data[data['Species'] == species]
    plt.figure(figsize=(12, 6))
    sns.lineplot(x='Year', y='Population', data=species_data)
    plt.title(f'Population Trend of {species} Over Time')
```

```
plt.xlabel('Year')
plt.ylabel('Population')
plt.show()
```

Geographic Distribution of Species

- **Objective**: To analyze the distribution of species across regions, highlighting areas with high biodiversity and potential hotspots for conservation.
- **Method**: A bar plot was used to display population counts across regions for each species, providing a clear view of which regions host larger populations.
- **Insights**: Analysis indicated that certain species populations were concentrated in specific regions, pointing to these areas as key habitats. This information is crucial for focusing conservation resources effectively.
- **Code Example**:

```
python
plt.figure(figsize=(12, 6))
sns.barplot(x='Region', y='Population', hue='Species', data=data)
plt.title('Population Distribution by Region')
plt.xlabel('Region')
plt.ylabel('Population')
plt.xticks(rotation=45)
plt.show()
```

5. Interactive Dashboard for Data Exploration

- **Objective**: To make the insights accessible and interactive, we developed an interactive dashboard using Plotly. This allows users to explore data dynamically, selecting specific species and years to view population trends and geographic distributions in real-time.
- **Tool**: We used Plotly's line chart capabilities to create interactive visualizations, enhancing user engagement and enabling decision-makers to analyze patterns at a more granular level.
- **Code Example**:

```
python
import plotly.express as px
fig = px.line(data, x='Year', y='Population', color='Species', title="Population Trends Over Time")
fig.show()
```

6. Key Findings and Insights

- **Population Trends**: Some species showed significant population growth over the study period, possibly due to conservation efforts, while others displayed consistent decline, indicating a need for targeted intervention.
- **Geographic Hotspots**: The analysis revealed regions with high species diversity, marking them as potential focal points for habitat preservation.
- **Conservation Opportunities**: By identifying regions and species at risk, this analysis highlights opportunities for targeted conservation efforts, potentially focusing on species with declining populations and regions with fragile ecosystems.

7. Conclusion and Recommendations

- **Conclusion**: This analysis of the Big Game Census data has uncovered valuable insights into population trends and species distributions. It provides a foundation for data-driven conservation planning, enabling stakeholders to prioritize resources effectively.
- **Recommendations**:
    - Increase conservation efforts in regions showing a decline in key species populations.
    - Monitor regions with high biodiversity and species richness, as these are critical for maintaining ecosystem stability.
    - Consider further studies on the environmental factors affecting species distributions to gain deeper insights for conservation planning.

8. Future Work

- **Advanced Analytics**: Future work could involve applying machine learning models to predict population changes based on historical data and environmental factors.
- **Automated Data Updates**: Automating data imports and updates from census sources would enable real-time monitoring of population changes.
- **Extended Geographic Analysis**: Incorporating more detailed geographic data, such as climate and land use, could enhance understanding of habitat suitability and threats.