UNIVERSITY OF HERTFORDSHIRE

UNDERSTANDING GDP GROWTH AND GLOBAL CO2 EMISSIONS: A CLUSTER ANALYSIS PERSPECTIVE

Usama Ali Shabab: 22061648

WHAT HAS BEEN LEARNT

Understanding and preparing the dataset involved tasks such as handling missing values, selecting relevant columns, and transposing data for meaningful analysis.

Applying k-means clustering provided insights into grouping countries based on similar CO2 emissions patterns, revealing distinct clusters with unique trends.

Fitting exponential and logistic growth curves allowed us to model and predict future CO2 emissions trends for individual countries, providing a deeper Fitting exponential and logistic growth curves

BACKGROUND

This comprehensive analysis delves into the interplay between a country's GDP growth and CO2 emissions, examining how economic development aligns with environmental impact. By concurrently investigating these two vital indicators, the study aims to uncover nuanced relationships, identify clusters of countries with similar trajectories, and ascertain whether economic prosperity is achieved sustainably or at the expense of heightened carbon emissions. This dual-focus approach enhances our understanding of the complex dynamics between economic advancements and environmental responsibilities, paving the way for informed policies and practices that prioritize both growth and ecological well-being.

Understanding the patterns and variations across countries allows for the identification of best practices and potential areas of improvement, fostering a holistic perspective on the intertwined challenges of economic development and environmental conservation.

AIM

Our aim was to analyze and compare the trajectories of GDP growth and CO2 emissions across different countries, unraveling insights into the complex interplay between economic advancement and environmental impact.

OBJECTIVES

- Cluster countries based on GDP growth and CO2 emissions trends.
- Identify similarities and differences among clusters for informed environmental strategies.

LITERATURE REVIEW

A literature review guided our analysis, exploring GDP growth, CO2 emission trends, and clustering techniques. Previous studies revealed the complex interplay between economic development and environmental sustainability, informing our methodological approach for comparative analysis.

METHODS

Data Preprocessing:

Performed data cleaning, handling missing values, and transformed data formats.

K-Means Clustering:

Utilized K-means clustering to group countries based on economic and environmental features.

Curve Fitting:

Applied curve fitting techniques (exponential and logistic) for trend analysis.

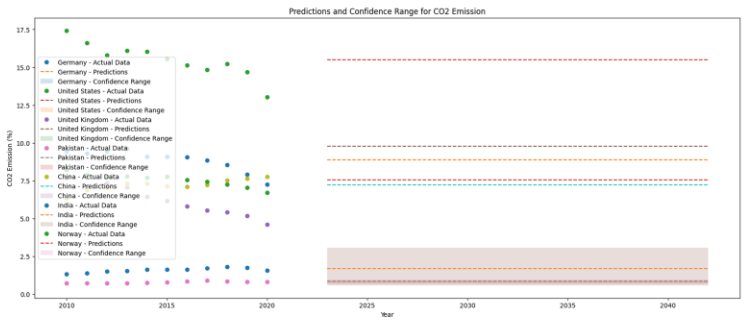
Comparison and Analysis:

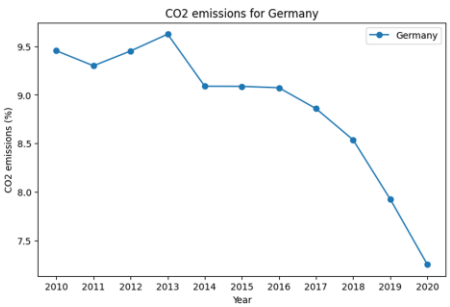
Compared clusters, evaluated similarities, and identified environmental and economic trends.

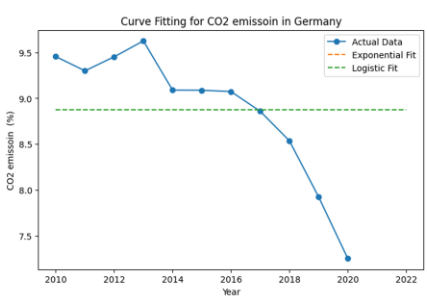
Data Visualization:

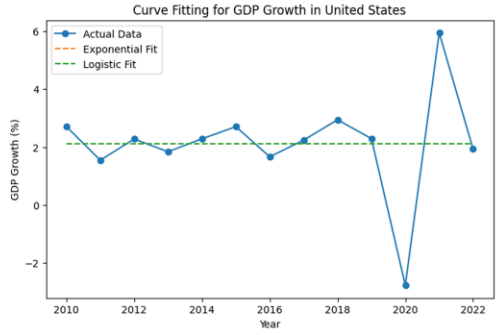
Implemented effective visualizations, including scatter plots and cluster representations, for clear interpretation.

PRELIMINARY RESULTS









DISCUSSIONS

Our analysis revealed nuanced patterns in the relationship between GDP growth and CO2 emissions across diverse countries. Clustering techniques unveiled distinct groups, offering a comparative lens for evaluating economic and environmental trends. Notably, certain clusters showcased a decoupling of economic growth from emissions, suggesting potential for sustainable development pathways. However, disparities in emission trajectories within clusters underscored the influence of national policies and industrial structures. The incorporation of curve fitting enabled a deeper understanding of temporal trends, allowing for projections and identification of potential areas for intervention. This discussion highlights the importance of tailored strategies for countries within specific clusters to align economic aspirations with environmental stewardship. Future research should delve into policy implications, exploring mechanisms to enhance sustainable development trajectories and mitigate environmental impact.

REFERENCES

World Bank. (2022). World Development Indicators 2022. Retrieved from https://databank.worldbank.org/source/world-development-indicators
Kaya, Y., & Yokobori, K. (1997). Environment, energy, and economy: strategies for sustainability. United Nations University Press.
IPCC. (2014). Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II, and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.
Scikit-learn: Machine Learning in Python. (2022). Retrieved from https://scikit-learn.org/stable/index.html
Wes McKinney. (2010). Data Structures for Statistical Computing in Python. Proceedings of the 9th Python in Science Conference.

https://github.com/usamaalishabab/Assignment_3.git