Analysis of Electric Power Consumption and GDP Forecasting using Clustering and Curve Fitting

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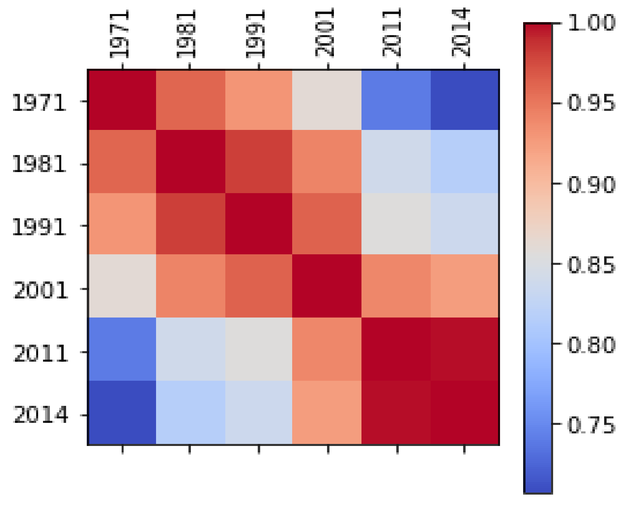
Abstract

This study aims to analyze the electric power consumption patterns and forecast GDP using clustering and curve-fitting techniques. I use the electric power consumption dataset and GDP per unit of energy use dataset for our analysis. The clustering analysis demonstrates distinct patterns in electric power consumption from 1971 to 2014. The forecasting of GDP is performed by fitting exponential, logistic, and polynomial models to the data. This analysis provides insights into the relationship between electric power consumption and economic growth.

Introduction

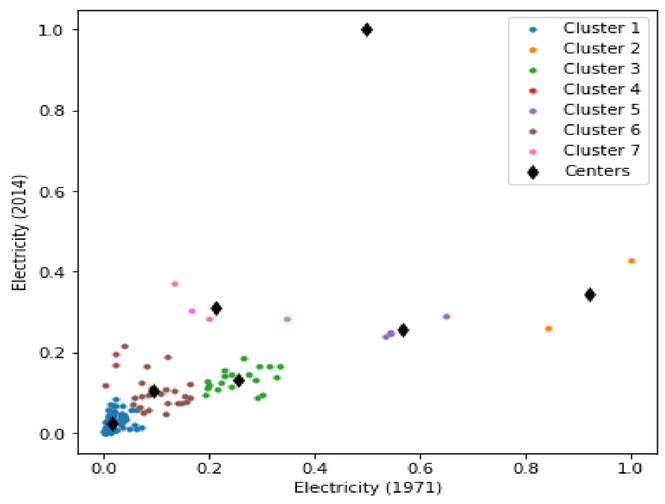
Electric power consumption and GDP are crucial indicators of a country's growth and development. Understanding the patterns in electric power consumption and forecasting GDP can help policymakers and businesses make informed decisions. In this study, we use clustering to analyze the electric power consumption data and curve-fitting techniques to forecast GDP. The Dataset is driven from the World Bank Datasets.

Preliminary Results and Analysis



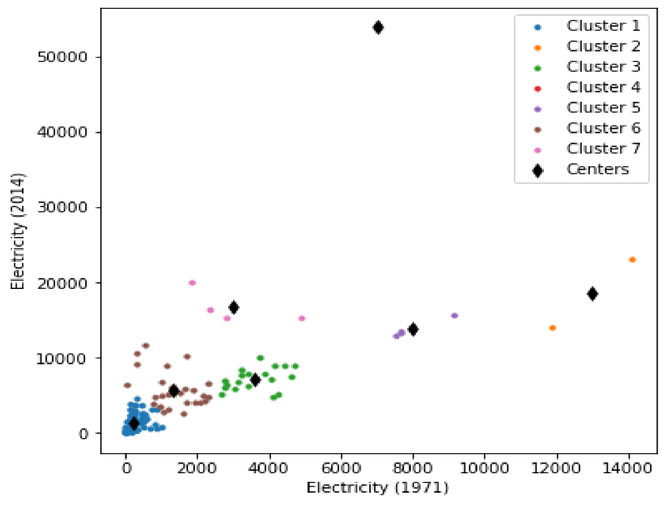
Correlation Matrix Plot

This graph shows the correlation between different years of electric power consumption data. The color intensity indicates the strength of the correlation.



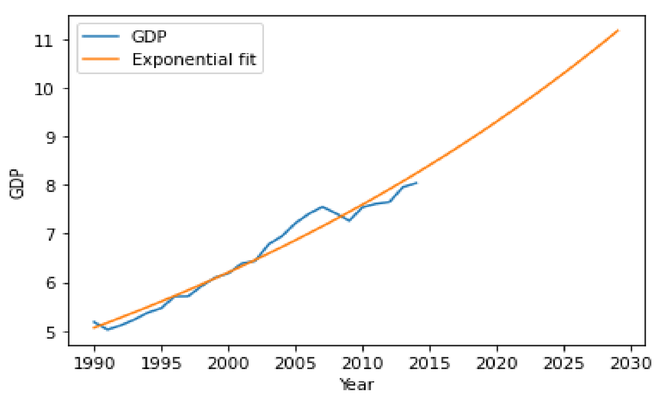
Clustering Plot (Normalized Data)

This graph displays the clusters of electric power consumption in 1971 and 2014 using normalized data. Each color represents a distinct cluster, and the black diamond markers indicate the cluster centers.



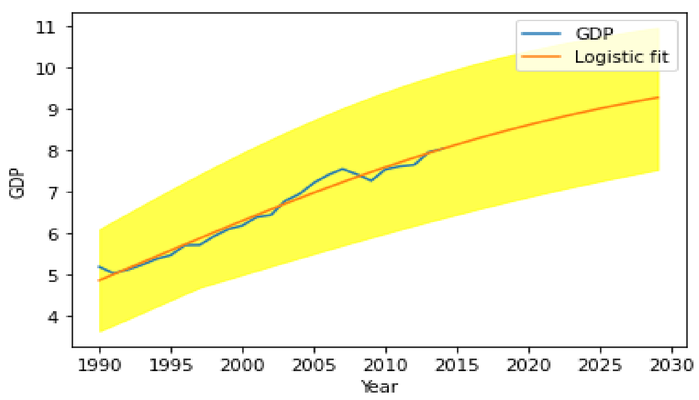
Clustering Plot (Scaled Data)

This graph shows the clusters of electric power consumption in 1971 and 2014 using scaled data, which allows for a clearer comparison between the years.



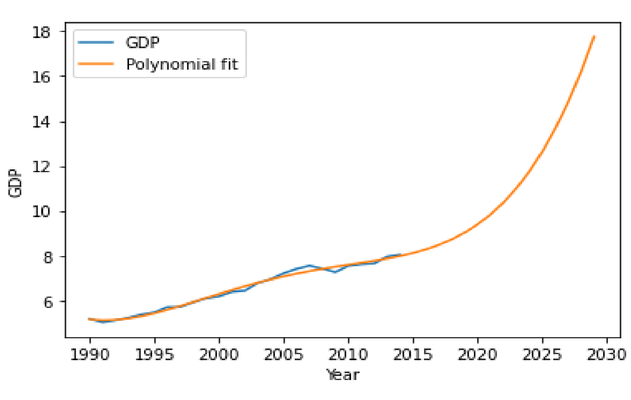
Exponential Fit Plot

This graph illustrates the actual GDP data along with the fitted exponential model.



Logistic Fit Plot

This graph presents the actual GDP data along with the fitted logistic model, including the error ranges in yellow.



Polynomial Fit Plot

This graph displays the actual GDP data along with the fitted polynomial model, including the error ranges in yellow.

Description for Clustering Graph

The clustering graph reveals distinct patterns in electric power consumption from 1971 to 2014. Seven clusters were identified, which show that countries have diverse electric power consumption patterns. These patterns can be further analyzed to understand the factors contributing to the differences in consumption.

Description for Fitting Graph

The fitting graphs showcase the performance of exponential, logistic, and polynomial models in forecasting GDP. Comparing these models allows us to assess their suitability for predicting GDP based on the given data. The logistic and polynomial models also include error ranges, providing insight into the uncertainty associated with the predictions.

Conclusion

This study demonstrates the utility of clustering and curve fitting techniques in analyzing electric power consumption patterns and forecasting GDP. The clustering analysis reveals diverse patterns in electric power consumption, which can be further investigated to understand the factors driving these differences. The curve fitting analysis suggests that the logistic and polynomial models, with their respective error ranges, may provide a reasonable forecast for GDP. This information can be valuable for policymakers and businesses in making informed decisions related to energy consumption and economic growth

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