

# Economic Analysis – Inflation Rate and GDP per capita in Pakistan using Clustering and Fitting Techniques.

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## Abstract:

This study analyses the economic landscape of Pakistan through a rigorous analysis of Inflation rate and GDP per capita trends over the years from 1960 to 2022. Exploring World Bank Data and advanced analytical techniques, the analysis involves clustering, polynomial fitting and forecasting. The initial clustering analysis reveals distinct groupings, offering insights into economic patterns of Pakistan. This provides a visual representation of commonalities among different subsets of data, offering insights into potential economic trends. Furthermore, polynomial fitting captures historical trends in both inflation rate and GDP per capita. Visualization of fitted curves aid in understanding the historical trajectories of these key economic indicators. Forecasting techniques provides future projections for both inflation rate and GDP per capita. Confidence intervals are estimated to account for uncertainties, providing decision-makers with a range of potential scenarios. This study empowers decision-makers with actionable insights related to inflation rate and GDP per capita, serving as a foundation for strategic economic policy and planning.

## Introduction:

The World Bank data provides a huge amount of data related to various indicators for enormous countries over the years. In this study, the interplay between inflation rate and Gross Domestic Product (GDP) is observed for the understanding of economic analysis for Pakistan. Inflation, as a measure of general increase in prices over time, influencing consumer behavior, investment decisions, and overall market stability. Simultaneously, GDP, reflecting the total economic output of the country, serves as a compass for assessing the nation's economic performance and standards of living. Against the backdrop of global economic shift, Pakistan's economic landscape becomes a fascinating subject of inquiry, this report aims to unravel the connection between inflation rate and GDP, leveraging extensive data from World Bank. Main objective of the study is to discern historical patterns embedded in inflation-GDP relationship and to forecast potential trajectories for Pakistan's economic future using clustering, polynomial fitting and forecasting techniques. The findings of this study can have implications for policymakers, economists and stakeholders for strategic decision-making.

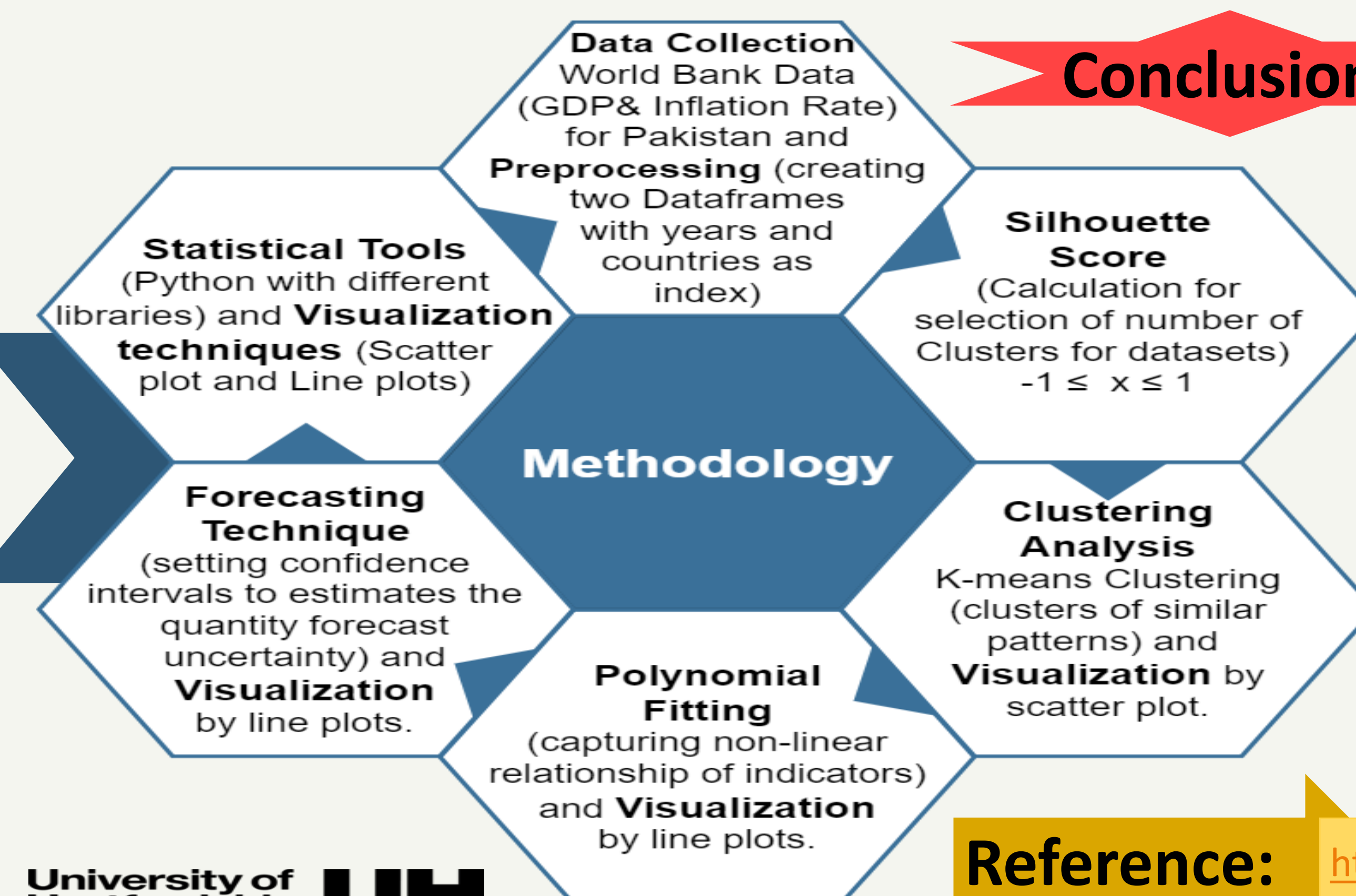
## Objectives:

- 1 Understanding Historical Patterns:**  
Uncover and analyze historical patterns in inflation rate and GDP dynamics of Pakistan.
- 2 Clustering Analysis:**  
Utilize clustering techniques to exhibits similar trends in terms of inflation rate and GDP behavior for Pakistan from 1960 to 2022.
- 3 Polynomial Fitting for Trend Analysis:**  
Applying polynomial fitting to model and understand the long term trend in both inflation rate and GDP per capita for Pakistan over period from 1960 to 2022.
- 4 Forecasting Future Trajectories:**  
Generate forecasts for future inflation rate and GDP trends in Pakistan over the coming years.
- 5 Confidence Interval Estimation:**  
Estimated confidence intervals for generated forecasts to quantify the uncertainty associated with future trajectories.
- 6 Empowering Decision-Makers:**  
Provide policymakers, economists and stakeholders with insights derived from the analysis.
- 7 Recommendation for Future Analysis:**  
Proposing recommendation for future study on Inflation rate and GDP trends.

## Dataset:

The datasets used in this analysis are sourced from the World Bank data which contains information about indicators related to inflation rate (annual %) and GDP per capita (current US\$). Inflation rate referred as general increase in prices over time while GDP reflects the total economic output of the country. These datasets contains information for many countries over an extensive period of time and are useful to understand changing economic trends of countries.

## Methodology:



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## Conclusion:

In closing, the analysis of Pakistan's inflation rate and GDP per capita from 1960 to 2022 reveals crucial insights. The percentage of inflation rate and GDP is lower for cluster 1 whereas it is high for GDP per capita in cluster 2 for Pakistan exposed by clustering. However, polynomial fitting captured fluctuating historical trends of both indicators and forecasting provided potential trajectories depicting increase in inflation rate and GDP in future in Pakistan. This study equips stakeholders with valuable insights for strategic decision-making and further economic analysis.

## Reference:

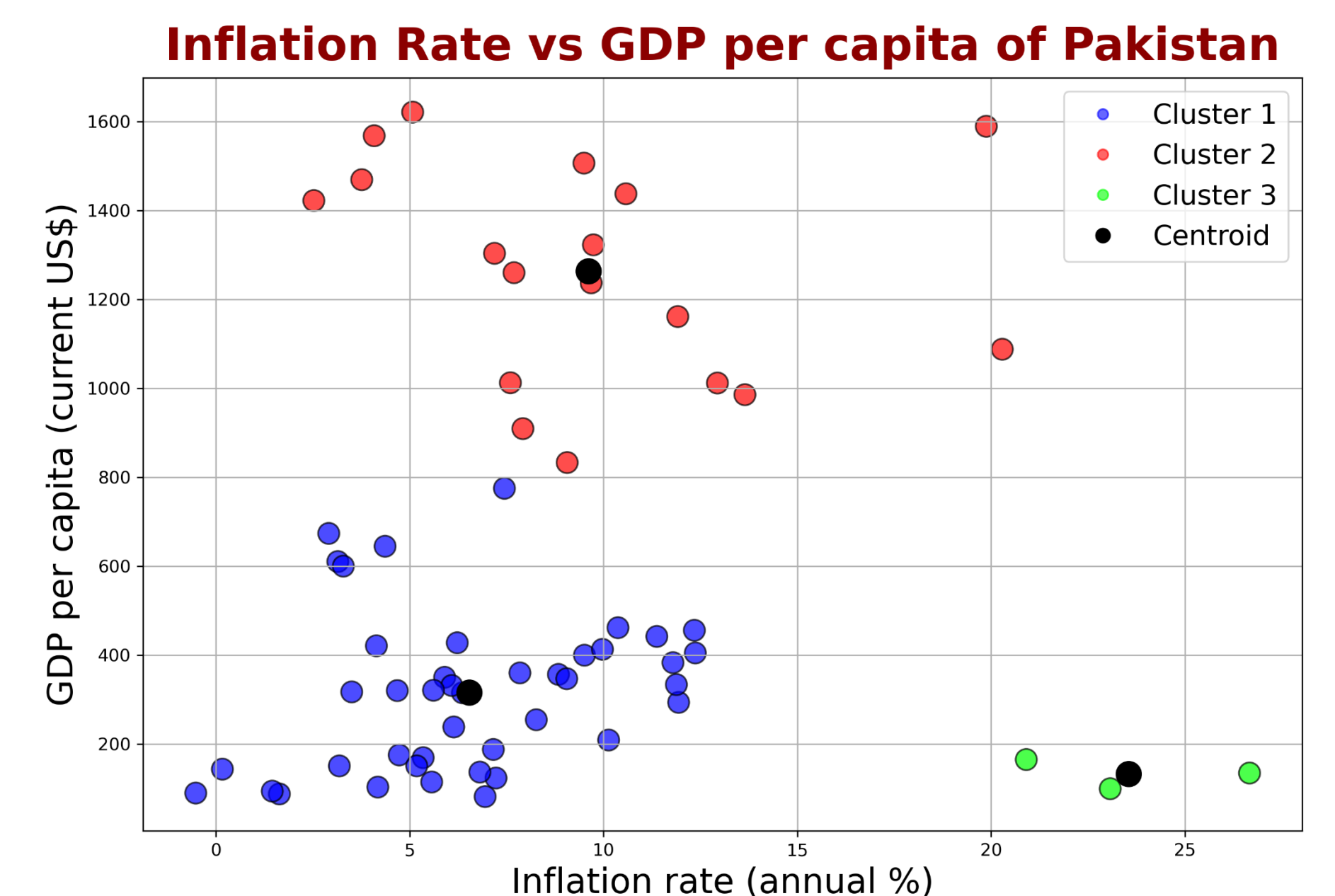
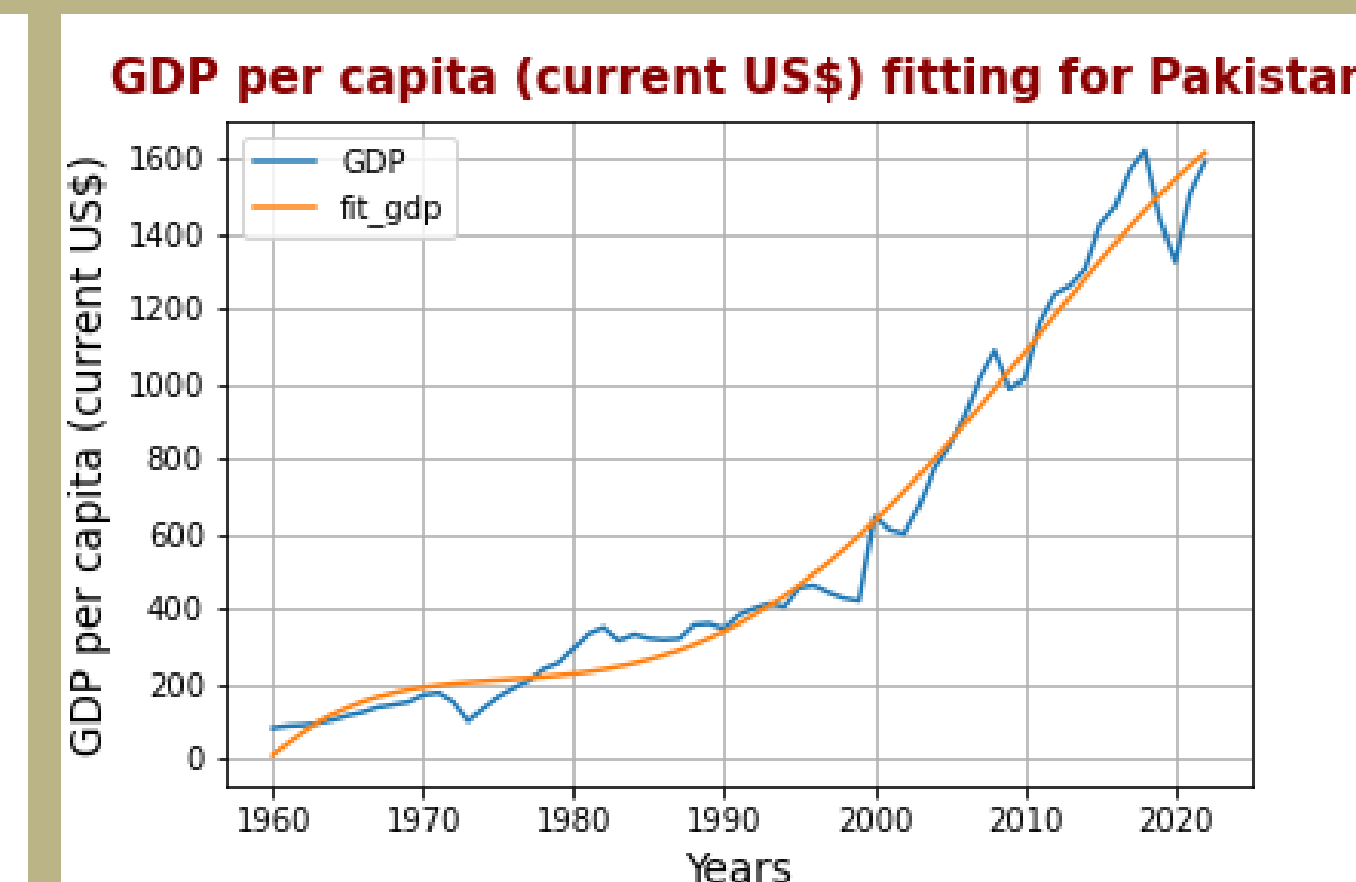
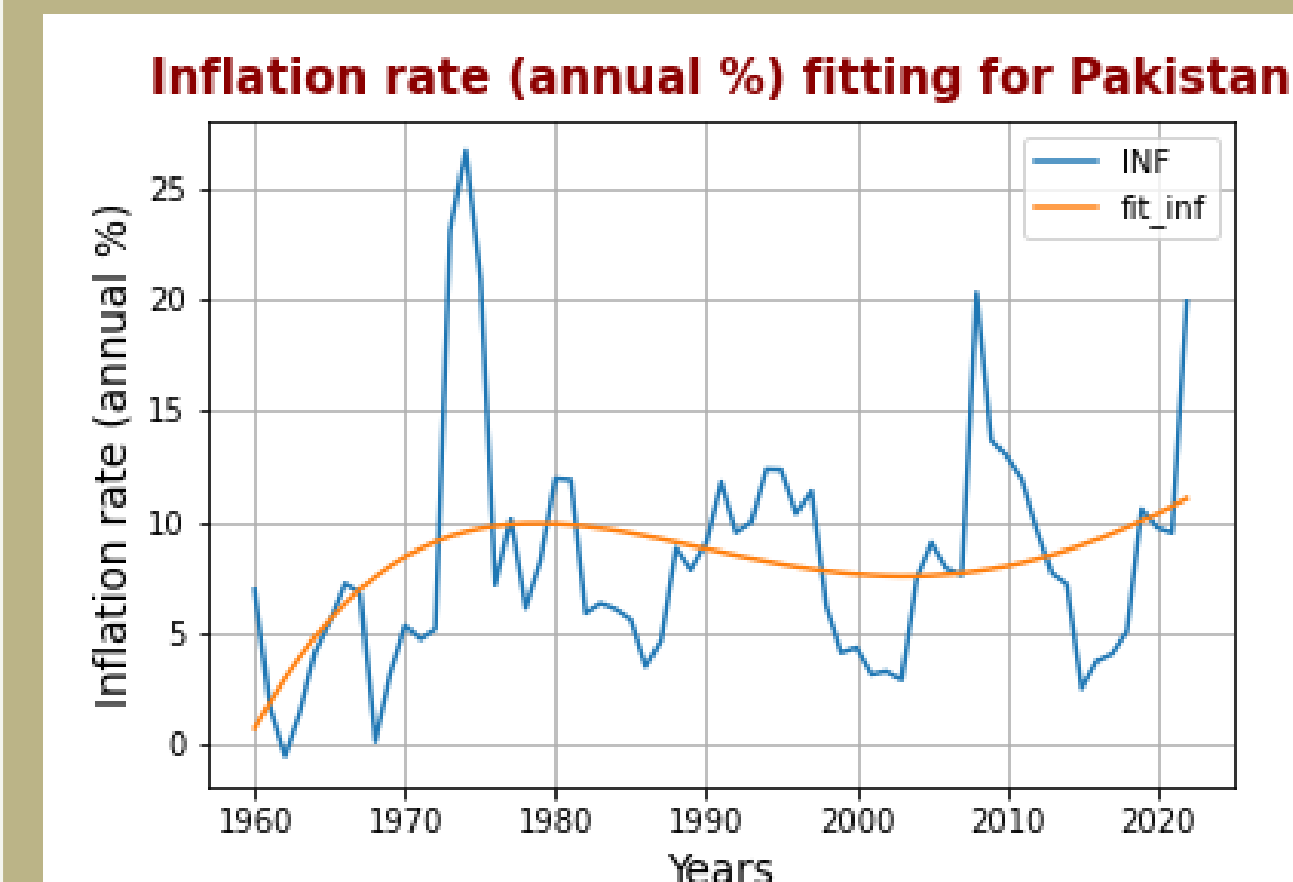
<https://github.com/samanqayyum/Applied-Data-Science-1>

## Findings (Clustering):

Clustering between similar datasets of inflation rate and GDP for Pakistan over a period from 1960 to 2022 showed that the Cluster 1 depicts low percentage of inflation rate varied with GDP per capita. However, Cluster 2 presents the high GDP varied with Inflation rate. This information is useful in understanding the variation between inflation rate and GDP per capita and identifying potential areas for economic development.

## Observation (Fitting):

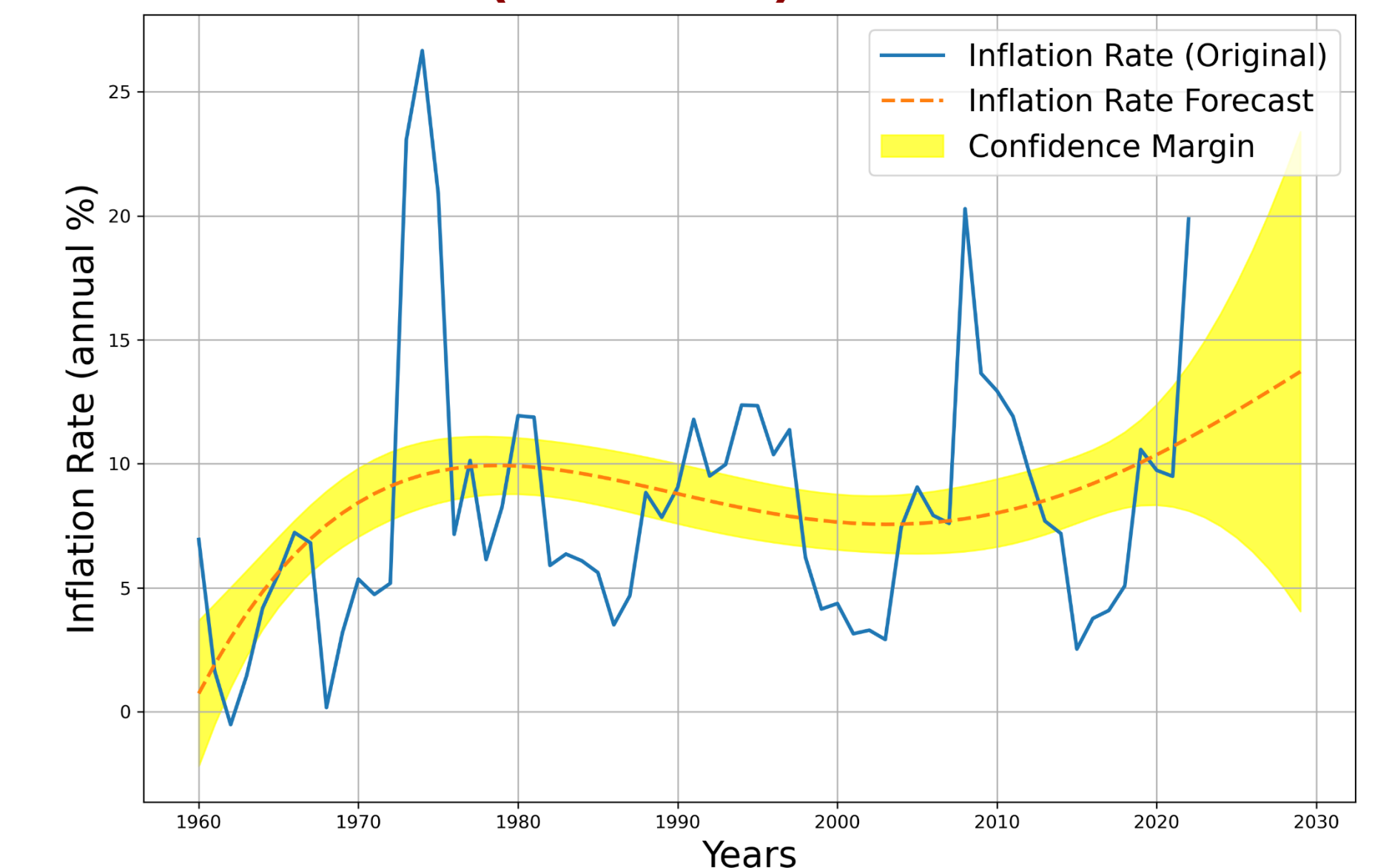
It is observed that the fitting graphs of both GDP and Inflation rate are not linear and showing huge fluctuations with increasing substantially



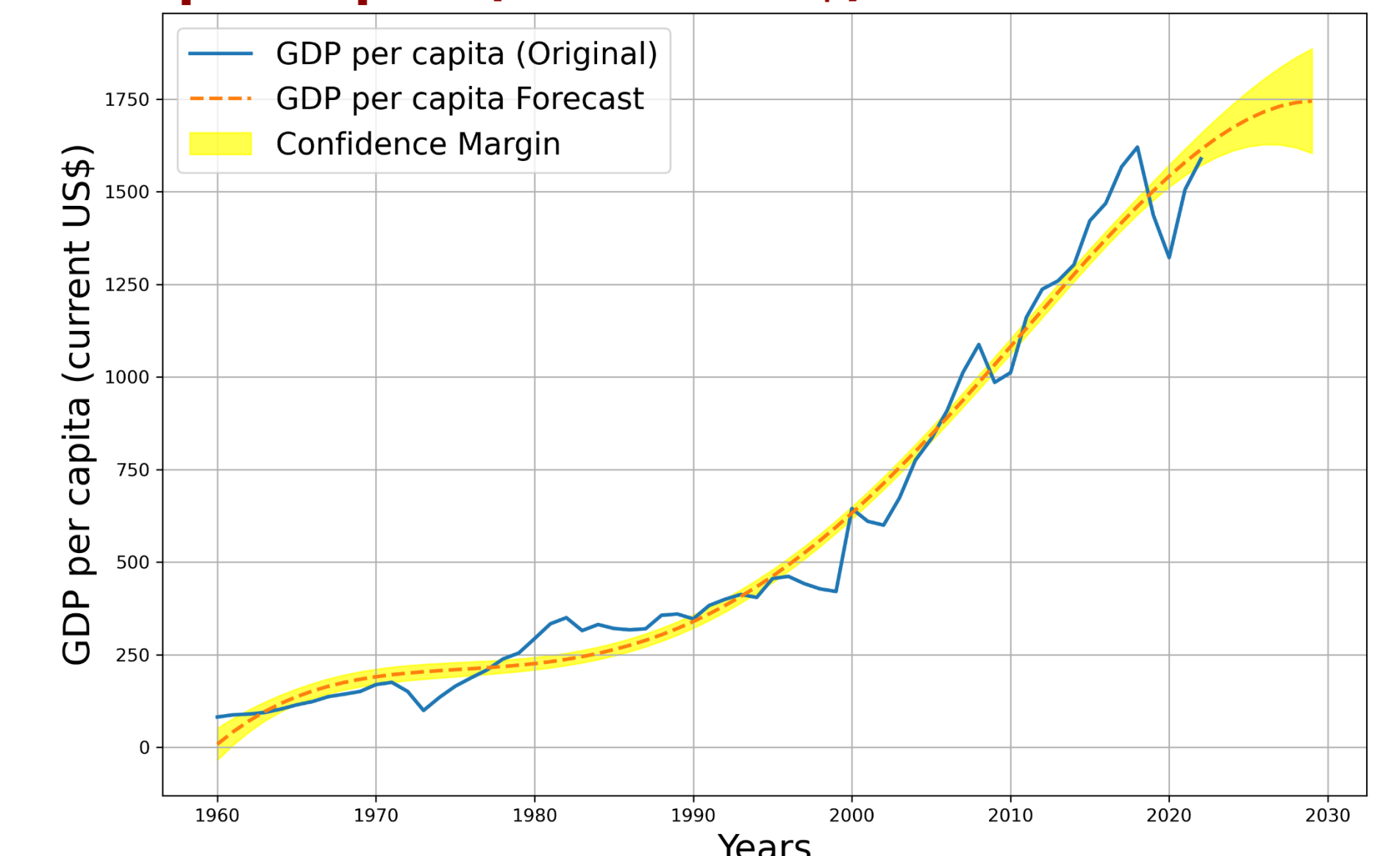
## Prediction (Forecasting):

Analyzing the below forecast graphs for GDP and Inflation rate, It is predicted that the percentage of both inflation rate and GDP has been increasing gradually over the years. So, it is predicted that the inflation rate of Pakistan will increase more than 25% whereas GDP of Pakistan will increase more that 5% by 2030. Economic factors will cause an increase in the percentages of both indicators. Accurate predictions can be made by analyzing future w.r.t affecting factors to indicators.

## Inflation Rate (annual %) Forecast for Pakistan



## GDP per capita (current US\$) Forecast for Pakistan



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