ECONOMICAL GROWTH IMPACT ON CLIMATE
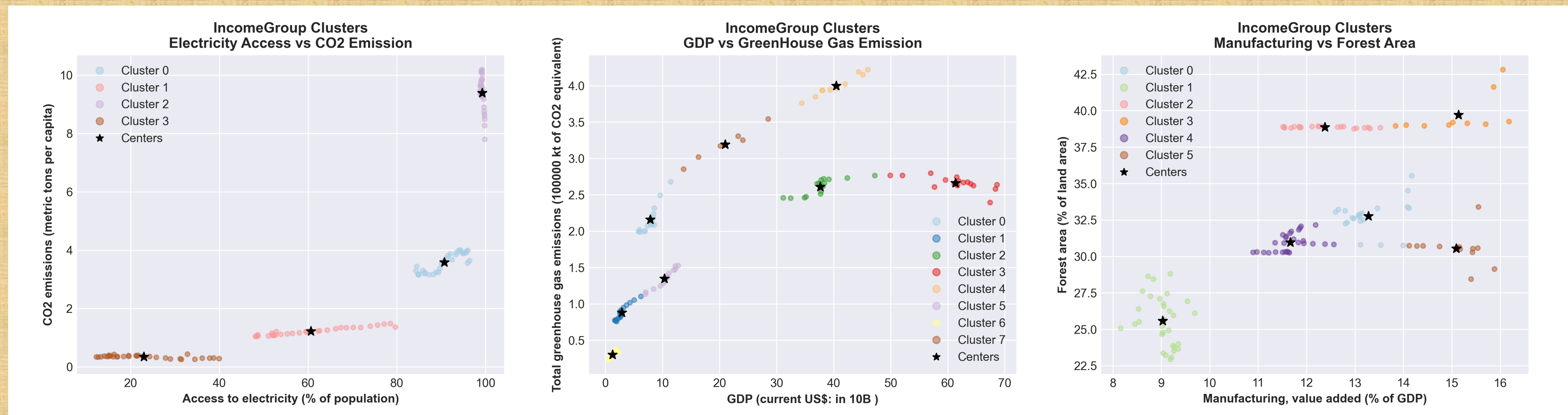## MOHIT AGARWAL

GitHub Repo

INTRODUCTION

The Earth's climate has been changing course over the past few years, due to our advancement in science and technology, leading much more comfortable life than our ancestors. We, in the 21st Century, require unprecedented amount of goods, resulting in extracting raw materials from the depths of earth's soil and ocean beds, for manufacturing. The effects of mining to the environment are quite well documented, causing deforestation, soil-erosion, pollution, human-wildlife conflict, etc, but above all the emissions of greenhouse gases, warms the planet by trapping heat within the atmosphere. Yes, there are natural factors, like, volcanic eruptions, shifting our climate, but the human interaction with nature, has accelerated the process.

ABSTRACT

An analysis using clustering and curve-fitting has been performed on the said topic, considering the factors like CO_2 emission, access to electricity, total greenhouse gases, GDP(Gross Domestic Product), forest area and value-added manufacturing. The clustering was performed by aggerating all the countries present in the dataset by their incomes, namely, high, low, upper-middle, lower-middle income groups from the year 1990 to 2020. Number of cluster were selected using silhouette scores. Using curve-fitting technique, forecast for a country among the upper-middle income group, China, have been conducted. From the analysis, it's evidential that the countries among upper-middle and lower-middle groups would grow its infrastructure, along with its impacts on the environment.

CLUSTERING

- **Left-Figure** → The graph of Electricity Access vs CO_2 Emission shows a clear divide between various counties income-group, giving distinct clusters, stating that the population of a country with higher chances of electricity access, emits more CO_2.
- **Middle-Figure** → The graph of GDP vs Total Greenhouse Gas Emission show 8 clusters, identifying countries with moderate GDP(350B-500B US$)-Cluster 4, produces the highest total greenhouse gases, despite countries have higher GDP.
- **Right-Figure** → The graph of Manufacturing vs Forest Area produces 6 clusters, which implies that as the valued added manufacturing increases, the land area of forest also increases.

CURVE-FITTING & FORECAST
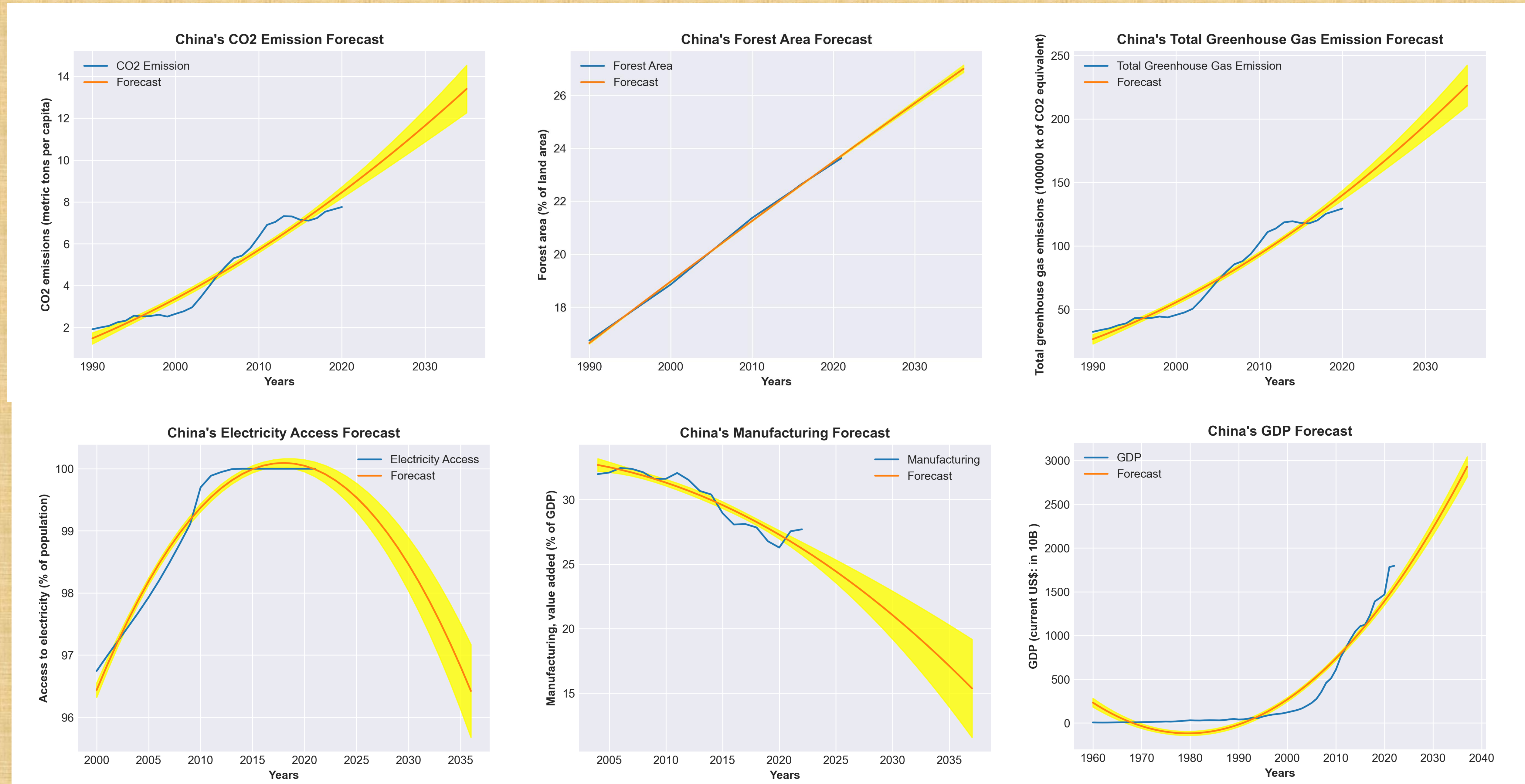
- China's **Total Greenhouse Gases** and **CO_2 Emission** plots shows to be linearly increasing for the next fifteen years, by almost 1.7 times and twice the present values, respectively, despite the downfall prediction seen in electricity access and manufacturing.
- **Manufacturing** in China is forecast to fall linearly to 15.37% of GDP from a current 27.70%. **Access to Electricity** forecast graph show that, the population will suffer to have proper electricity, falling back slightly lower to it's early 2000's.
- **Forest** growth has been linear over the years and forecast for next 15 years also says it will be linear. The yearly growth is about 0.8%
- **GDP** forecast graph clearly show the growth will be somewhat an exponential one, growing by almost 49% of current value.

CONCLUSION

The clustering analysis gives an insight that higher income countries, like United States, Germany contribution to the environmental degradation is quite high. However, the upper and lower middle-income countries, like Brazil and India, respectively, have started to produce high amount of pollutant due to urbanization. Looking at China's forecast, their effects to scrape greenhouse gases through foresting has not been yielding desire results, as the emission is on the rise. We need to starts taking care of our planet, as it has taken care of us.