CO2 EMISSION BY COUNTRIES

INTRODUCTION:

Carbon dioxide emissions are the primary driver of global climate change. It’s widely recognised that to avoid the worst impacts of climate change, the world needs to urgently reduce emissions. But, how this responsibility is shared between regions, countries, and individuals has been an endless point of contention in international discussions.

We see that prior to the Industrial Revolution, emissions were very low. Growth in emissions was still relatively slow until the mid-20th century. In 1950 the world emitted 6 billion tonnes of CO_2.
By 1990 this had almost quadrupled to 22 billion tonnes. Emissions have continued to grow rapidly; we now emit over 36 billion tonnes each year.Emissions growth has slowed over the last few years, but they have yet to reach their peak.

A) OVERVIEW:

In general, developed countries have higher CO_2 emissions. In the United States , energy use has increased in the past five years, most likely due to greater heating and cooling demands and lower oil prices, increasing the number of people traveling. This increase comes after almost a decade of a decrease in energy use. Developed countries such as Denmark, Luxembourg, and Switzerland are among the most environmentally friendly, implementing green initiatives to reduce their carbon footprint and overall improve their environmental health. The world can look at these developed countries to lead the initiatives for lowering CO_2 emissions.
China has the highest level of CO_2 emissions, producing 11.535 gigatons of CO_2 emissions in 2019, followed by the United States with 5.243 gigatons. Below are each country's total CO_2 emissions for 2019 and their share of total global CO_2 emissions.

B)PURPOSE:

The world watches out for carbon dioxide (CO_2) emissions. The excess is the main cause of global warming due to the greenhouse effect. We will show you a video and a chart with conclusive data to understand the importance of the compliance of the Paris COP21 resolutions. Global warming worsens the lack of access to water and it increases droughts.

Although the nearly 200 government committed to the COP 21 agreements are the ones who will decide on the compliance of the goals, there is a lot each one of us can do. First of all, to reduce any combustion process we provoke directly, such as the use of the car or the burning of wood; we also need to avoid any unnecessary electrical expenditure, which is likely to be high: lighting, domestic appliances, air conditioning and heating are responsible for a great part of the CO_2 columns you have seen in the video.

We also need to be aware that we need to fight deforestation. Each tree that is lost results in CO_2 that remains in the atmosphere. We all need to be aware of a perverse cycle: if temperature increases, so will do the transpiration of vegetation, with the resulting reduction of humidity in the soil; if we add less rain and more violent downpours to this, we obtain more erosion and deforestation, with the resulting reduction in the absorption of CO_2.

LITERATURE SURVEY:

Carbon emission research was initiated in 1981 with the first publication focusing on volatile organic carbon emissions of cooling tower water [22]. Thereafter several researchers explored the domain without significant impacts until the Kyoto protocol was signed in 1997. However, carbon Sustainability 2019, 11, 3972 5 of 24 emission research became a trending topic after 2007, resulting in a significant increase in research publications. With the rising global temperatures, climate change has become a major global concern which is also considered as the most serious issue global community has to address in the 21st century [23]. Research on global carbon emissions has significantly increased after discovering carbon emissions as the major cause of climate change. Increasing carbon emissions have caused significant concern amongst the countries such as China, United States, Russia, India, European Union, and Japan as the leading carbon emitters of the world [24]. Carbon emission research expands over several research areas which include environmental sciences, engineering, economics, energy, etc. Table 1 indicates the top 10 research areas which emission research has impacted.

Top 10 research areas affected by global carbon emission research

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Category	Record Count	Percentage
Environmental Sciences	1374	46.66%
Green Sustainable Science Technology	635	21.56%
Engineering Environmental	586	19.90%
Environmental Studies	557	18.91%
Energy Fuels	535	18.17%
Economics	367	12.46%
Engineering Chemical	143	5.81%
Meteorology Atmospheric Sciences	157	5.33%
Ecology	104	3.53%
Engineering Civil	85	2.89%

Accordingly, it is evident that the majority of carbon emission research relates to environmentrelated aspects. Economics, energy fuels, ecology, and civil engineering are some of the other notable research areas which have been affected by carbon emission research. A major reason for carbon emission research to expand into the aforementioned research areas is the goal of sustainable development which has become increasingly popular among the global community due to low carbon emission society concept

EXISTING PROBLEM:

It is well-known that CO2 emissions contribute to global warming and climate change, which can significantly cause severe impacts and consequences for humans and the environment. CO2 emissions act like a blanket in the air, trapping heat in the atmosphere, and warming up the Earth [11]. This layer prevents the Earth from cooling, and thus raises global temperatures. Global warming would affect environmental conditions, food and water supplies, weather pattern, and sea levels. Based on the National Oceanic and Atmospheric Administration (NOAA) Global Climate Summary, it stated that combined land and ocean temperature since 1880 has increased with an average rate of 0.07 ◦C per decade. The temperature continues rising since 1981, with an average rate of 0.18 ◦C, which is over twice as massive as previous times. Figure 2 illustrates the impact of CO2 emissions as a result of rising global temperatures. The release of CO2 alters water supplies and changes harvesting seasons. For instance, climate change undermines coastal and marine regions with rising ocean levels, which triggers a rising demand for food crops. CO2 also causes acid rain, which physically damages trees [16] and the built environment [17,18]. These impacts and consequences of CO2 emissions can be seen now. They extend well beyond the rising global temperatures, which is affecting ecological systems and communities across the world.

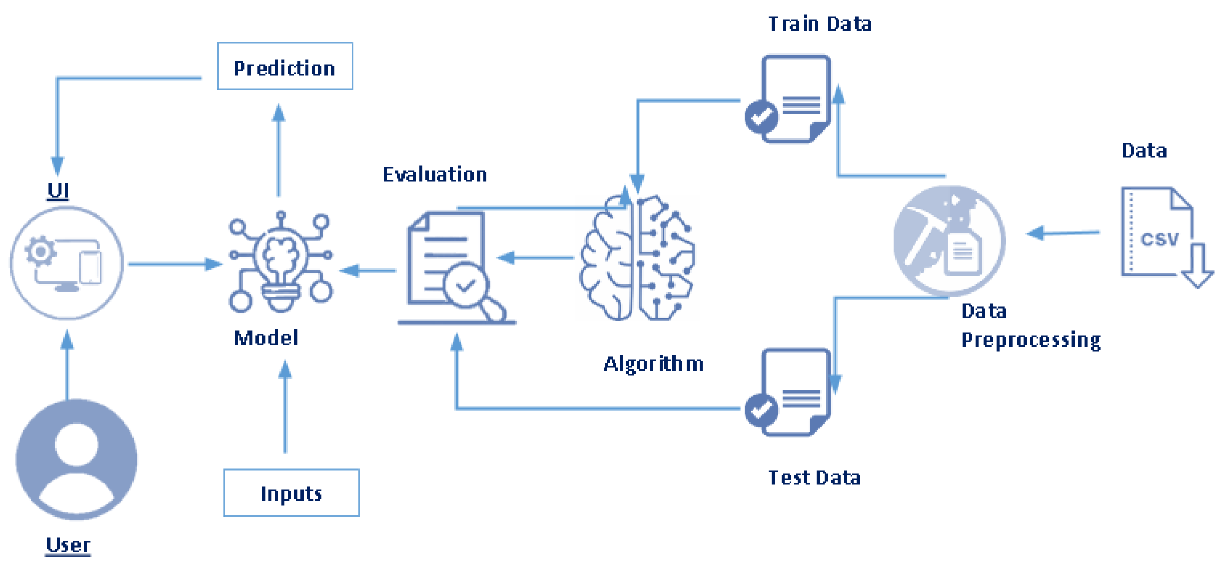
PROPOSED SOLUTION:

Over the past two decades, governments and policymakers have been urged to take action to mitigate CO2 emissions in various sectors [12]. This section discusses several strategies to reduce CO2 emissions in response to concerns on the global warming challenge in the building sector (Figure 3). These strategies can be applied at various scales towards CO2 emissions reduction. Figure 3. Strategies in reducing CO2 emissions in the building sector. 4.1. Standards and Policy Many sustainable building standards, codes, policies, and guidelines packages have been introduced in many countries across the world, which aim to improve building energy performance and reduce CO2 emissions. Under the Paris Agreement commitment and the United Nations Sustainable Development Goals, Nationally Determined Contribution (NDC) was set up in 2015 for the decarbonization of the building sector. A total of 184 countries participated in the NDC. Governments have taken initiatives in the decarbonization of the building sector through the establishment of policies and standards. Table 1 summarizes existing standards and policies committed by selected countries under this strategy, that incorporate the reduction of CO2 emissions in their goals and objectives. These packages set minimum requirements for energy performance and efficiency in buildings towards zero or low carbon buildings. There are more than 60 countries worldwide that initiated plans to implement these either mandatorily or volu

THEORITICAL ANALYSIS:

Climate change is a significant global concerning issue. The large-scale exploitation and utilization of energy resources is one of the major causes of environmental pollution and climate change. As a new concept of energy development , low carbon economy becomes the world's energy production and development constraint. Increasing environmental pressure caused by the consumption of energy, mostly coal. Coal is the main energy consumed in China, The dominance of coal is not expected to fall significantly even as China's energy demand grows , the energy structure with coal playing the main role will remain unchanged for a long time, Coal consumption has been the main cause of smoke pollution[1], The environmental cost is maximum. as well as the main source of greenhouse gas. China with low accumulative emissions. is a developing country in the primary stage of industrialization, From 1950 to 2002, the aggregate amount of China's fossil fuel CO2 emissions accounted for only 9.3 percent of the world's total in the same period. The amount of China's per-capita CO2 emissions ranked 92nd in the world, and the elasticity coefficient of carbon dioxide emissions per-unit GDP was very small. International Energy Agency report shows that the world's carbon dioxide emissions will be incressed with a higher speed after 2010, China's CO2 emissions, second only to the United States, are also a threat to the global environment

BLOCK DIAGRAM:

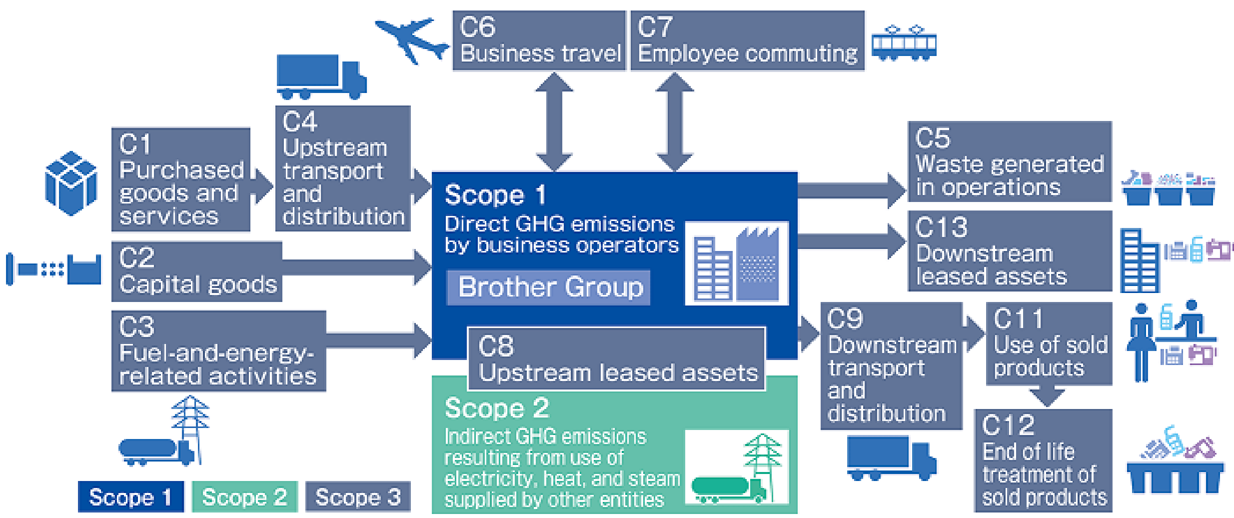


HARDWARE/SOFTWARE DESIGNING:

As computer hardware and software become more powerful, they also increase their energy demand. This is particularly true when it comes to the hardware that runs advanced AI and machine learning applications and trains deep learning models. This means engineers and researchers spend a lot of time working on ways to help systems operate with as much energy efficiency as possible. This, coupled with the use of renewable energy, can have a significant impact on opex emissions — those that come from recurring operations.

Data centers like Facebook's, for example, have increased their energy efficiency through a combination of system improvements and renewable energy. Using warehouse-scale systems and lowering cooling and facility overheads makes for less power consumption. And using renewable energy further reduces a data center's carbon footprint. In 2019, most of Facebook's data centers reached nearly zero carbon emissions after shifting to green, renewable energies like solar and wind.

This is a milestone achievement, but it also points the road to the next challenge for tech companies: shifting focus towards capex emissions and setting ambitious net zero targets through their value chain.



EXPERIMENTAL INVESTIGATIONS

Summary of the case project

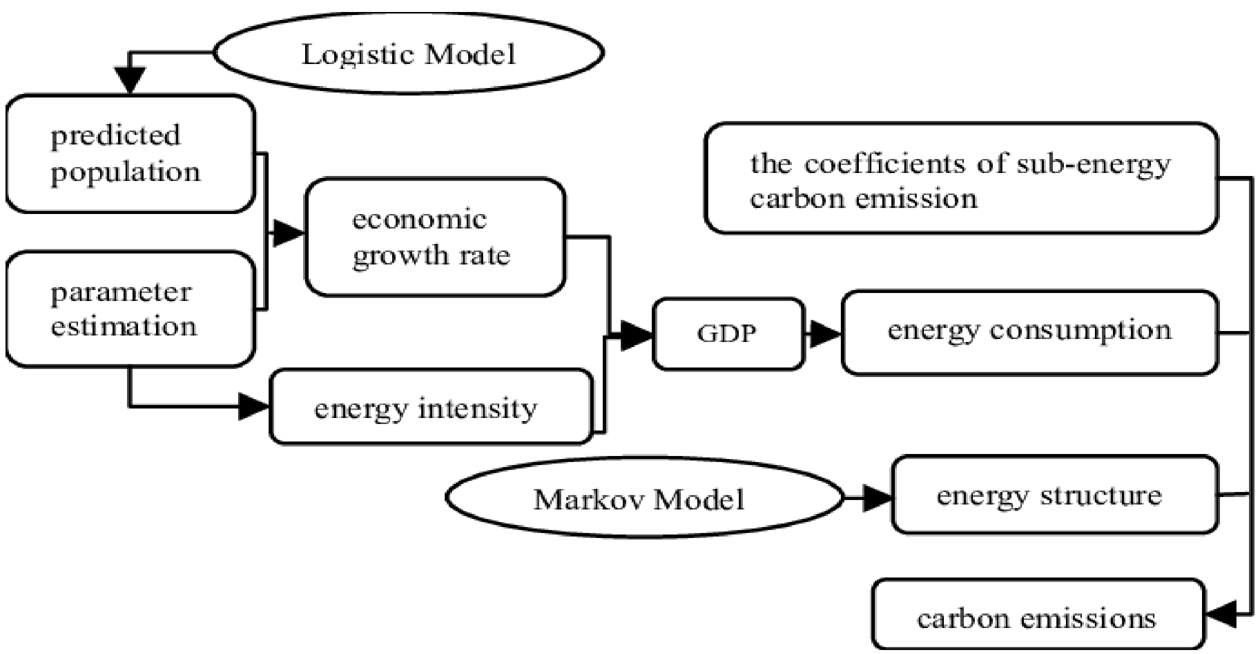
A case project was selected to examine the CO_2 emission reduction effect of in-situ production of PC components. The PC components were then selected for in-situ production. Table 1 summarizes the project characteristic of a huge storage building. The case project involved a four-story building, consisting of PC structures, composed of RC cores and a steel roof. Its floor height was 10 m, with a column span ranged from 12 m to 24 m. It was a heavy-loaded building (2.4 t/m^2).

The PC components produced for this study were columns, girders and slabs. Components that could be produced on site were restricted to columns and girders that require smaller production area. In other words, since columns and girders are thin and long, they did not require a large space for production. However, slabs required a wider space, making it difficult to produce them in the limited space. Thus, Figure 2 shows the quantity of columns and girders used for calculating the CO_2 emission reduction effect.

Planning of in-situ production

Although the column components for the in-situ production were chosen, the decision to use in-situ production was made after the erection began. Therefore, the quantity of PC components ordered for in-plant production had to be adjusted, and the erection schedule for PC components needed to be re-examined. The columns on the first floor were already erected at the time of the in-situ production planning. Figure 3(a) shows 123 columns on the second floor, while Figure 3(b) shows the selected 117 columns on the third floor (240 columns in total). The selected columns were used to analyze the CO_2 emission reduction effect, and their sizes were similar to the rebar details, considering the convenience of construction.

FLOWCHART:



RESULT:

The first research publication on carbon emission was in 1981, and since then carbon emission research has gained ground due to increased global warming. Figure 2 depicts the gradual increase of research publications related to the domain starting from 1980 to June 2019. In 2018, there have been 479 research articles related to GHG emissions, recording the highest number of publications on the domain. According to Figure 3, carbon emission research has increased significantly since 2007. The highest number of publications on carbon emission research was reported in 2018—479 publications. There were 220 publications reported already by June 2019, implying a significant increase in publications on this domain in 2019. The carbon emission research domain remains to be a key theme of sustainability research and many researchers and institutions, therefore, tend to explore the domain extensively. In order to explore the research patterns of carbon emission research, a co-authorship analysis, country, and institutional analysis and a co-citation analysis were conducted. The increasing trend of carbon emission research articles indicates the enhanced attention towards this domain of the researchers. This is a further indication that carbon emission research domain has become a highly popular domain amongst the global researchers. Rapidly changing global climate change can be recognized as one of the major reasons for this increased level of attention. Moreover, the attention of global leaders and policymakers to identify possible climate change mitigation strategies is another reason for this surge in carbon emission research.

ADVANTAGES:

Carbon is in carbon dioxide, which is a greenhouse gas that works to trap heat close to Earth. It helps Earth hold the energy it receives from the Sun so it doesn't all escape back into space. If it weren't for carbon dioxide, Earth's ocean would be frozen solid.

DISADVANTAGES:

.Carbon dioxide gas can be toxic and very harmful to humans, It increases the temperature of the Earth's atmosphere, It causes the global warming effect that has bad effects on the Earth.Increasing the percentage of carbon dioxide gas in the air causes suffocation of living organisms as well as global warming that threatens the existence of life on this planet, a high concentration of carbon dioxide gas causes narcosis.

Carbon dioxide gas level increases to higher than 5 % in the room, this ratio is enough to kill the human being, carbon dioxide gas increases the cerebral blood flow and intracranial pressure.
Increasing the percentage of carbon dioxide gas in air causes melting the snow on the

tops of mountains and the two poles causing the raise of the level of seawater, so some coastal towns will drown.

APPLICATIONS:

There are both natural and human sources of carbon dioxide emissions. Natural sources include decomposition, ocean release and respiration. Human sources come from activities like cement production, deforestation as well as the burning of fossil fuels like coal, oil and natural gas.

Due to human activities, the atmospheric concentration of carbon dioxide has been rising extensively since the Industrial Revolution and has now reached dangerous levels not seen in the last 3 million years.1 2 3 Human sources of carbon dioxide emissions are much smaller than natural emissions but they have upset the natural balance that existed for many thousands of years before the influence of humans.

This is because natural sinks remove around the same quantity of carbon dioxide from the atmosphere than are produced by natural sources.4 This had kept carbon dioxide levels balanced and in a safe range. But human sources of emissions have upset the natural balance by adding extra carbon dioxide to the atmosphere without removing any

CONCLUSION:

First, the technology needs to mature further. While the individual components of CO_2 capture and storage are well developed, they still need to be integrated into full scale projects in the electricity sector. Such projects would demonstrate whether the technology works when fully scaled up, thus increasing knowledge and experience. More studies are needed to analyse and reduce the costs and estimate the potential capacity of suitable geological storage sites.

FUTURE SCOPE:

After 2035, U.S. CO_2 emissions begin to trend upward, reflecting the overall increase in the use of energy as a result of increasing population and economic growth. EIA projects that total U.S. energy-related CO_2 emissions in 2050 will be about 4,807 million metric tons, or about 5% more than the amount in 2020.

BIBLIOGRAPHY:

Since the onset of the industrial revolution, atmospheric concentrations of carbon dioxide have been steadily increasing. Indications are that the global level of carbon dioxide will double by the end of the 21st century. The major sources of this input are the combustion of fossil fuels; deforestation, particularly in the underdeveloped areas of the world; and land modifications such as erosion, desertification, and urbanization. A growing number of people are becoming concerned that this increasing carbon dioxide concentration will adversely affect the global climate. The mechanism of action is popularly known as the “greenhouse effect” and is based on the ability of carbon dioxide to transmit visible and ultraviolet radiation but to absorb and scatter infrared radiation, thereby upsetting the global radiation balance and raising global temperatures. The effects of this temperature rise are in considerable dispute but will probably favor some regions while others will suffer.

APPENDIX:

SOURCE CODE

```
import pandas as pd
import numpy as np
import random
import matplotlib.pyplot as plt
from collections import Counter as c # return counts
import seaborn as sns #used for data Visualization
import matplotlib.pyplot as plt
#import missingno as msno #finding missing values
from sklearn.model_selection import train_test_split #splits data in random train and
test array
from sklearn.metrics import
accuracy_score,mean_squared_error,mean_absolute_error#model performance
import pickle #Python object hierarchy is converted into a byte stream,
from sklearn.linear_model import LinearRegression #Regresssion ML algorithm

data = pd.read_csv('Indicators.csv')
data.shape
data.head(10)
data.head(10)
countries = data['CountryName'].unique().tolist()
len(countries)
```

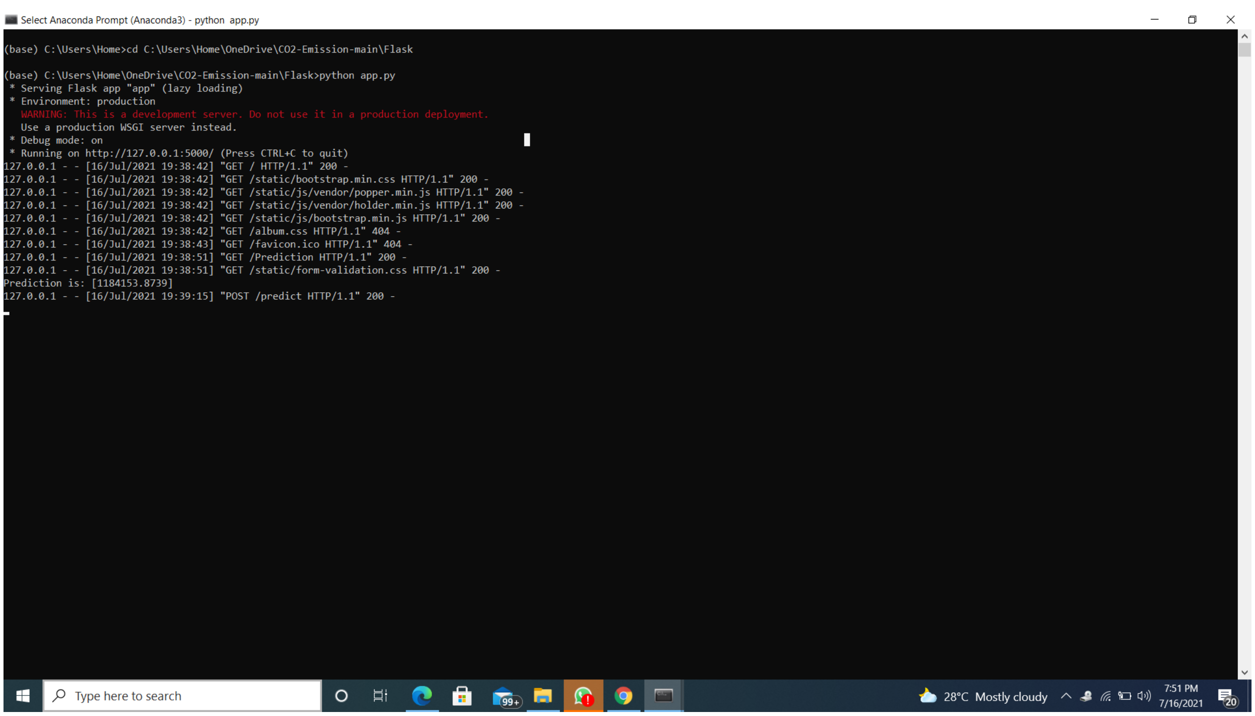
```
# How many unique country codes are there ? (should be the same #)
countryCodes = data['CountryCode'].unique().tolist()
len(countryCodes)
# How many years of data do we have ?
years = data['Year'].unique().tolist()
len(years)
print(min(years)," to ",max(years))
 select CO2 emissions for the United States
hist_indicator = 'CO2 emissions \(metric'
hist_country = 'USA'

mask1 = data['IndicatorName'].str.contains(hist_indicator)
mask2 = data['CountryCode'].str.contains(hist_country)

# stage is just those indicators matching the USA for country code and CO2 emissions
over time.
stage = data[mask1 & mask2]
stage.head()
# get the years
years = stage['Year'].values
# get the values

co2 = stage['Value'].values

# create
plt.bar(years,co2)
plt.show()
# switch to a line plot
plt.plot(stage['Year'].values, stage['Value'].values)

# Label the axes
plt.xlabel('Year')
plt.ylabel(stage['IndicatorName'].iloc[0])

#label the figure
plt.title('CO2 Emissions in USA')
```

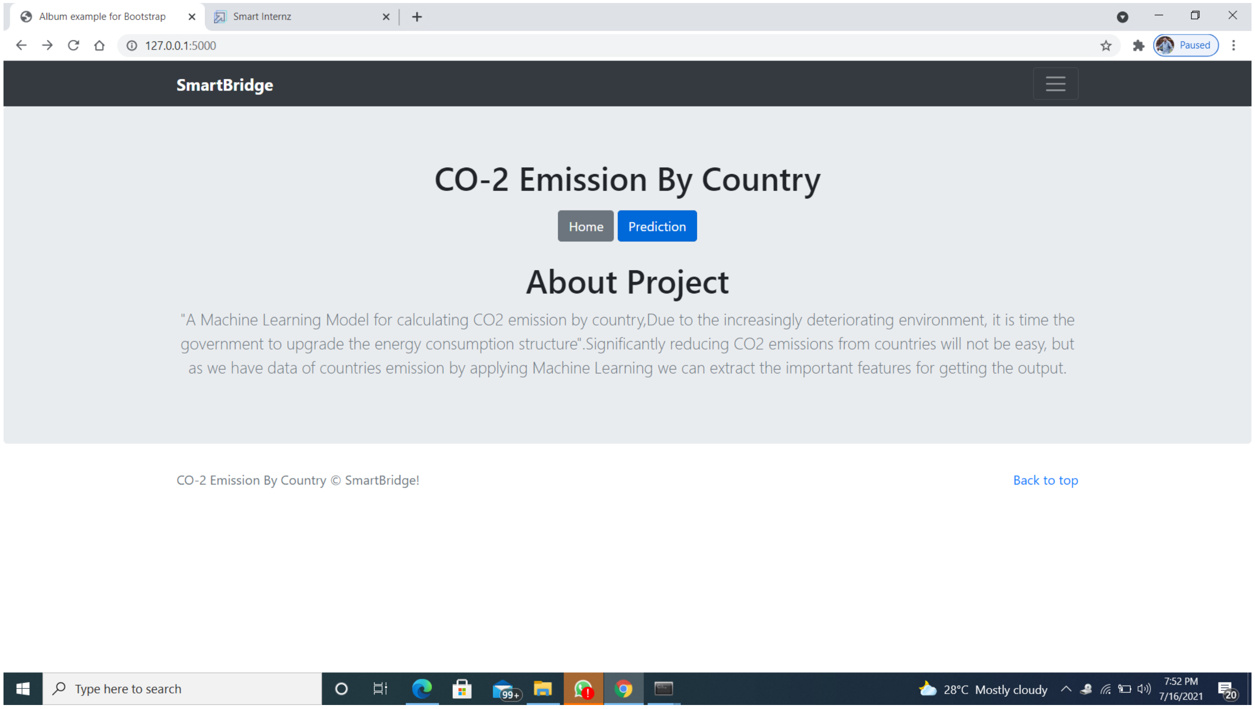
```
# to make more honest, start they y axis at 0
plt.axis([1959, 2011,0,25])
#plt.plot(stage['Year'].values, stage['Value'].values)

plt.show()
# If we want to just include those within one standard deviation fo the mean, we could
do the following
# lower = stage['Value'].mean() - stage['Value'].std()
# upper = stage['Value'].mean() + stage['Value'].std()
# hist_data = [x for x in stage[:10000]['Value'] if x>lower and x<upper ]

# Otherwise, let's look at all the data
hist_data = stage['Value'].values
print(len(hist_data))
# the histogram of the data
plt.hist(hist_data, 10, normed=False, facecolor='green')

plt.xlabel(stage['IndicatorName'].iloc[0])
plt.ylabel('# of Years')
plt.title('Histogram Example')

plt.grid(True)

plt.show()
# select CO2 emissions for all countries in 2011
hist_indicator = 'CO2 emissions \(metric'
hist_year = 2011

mask1 = data['IndicatorName'].str.contains(hist_indicator)
mask2 = data['Year'].isin([hist_year])

# apply our mask
co2_2011 = data[mask1 & mask2]
co2_2011.head()
# let's plot a histogram of the emmissions per capita by country

# subplots returns a touple with the figure, axis attributes.
```

```
fig, ax = plt.subplots()

ax.annotate("USA",
        xy=(18, 5), xycoords='data',
        xytext=(18, 30), textcoords='data',
        arrowprops=dict(arrowstyle="->",
                connectionstyle="arc3"),
        )

plt.hist(co2_2011['Value'], 10, normed=False, facecolor='green')

plt.xlabel(stage['IndicatorName'].iloc[0])
plt.ylabel('# of Countries')
plt.title('Histogram of CO2 Emissions Per Capita')

#plt.axis([10, 22, 0, 14])
plt.grid(True)

plt.show()
# select GDP Per capita emissions for the United States
hist_indicator = 'GDP per capita \(constant 2005'
hist_country = 'USA'

mask1 = data['IndicatorName'].str.contains(hist_indicator)
mask2 = data['CountryCode'].str.contains(hist_country)

# stage is just those indicators matching the USA for country code and CO2 emissions
over time.
gdp_stage = data[mask1 & mask2]

#plot gdp_stage vs stage
# switch to a line plot
plt.plot(gdp_stage['Year'].values, gdp_stage['Value'].values)

# Label the axes
plt.xlabel('Year')
plt.ylabel(gdp_stage['IndicatorName'].iloc[0])
```

```
#label the figure
plt.title('GDP Per Capita USA')

# to make more honest, start they y axis at 0
#plt.axis([1959, 2011,0,25])

plt.show()

from sklearn.ensemble import RandomForestRegressor
rand=RandomForestRegressor(n_estimators=10,random_state=52)
rand.fit(x_train,y_train)
from collections import Counter as c
c(data["CountryCode"])
c(data["CountryName"])
rand.score(x_train,y_train)
data.head()
import pickle
pickle.dump(rand,open("co2.pickle","wb"))
```

UI OUTPUT SCREENSHOT:

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CO-2 Emission By Country
Home
Prediction
About Project
"A Machine Learning Model for calculating CO2 emission by country,Due to the increasingly deteriorating environment, it is time the government to upgrade the energy consumption structure".Significantly reducing CO2 emissions from countries will not be easy, but as we have data of countries emission by applying Machine Learning we can extract the important features for getting the output.
CO-2 Emission By Country © SmartBridge!
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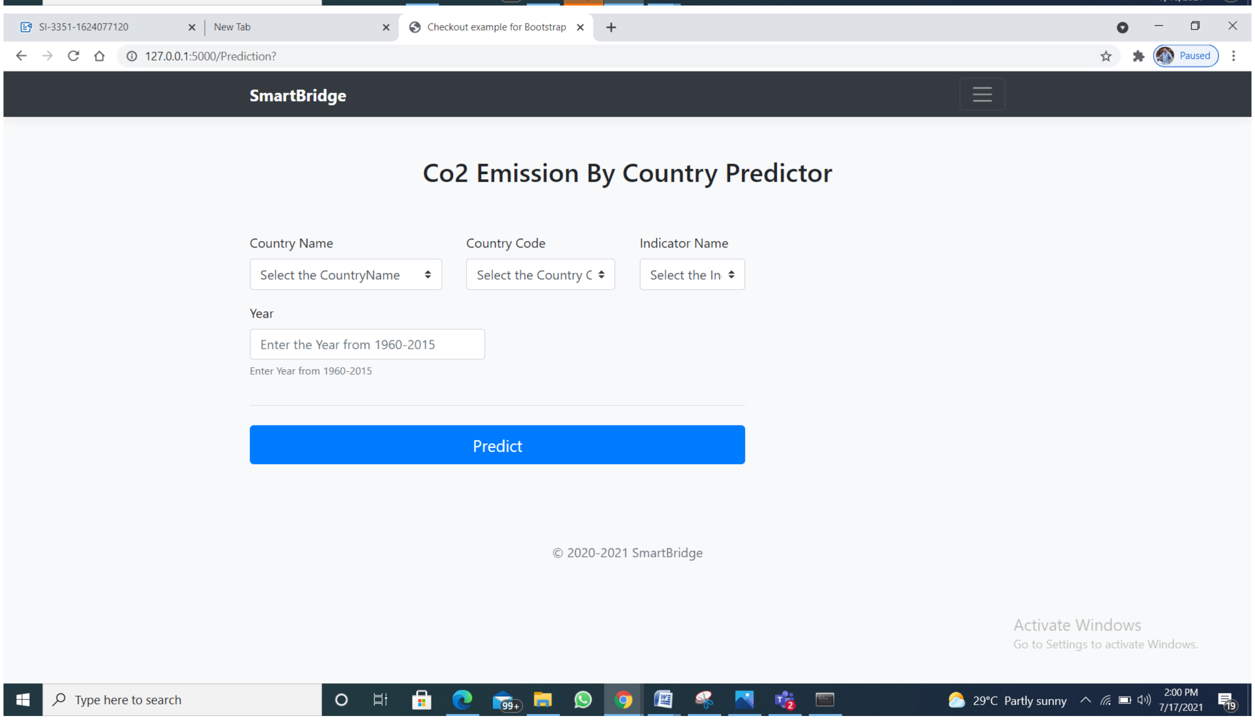
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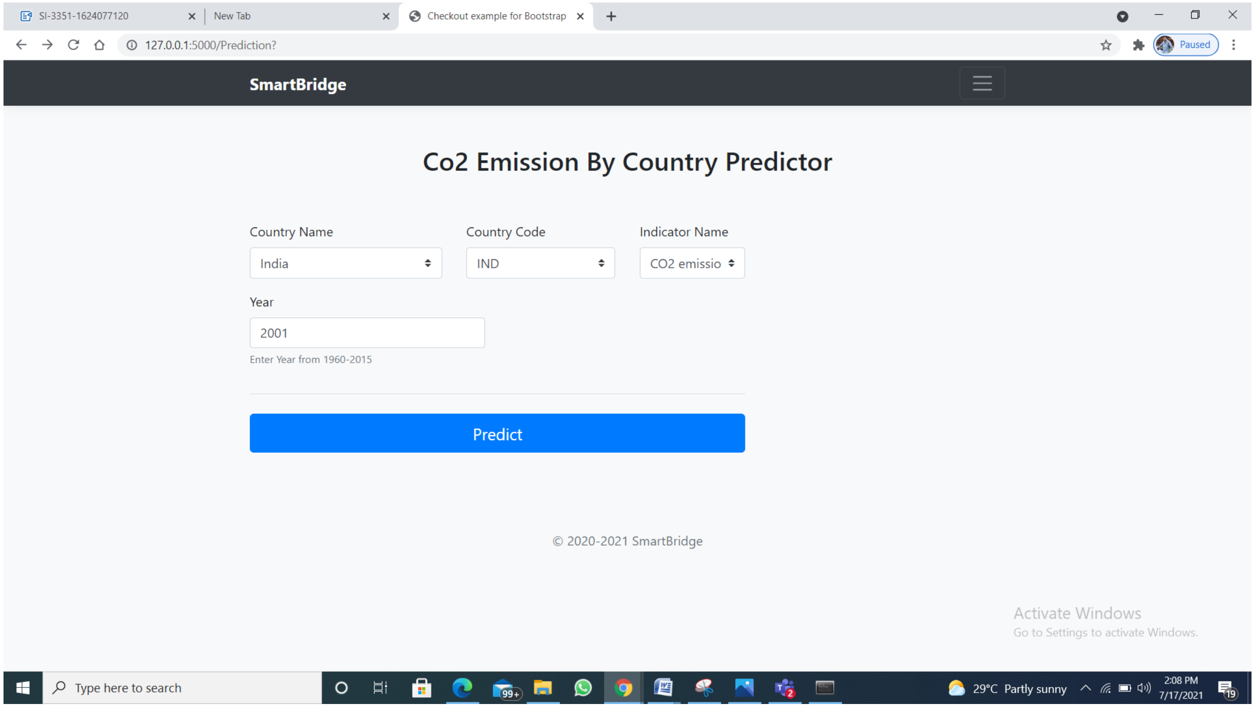
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Co2 Emission By Country Predictor
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© 2020-2021 SmartBridge
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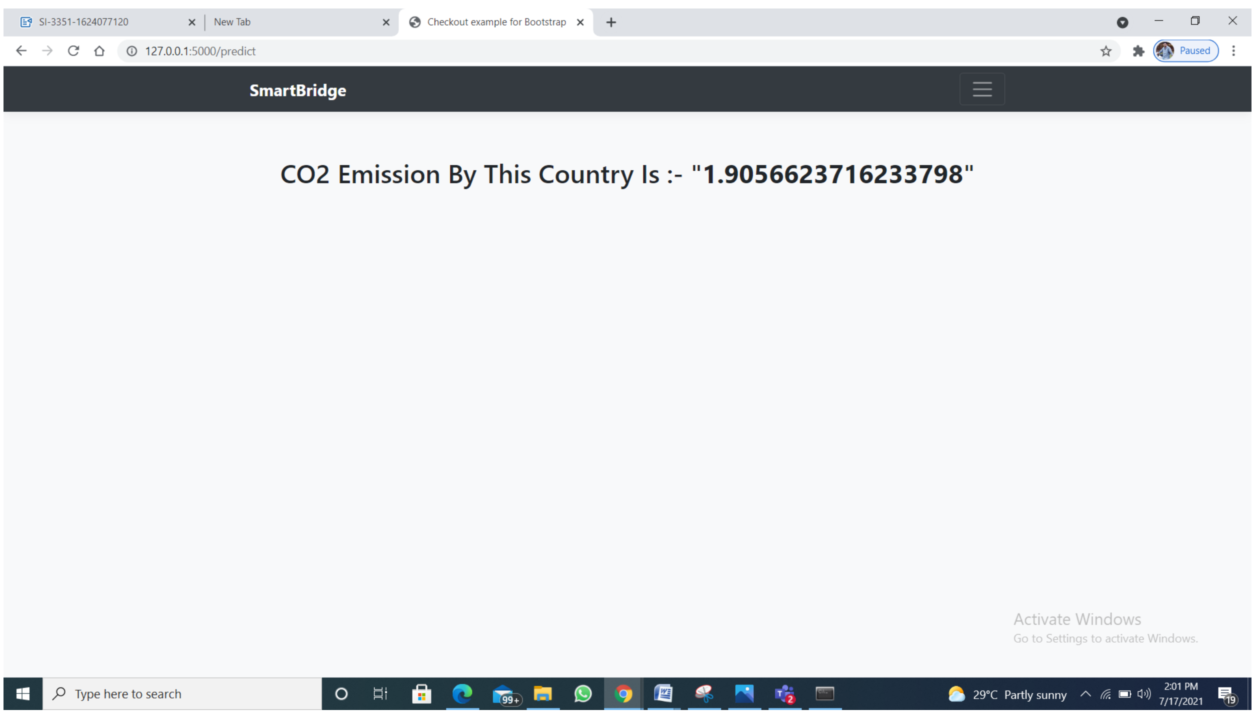
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CO2 Emission By This Country Is :- "1.9056623716233798"
Activate Windows
Go to Settings to activate Windows.
Type here to search
29°C Partly sunny
2:01 PM
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