EMISSION OF CO_2 FROM CARS

Using Machine Learning(Random Forest Regression)

Developed by: Dareen Fathima, Archana Gopu, Jakki Prathyusha, Gopinath Deshaboina

Smart Bridge-Remote Summer Internship program

INTRODUCTION

Transport is Europe's biggest source of carbon emissions, contributing 27% to the EU's total CO_2 emissions,with cars and vans representing more than two thirds of these, according to the European Environment Agency (EEA).2 Transport is the only sector in which emissions have grown since 1990,3 contributing to the increase in the EU's overall emissions in 2015.4 Transport related emissions further increased in 2016 and in 2017 EU oil consumption – a good proxy for transport CO_2 – increased at its fastest pace since 2001.If we are to achieve the Paris climate goals, it is likely that transport emissions must be reduced by 94% from 2005 levels,6 much more than the 60% suggested by the European Commission in its outdated and discredited 2011 Transport White Paper.7 Given the challenges of fully decarbonising aviation and shipping by 2050, light duty vehicles, i.e. cars and vans, will need to be entirely decarbonised by 2050. Such a reduction cannot be achieved through incremental improvements to existing vehicles. There is a limit to the efficiency improvements possible with internal combustion engines and low carbon drop-in replacement fuels for oil (either advanced biofuels or synthetic fuels) cannot, realistically, be produced in the volumes needed to power all mobility. 8,9 Instead,a transformation is needed in the way that personal mobility is delivered, including a shift to electro-mobility.

1.1 Overview

In today's world, emission trends from road transport in the EU with a particular focus on cars and vans. It shows emissions are rising again as demand for mobility outstrips the minimal improvement in efficiency. The impact of biofuel consumption and shows that biofuel policies have not led to a decrease in emissions on a well-to-wheel basis. Finally, a critique of projections of transport emissions is undertaken, and the implications of thhese projections for policy discussed.

A typical passenger **vehicle** emits about 4.6 metric tons of **carbon dioxide** per year.

This assumes the average gasoline **vehicle** on the road today has a fuel economy of about 22.0 miles per gallon and drives around 11,500 miles per year. Every gallon of gasoline burned creates about 8,887 grams of **CO_2**.

1.2 Purpose

Our aim from the project is to make use of pandas, matplotlib,&seaborn libraries from python to extract the libraries for machine learning for the emission of co2 from cars.
Secondly,here in this project we are going to use random forest regression.
By using this algorithm depends upon our input data the outputof the vehicle are going to predict the co2 emission of that particular car. So that if the Emission of co2 of that particularcar is more then the threshold value then that car details should
be sent to the particular RTA region head to seize the car.ssssss
And decreasing vehicle mass has strong cost benifits and is a viable method to reach the EU's Co2 reduction goals over the next three decades.

2.1 LITERATURE SURVEY

At the pace of current CO2 emissions, scientists expect an increase of between 1.5° and 5.3°C (34.7° to 41.5°F) in average temperature by 2100. If no action is taken, it would have harmful consequences to humanity and the biosphere.
In fact, the average temperature of the planet has increased by 0.8º Celsius (33.4° Fahrenheit) compared to the end of the 19th century. Each of the last three decades has been warmer than all previous decades since the beginning of the statistical surveys in 1850.

2.2 Proposed Solution

machine Learning(Random Forest Regression)

Random Forest Regression algorithm in machine learning method which is an ensemble technique capable of performing both regression and classification tasks with the use of multiple decision trees and a technique called Bootstrap and Aggregation, commonly known as bagging.We need to approach the Random Forest regression technique like any other machine learning technique

- Design a specific question or data and get the source to determine the required data.
- Make sure the data is in an accessible format else convert it to the required format.
- Specify all noticeable anomalies and missing data points that may be required to achieve the required data.
- Create a machine learning model
- Set the baseline model that you want to achieve
- Train the data machine learning model.
- Provide an insight into the model with test data
- Now compare the performance metrics of both the test data and the predict data from the model.
- If it doesn’t satisfy your expectations, you can try improving your model accordingly or dating your data or use another data modeling technique.
- At this stage you interpret the data you have gained and report accordingly.

3. THEORETICAL ANALYSIS

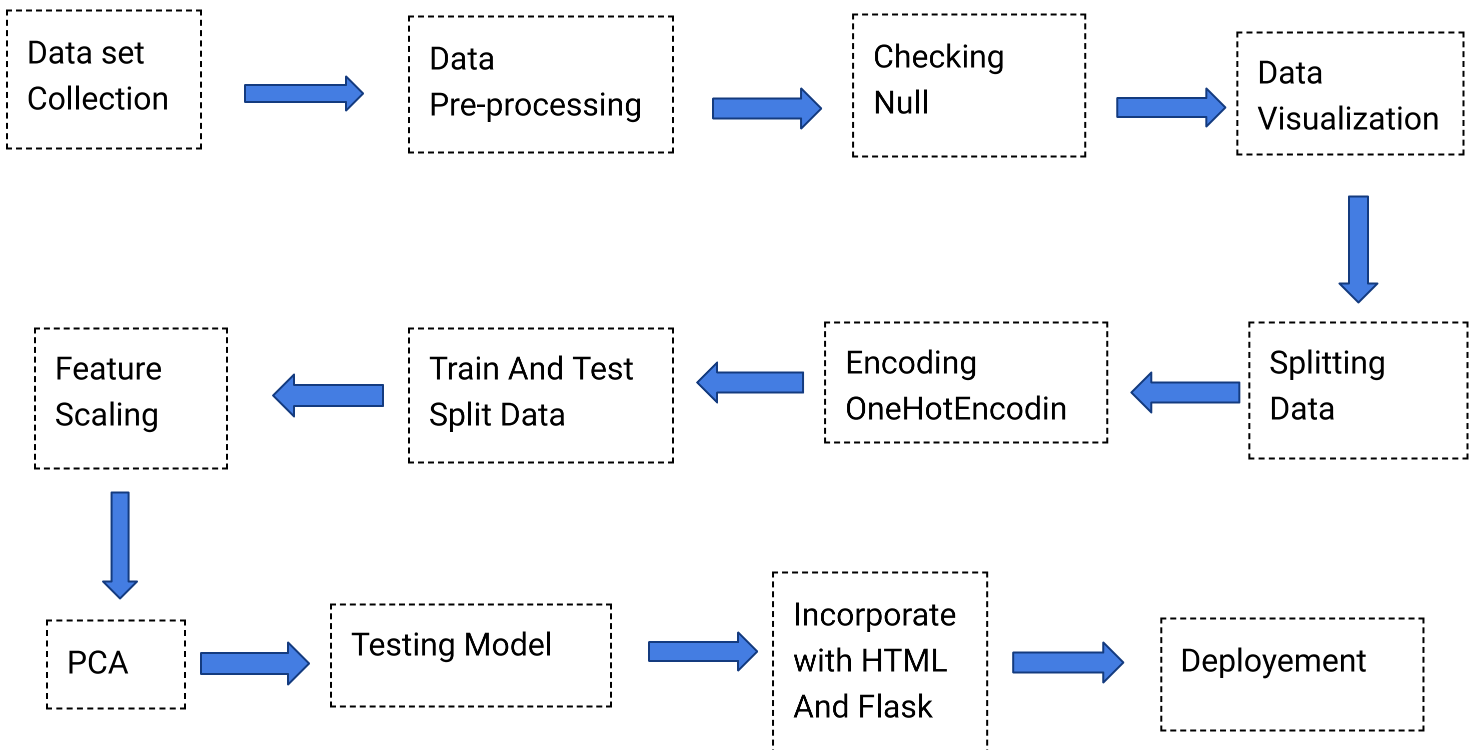
While selecting the algorithm that gives an accuracy prediction we gone through lot of algorithms which give the results abruptly accurate and form them we selected only one algorithm for the prediction problem that is Random Forest Regression algorithm it assumes that the presence of a particular feature in a review is unrelated to the presence of any other feature.

The peculilarity of this collecting the car details real time and working with the prediction at the same time, so we can know the the amount of co2 released from cars.Accuracy is defined as the ratio of samples correctly classified by the classifier to the total number of samples for a given test data set. The formula is as follows

Accuracy=TP+TN/TP+TN+FT+FN

At first we got like lot of worst accuracies because we tried lot of algorithms for the best accurate algorithm, finally after all of that the best suitable algorithm which gives the prediction accurately is Random Forest Regression Algorithm. And predict problem for the Emissiom Of Co2 From Cars.

3.1 Block Diagram



3.2 Software Designing

Jupyter Notebook Environment

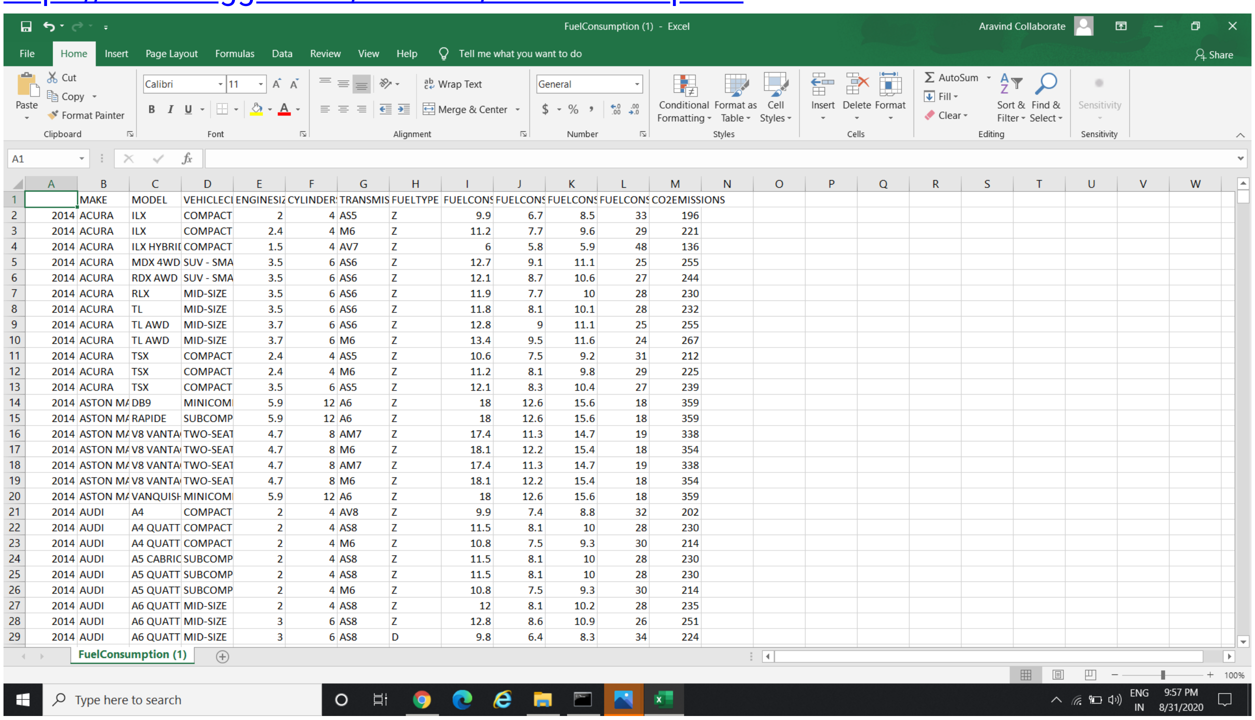
- Spyder Ide
- Machine Learning Algorithms
- Python (pandas, numpy, matplotlib, sklearn)
- HTML
- Flask

We developed this Emission Of Co2 From Cars by using the Python language which is a interpreted and high level programming language and usng the Machine Learning algorithms.for coding we used the Jupyter Notebook environment of the Anaconda distributions and the Spyder, it is an integrated scientific programming in the python language.

For creating an user interface for the prediction we used the Flask. It is a micro web framework written in Python. It is classified as a microframework because it does not require particular tools or libraries. It has no database abstraction layer, form validation, or any other components where pre-existing third-party libraries provide common functions, and a scripting language to create a webpage is HTML by creating the templates to use in th functions of the Flask and HTML.

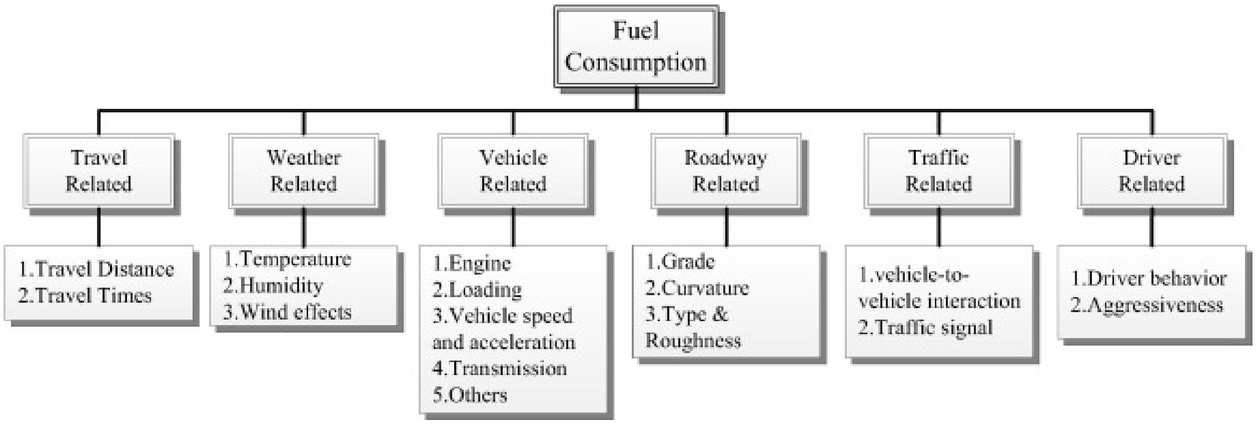
4. EXPERIMENTAL INVESTIGATION

In this paper, the dataset we used is derived from https://www.kaggle.com/sarita19/fuel-consumption



	MAKE	MODEL	VEHICLECI	ENGINESIZ	CYLINDER:	TRANSMIS	FUELTYPE	FUELCONS	FUELCONS	FUELCONS	FUELCONS	CO2EMISSIONS
2014	ACURA	ILX	COMPACT	2	4	AS5	Z	9.9	6.7	8.5	33	196
2014	ACURA	ILX	COMPACT	2.4	4	M6	Z	11.2	7.7	9.6	29	221
2014	ACURA	ILX HYBRII	COMPACT	1.5	4	AV7	Z	6	5.8	5.9	48	136
2014	ACURA	MDX 4WD	SUV - SMA	3.5	6	AS6	Z	12.7	9.1	11.1	25	255
2014	ACURA	RDX AWD	SUV - SMA	3.5	6	AS6	Z	12.1	8.7	10.6	27	244
2014	ACURA	RLX	MID-SIZE	3.5	6	AS6	Z	11.9	7.7	10	28	230
2014	ACURA	TL	MID-SIZE	3.5	6	AS6	Z	11.8	8.1	10.1	28	232
2014	ACURA	TL AWD	MID-SIZE	3.7	6	AS6	Z	12.8	9	11.1	25	255
2014	ACURA	TL AWD	MID-SIZE	3.7	6	M6	Z	13.4	9.5	11.6	24	267
2014	ACURA	TSX	COMPACT	2.4	4	AS5	Z	10.6	7.5	9.2	31	212
2014	ACURA	TSX	COMPACT	2.4	4	M6	Z	11.2	8.1	9.8	29	225
2014	ACURA	TSX	COMPACT	3.5	6	AS5	Z	12.1	8.3	10.4	27	239
2014	ASTON MA	DB9	MINICOMI	5.9	12	A6	Z	18	12.6	15.6	18	359
2014	ASTON MA	RAPIDE	SUBCOMP	5.9	12	A6	Z	18	12.6	15.6	18	359
2014	ASTON MA	V8 VANTA	TWO-SEAT	4.7	8	AM7	Z	17.4	11.3	14.7	19	338
2014	ASTON MA	V8 VANTA	TWO-SEAT	4.7	8	M6	Z	18.1	12.2	15.4	18	354
2014	ASTON MA	V8 VANTA	TWO-SEAT	4.7	8	AM7	Z	17.4	11.3	14.7	19	338
2014	ASTON MA	V8 VANTA	TWO-SEAT	4.7	8	M6	Z	18.1	12.2	15.4	18	354
2014	ASTON MA	VANQUISH	MINICOMI	5.9	12	A6	Z	18	12.6	15.6	18	359
2014	AUDI	A4	COMPACT	2	4	AV8	Z	9.9	7.4	8.8	32	202
2014	AUDI	A4 QUATT	COMPACT	2	4	AS8	Z	11.5	8.1	10	28	230
2014	AUDI	A4 QUATT	COMPACT	2	4	M6	Z	10.8	7.5	9.3	30	214
2014	AUDI	A5 CABRIC	SUBCOMP	2	4	AS8	Z	11.5	8.1	10	28	230
2014	AUDI	A5 QUATT	SUBCOMP	2	4	AS8	Z	11.5	8.1	10	28	230
2014	AUDI	A5 QUATT	SUBCOMP	2	4	M6	Z	10.8	7.5	9.3	30	214
2014	AUDI	A6 QUATT	MID-SIZE	2	4	AS8	Z	12	8.1	10.2	28	235
2014	AUDI	A6 QUATT	MID-SIZE	3	6	AS8	Z	12.8	8.6	10.9	26	251
2014	AUDI	A6 QUATT	MID-SIZE	3	6	AS8	D	9.8	6.4	8.3	34	224

5.FLOW CHART



6.RESULT

1.The development of co2 emissions from cars explains us a lot of benifits
2.it helps us to estimate the how much co2 emissioned from cars
3.Heavier vehicles have greater inertia and greater rolling resistance, which both contribute to increased fuel consumption. Reducing weight is a very effective way to improve a vehicle's efficiency
4.if the co2 emission is greater then the threshold then the vehicle is sezied otherwise the vehicle is safe

7.ADVANTAGES AND DISADVANTAGES

Advantages:

- Fossil fuels can generate a large amount of electricity at a single location.
- They can be found very easily.
- They are cost-effective.
- Transportation of oil and gas can be done easily through pipelines.
- They have become safer over time.

- Despite being a finite resource, it is available in plenty.

Disadvantages:

- Fossil fuels emit carbon dioxide when burnt which is a major greenhouse gas and the primary source of pollution. This has contributed to global warming.
- They are a non-renewable resource, i.e., once used they cannot be replaced.
- Combustion of fossil fuels makes the environment more acidic. This has led to unpredictable and negative changes in the environment.
- Harvesting of fossil fuels also causes fatal diseases among the people. For eg., the coal miners often suffer from Black Lung Disease. The natural gas drillers are constantly exposed to chemicals and silica which is dangerous for their health.

8.APPLICATIONS

1.At its most fundamental, **fuel**-**efficiency** refers to the ability of a vehicle to extract energy from **fuel**.
2. The more energy a vehicle can extract from **fuel**, the greater **fuel**-**efficiency** the vehicle is said to have.Similarly, the less energy a vehicle extracts, the less fuel-efficient the vehicle is.

3.**Fuel consumption** is the amount of **fuel** used per unit distance; for example, litres per 100 kilometres (L/100 km). ... In this case, the higher the value, the more economic a vehicle is (the more distance it can travel with a certain volume of **fuel**).

9. CONCLUSION

The average contribution of CO_2 **emissions** of private **cars** in Tehran was higher (88%) than other **vehicles**. It was concluded that high volume of traffic, transport consumption of fossil fuels and shortage of adequate public transport system are responsible for the high CO_2 level in environment in Tehran.
Overall, **greenhouse gas emissions** fell about 2 percent in **2019**, according to

preliminary estimates by Rhodium Group, an economic analysis firm. The previous year, strong economic growth and other factors had pushed **emissions** up roughly 3 percent. **Follow these tips to effectively reduce emissions, drive more safely, and save money on fuel costs all at the same time:**

1. Drive efficiently – go easy on the gas pedal and brakes.
2. Maintain your **car** – get regular tune-ups, follow the manufacturer's maintenance schedule, and use the recommended motor oil.

10. FUTURE SCOPE

In future the Random Forest Regression algorithm can be applied on other data sets available for fuel consumtion of cars approvals to further investigate its accuracy. A rigorous analysis of other machine learning algorithms other than these six can also be done in future to investigate the power of machine learning algorithms fuel consumption prediction. In further study, we will try to conduct experiments on larger data sets or try to tune the model so as to achieve the state -of-art performance of the model and a great UI support system making it complete web application model.

11.BIBILIOGRAPHY

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APPENDIX

HTML:

```
    <html>
    <head>
    <style>
        body {
            background-image:url("{{url_for('static',
filename='image2.jpg')}}");
            background-repeat: no-repeat;
            background-attachment: fixed;
            background-size: 100% 100%;
        }
        </style>
        <style>
            .butto    display: inline-block;
              padding: 10px 15px;
              font-size: 24px;
              cursor: pointer;
              text-align: center;
              text-decoration: none;
              outline: none;
              color: #fff;
              background-color: #4CAF50;
              border: none;
              border-radius: 10px;
              /* box-shadow: 0 9px #999; */
            }

            .button:hover {background-color: #3e8e41}

            .button:active {
              background-color: #3e8e41;
              /* box-shadow: 0 5px #666; */
              transform: translateY(4px);
            }
            </style>
        </head>
<body>
```

```html
    <!-- <img src="{{url_for('static', filename='image1.jpg')}}" /> -->
    <p style="margin-left:33%;font-size:
60px;;margin-top:10%;color:indigo;background-color:white;width:37%;text-al
ign: center;"> CO2 Emission From Cars</p>
    <div style="margin-left:15%;margin-top:5%;">
<form action ="/predict" method = "POST">

   <table CELLPADDING=5>
 <tr>
 <td>
<b style="color:black;font-size: 18px">MODELYEAR</b>
 <p><input type = "text" name = "MODELYEAR"/></p>
 <br>
</td>


<td>
 <b style="color: black;font-size: 18px">ENGINESIZE</b>
 <p><input type = "text" name = "ENGINESIZE"/></p>
 <br>
</td>
<td>
 <b style="color: black;font-size: 18px">CYLINDERS</b>
 <p><input type = "text" name = "CYLINDERS"/></p>
 <br>
</td>
</tr>


<td>
 <b style="color: black;font-size: 18px">FUELCONSUMPTION_CITY </b>
 <p><input type = "text" name = "FUELCONSUMPTION_CITY"/></p>
</td>
<td>
 <b style="color: black;font-size: 18px">FUELCONSUMPTION_HWY </b>
 <p><input type = "text" name = "FUELCONSUMPTION_HWY"/></p>
```

```html
</td>
<td>
 <b style="color: black;font-size: 18px">FUELCONSUMPTION_COMB </b>
 <p><input type = "text" name = "FUELCONSUMPTION_COMB"/></p>
</td>
</tr>
</p>
<tr>
  <td>
    <b style="color: black;font-size: 18px"> FUELCONSUMPTION_COMB_MPG</b>
    <p><input type = "text" name = "FUELCONSUMPTION_COMB_MPG"/></p>
   </td>
</tr>
<tr>
    <td><button class="button" onclick="submit">submit</button><br>
    </td>
</tr>
<tr>
    <td>
<p style="color: cornsilk;"><h2 style="background-color: blue;text-align:
center;width:80px;">{{y}}</h2></p>
</td
</tr>
</table>
</form>
</div>
</body>
</html>
```

APP.PY:

```python
from flask import Flask,render_template,request,url_for
import pickle
model = pickle.load(open('CO2EMISSIONS.pkl','rb'))
app = Flask(__name__,)
```

```python
@app.route('/')
def hello_world():
    return render_template("index1.HTML")
@app.route('/predict',methods=["POST"])
def fun2():
    MODELYEAR = request.form['MODELYEAR']
    ENGINESIZE = request.form['ENGINESIZE']
    CYLINDERS = request.form['CYLINDERS']
    FUELCONSUMPTION_CITY = request.form['FUELCONSUMPTION_CITY']
    FUELCONSUMPTION_HWY = request.form['FUELCONSUMPTION_HWY']
    FUELCONSUMPTION_COMB  = request.form['FUELCONSUMPTION_COMB']
    FUELCONSUMPTION_COMB_MPG = request.form['FUELCONSUMPTION_COMB_MPG']


    data =
[[int(MODELYEAR),float(ENGINESIZE),int(CYLINDERS),float(FUELCONSUMPTION_CITY
),float(FUELCONSUMPTION_HWY),float(FUELCONSUMPTION_COMB),int(FUELCONSUMPTION
_COMB_MPG)]]
    pred = model.predict(data)
    print(pred)
    if(pred>256.99):
        return render_template("index1.HTML",y = "Your Vehicle Sezied
Because Co2 Emission value is Higer, The Value is"+str(pred))
    else:
                return render_template("index1.HTML",y = "Your Vehicle
Safe, Because less emission,The Value is"+str(pred))

if __name__== '__main__':
    app.run(debug =True) #wsgi local server url
```