Prediction of Car Emissions to Reduce Air Pollution

What is Air Pollution

When harmful or excessive quantities of substances including the gases, particles, and biological molecules are introduced into Earth's atmosphere, it is called **Air Pollution.**

Primary Pollutants: The pollutants that directly cause air pollution are known as primary pollutants. Sulphur-dioxide emitted from factories is a primary pollutant.

Secondary Pollutants: The pollutants formed by the intermingling and reaction of primary pollutants are known as secondary pollutants. Smog, formed by the intermingling of smoke and fog, is a secondary pollutant.

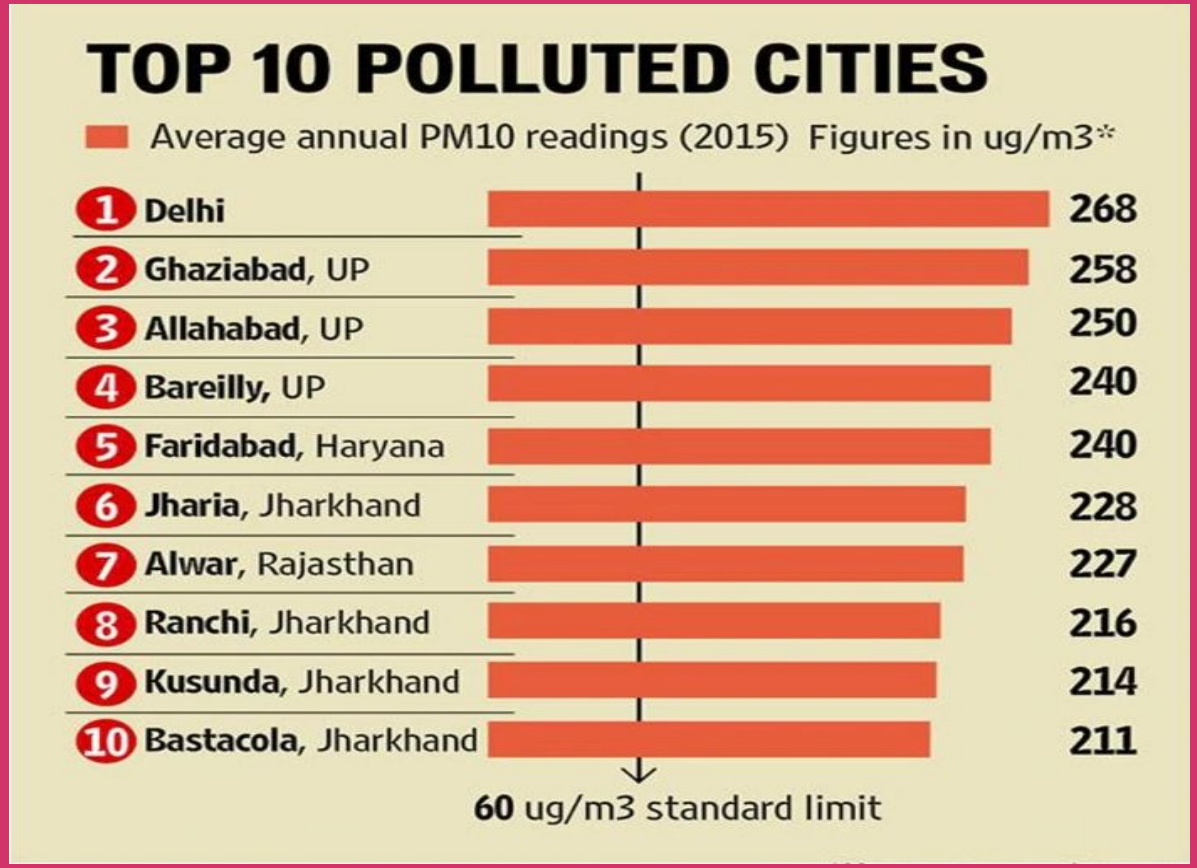
Air Pollution In Indian Cities

Delhi tops the list of 20 most polluted cities in the country.

According to the Greenpeace India report, **1.2 million deaths** take place every year in India due to air pollution, which is only a “fraction less” than that caused by tobacco usage, and **3% of the GDP** is lost due to air pollution.

The report said that only a “few” cities in southern India that comply with air quality standards prescribed by the Central Pollution Control Board (CPCB).

It also pinpointed **vehicular emissions** as one of the “main culprits” for the deteriorating air quality across the country.


TOP 10 POLLUTED CITIES
Average annual PM10 readings (2015) Figures in ug/m3*
1 Delhi 268
2 Ghaziabad, UP 258
3 Allahabad, UP 250
4 Bareilly, UP 240
5 Faridabad, Haryana 240
6 Jharia, Jharkhand 228
7 Alwar, Rajasthan 227
8 Ranchi, Jharkhand 216
9 Kusunda, Jharkhand 214
10 Bastacola, Jharkhand 211
60 ug/m3 standard limit

Environmental Impacts of Air Pollution

Global Warming

Due to the emission of greenhouse gases, there is an imbalance in the gaseous composition of the air. This has led to an increase in the temperature of the earth. This increase in earth's temperature is known as **global warming**. This has resulted in the melting of glaciers and an increase in sea levels. Many areas are submerged under water.

Acid Rain

The burning of fossil fuels releases harmful gases such as nitrogen oxides and sulphur oxides in the air. The water droplets combine with these pollutants, become acidic, and fall as acid rain which damages human, animal and plant life.

Environmental Impacts of Air Pollution

Diseases

Air pollution has resulted in **several respiratory disorders** and **heart diseases** among humans. The cases of **lung cancer** have increased in the last few decades. Children living near polluted areas are more prone to pneumonia and asthma. Many people die every year due to the direct or indirect effects of air pollution.

Effect on Animals

The air pollutants suspend on the water bodies and affect the aquatic life. Pollution also compels the animals to leave their habitat and shift to a new place. This renders them stray and has also led to the extinction of a large number of animals species.

Major Causes of Air Pollution

- **Burning of fossil fuels in power plants**
- **Exhaust from vehicles**
- **Discharges from manufacturing industries and factories**
- **Mining activities … etc.**

Major Causes of Air Pollution

As per **WHO**, the transport sector is the fastest growing contributor to climate emissions.

Road transport is estimated to be responsible for up to 30% of particulate emissions (PM) in European cities and up to 50% of PM emissions in OECD countries.

Our Idea

- With the increase in population, it is not very practical to reduce the amount of personal vehicles usage.
- Instead, what can be helpful is to adopt technologies which relatively produce less emissions from manufactured cars.
- Using the **Machine Learning Method of Linear Regression**, we construct a model that can predict the amount of gas emissions from around 5000 car technologies.

Linear Regression

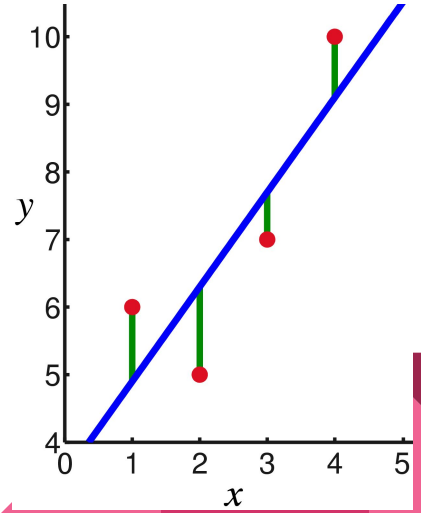
- **Linear regression** is a linear approach to modeling the relationship between a scalar response (dependent variable) and one or more explanatory variables (independent variables).
- The relationships are modeled using linear predictor functions whose unknown model parameters are estimated from the data.
- In linear regression, the observations (red) are assumed

  to be the result of random deviations (green) from an

  underlying relationship (blue) between a dependent

  variable (y) and an independent variable (x).

  The regression line is the best fit line for our model.



Accuracy of prediction

Total HydroCarbons (THCs), and NOx emissions were predicted for the test data with an **accuracy of 81%**.

How this Model Helps

- Get to know the approximate amount of emissions a particular model and make of car gives.
- Use it to compare with the predicted emissions of the other car models so as to choose the ones with fewer emissions.
- Use it to analyze and adopt the technologies which provide the least emissions.
- Move towards a **more eco-friendly travel**.

Moving on to the Code and Dataset ...