Predicting Air Pollutant Concentrations in Beijing Using Regression Models

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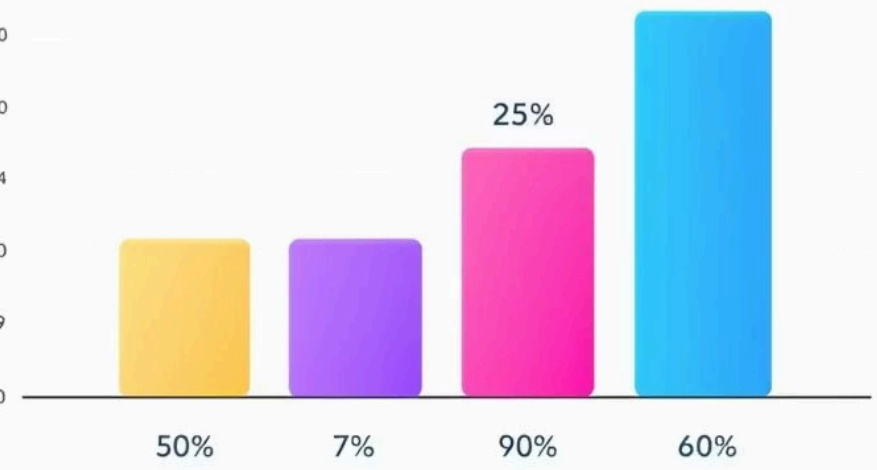
Problem

1 Define the Challenge

Given various meteorological variables, what are the predicted concentrations of air pollutants- PM10, SO_2, and NO_2 in Beijing?

2 Motivation

Air pollution is one of the most serious **environmental challenges** of our time. According to the World Health Organization, it contributes to around **8 million premature deaths** every year. Moreover, **99%** of the global population is exposed to air that does not meet WHO standards. In this project, we aim to **predict the levels of various air pollutants** using machine learning models, helping to better understand and manage air quality risks.



Data Set

Source	UC Irvine Machine Learning Repository
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Information	Hourly data of 6 air pollutants + 6 meteorological variables from Beijing stations.
Entries	420,768 rows x 17 columns
Important Features	"day", "hour", "TEMP", "PRES", "DEWP", "station", "WSPM"
Targets	"PM10", "SO_2" and "NO_2"
Previous Work	Prior work predicted "PM2.5".

Comparison with Alternative Methods

Dense Neural Network (DNN)

- Captures complex nonlinear relationships.
- Handles multi-target regression effectively.
- Suitable for moderate sized data samples.
- Excels with tabular data structures.

XGBRegressor

- Manages missing data and outliers well.
- Robust to preprocessing and normalization.
- Performs strongly on heterogeneous features.
- Highly effective for tabular datasets.