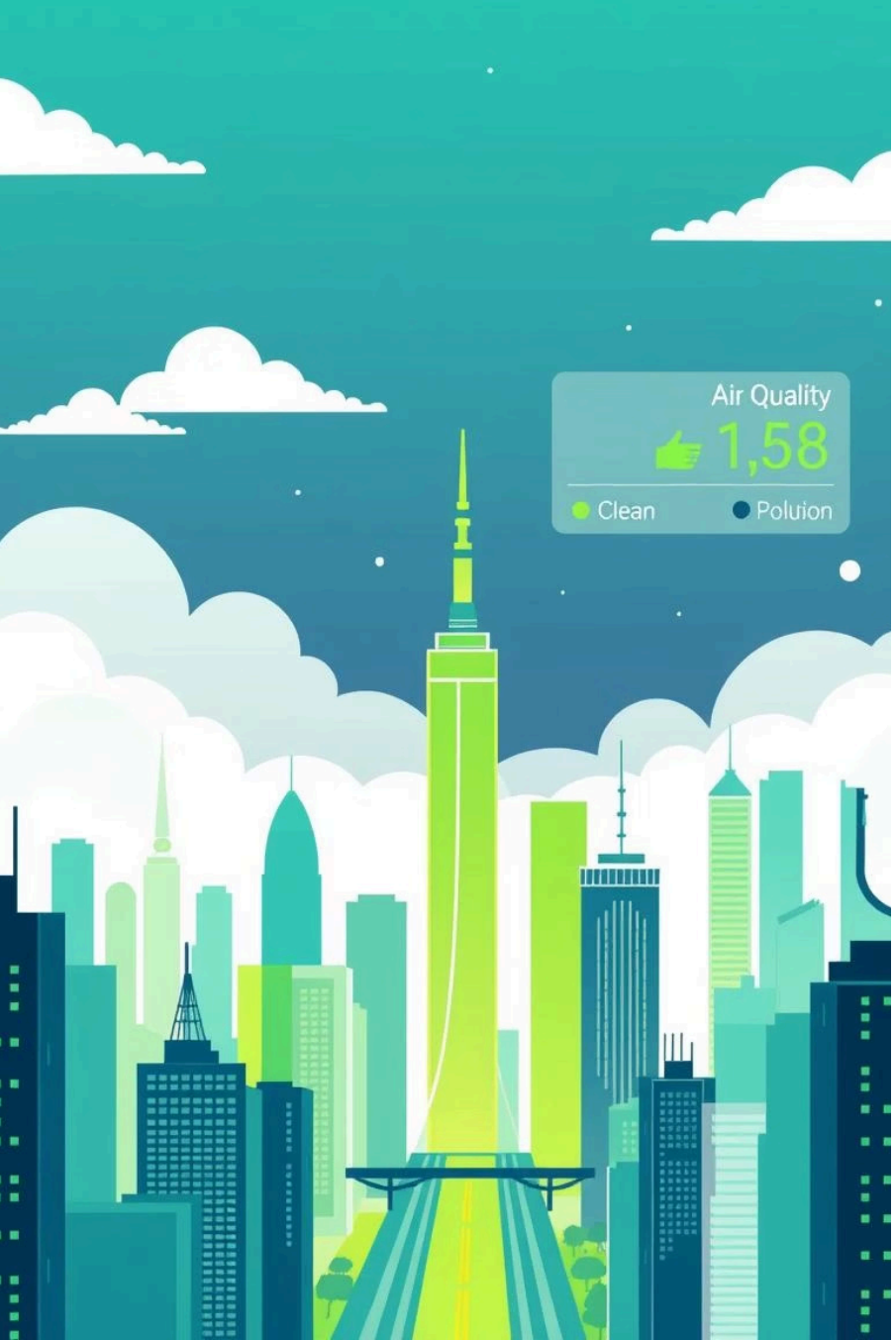

OMOTEC
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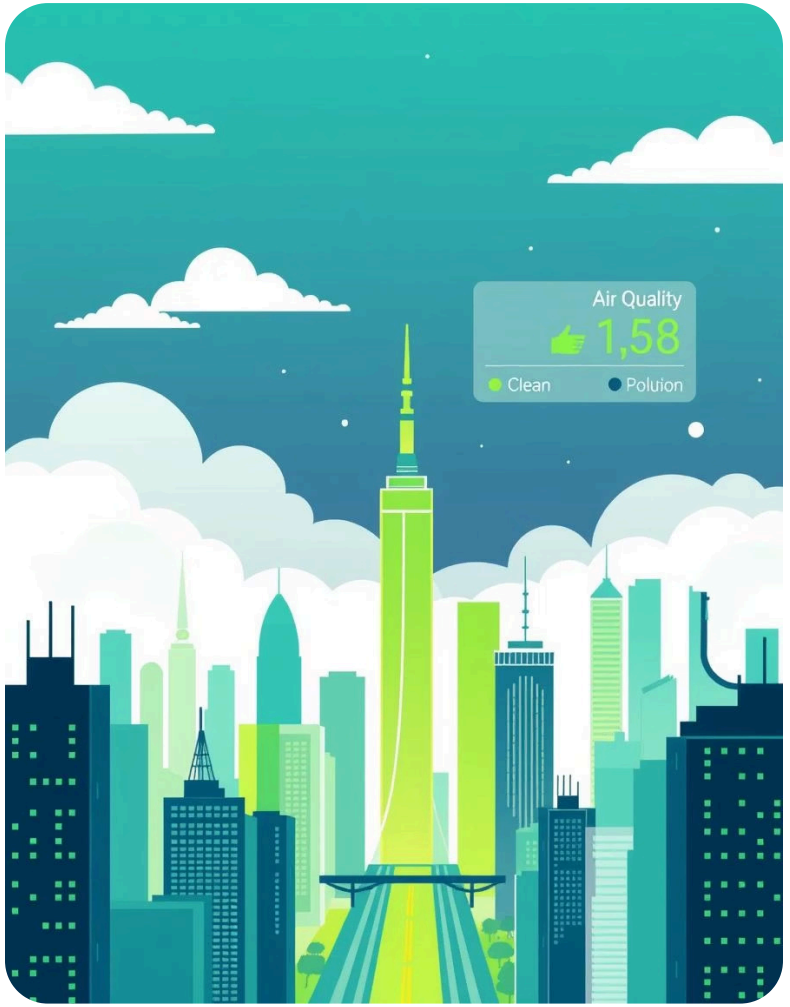
OMOTEC Webinar Introduction

PROJECTS



OMOTEC Project # 1

Predicting Our Planet's Future: ML in Air Quality & Space

Explore how machine learning and Python are empowering critical advancements in environmental forecasting and celestial mechanics.

Real-Time Air Quality Forecasting with LSTM

This project leverages LSTM neural networks to predict hourly PM2.5 and PM10 levels, vital for public health advisories.

Project Overview

Utilizes historical air and weather data from OpenAQ and OpenWeatherMap APIs to train and forecast pollution for the next 24 hours.

Technical Deep Dive

- **Data Ingestion:** Automated API calls for real-time and historical datasets.
- **Model Architecture:** TensorFlow/Keras for building robust LSTM models.
- **Output:** Detailed prediction graphs for actionable insights.

Explore the GitHub Repository

AQI Prediction Dashboard Using Streamlit

Empower users to interact with air quality predictions through an intuitive Streamlit web application.

1

Interactive Dashboard

A Python app that predicts AQI based on CO, temperature, and humidity, allowing user input for custom scenarios.

2

Real-time Exploration

Users can enter live pollution and weather values to immediately see AQI forecasts, enhancing understanding of contributing factors.

Access the Project on GitHub

OMOTEC Project # 2

Asteroid Hazard Classification with Machine Learning

Identify Potentially Hazardous Asteroids (PHAs) by applying machine learning to NASA's NEO dataset.

Core Functionality

- **Data Acquisition:** Downloads orbital and physical parameters from NASA's NeoWs API.
- **Model Training:** Employs Random Forest or Logistic Regression for classification.
- **Performance:** Achieves impressive accuracy of ~92% in identifying PHAs.

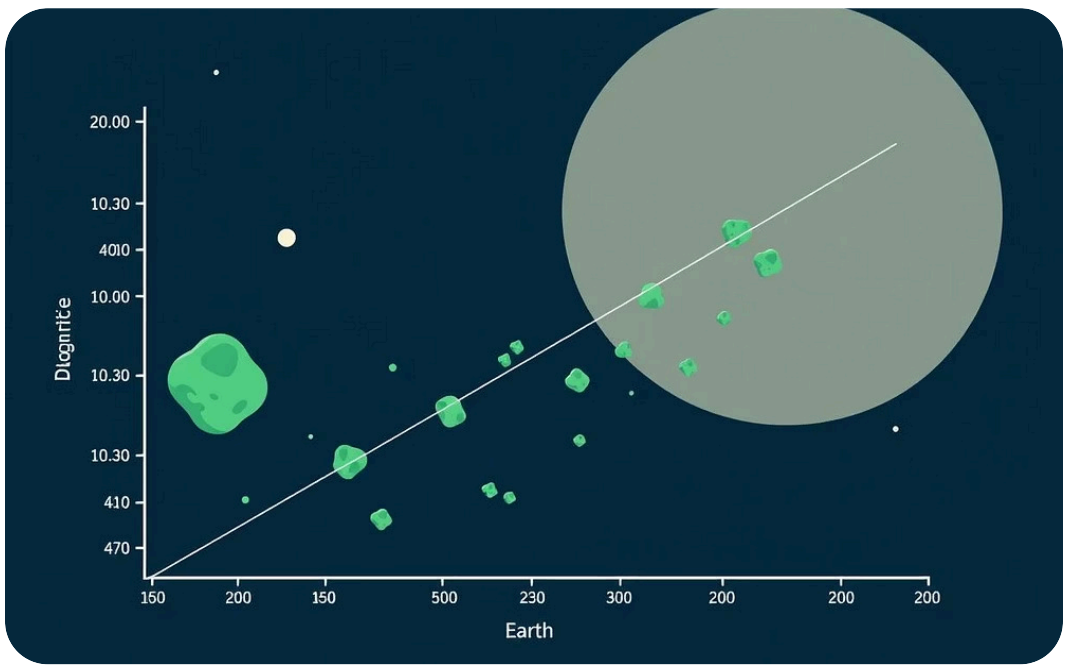
Significance

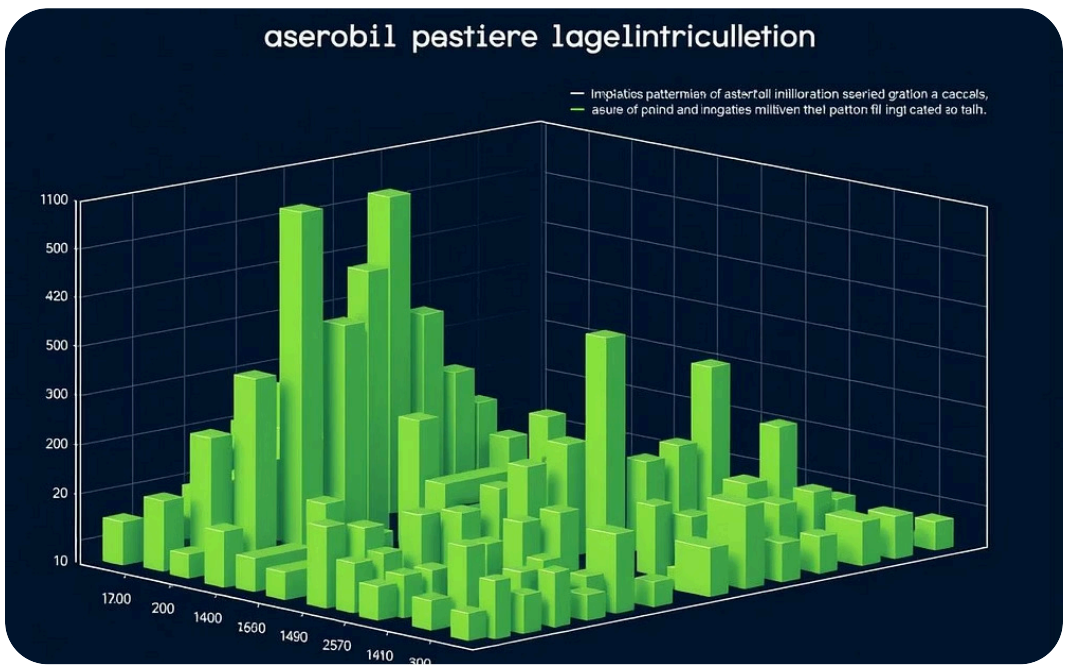
> This project simulates a crucial aspect of planetary defense, enabling early identification of potential impact threats.

View Project Code on GitHub

Asteroid Orbit Data Analysis & Visualization

Dive into the cosmos with interactive visualizations of asteroid characteristics, understanding their behavior and potential impact.





Statistical Insights

Analyzes statistics like magnitude, distance to Earth, and orbital elements.

Rich Visualizations

Generates scatter plots, histograms, pie charts, and linear regression models using Matplotlib and Seaborn.

Explore the Analysis Notebook

Near-Earth Asteroids 3D Orbit Visualization

Experience the celestial dance of Near-Earth Asteroids through dynamic 3D visualizations powered by Plotly and NASA data.

This project fetches real orbital data from NASA's NeoWs API to compute and render interactive 3D visualizations. Observe asteroid trajectories, eccentricity, inclination, and hazard status in unprecedented detail.

A powerful educational tool, it provides a virtual satellite simulation without the need for physical hardware, making complex orbital mechanics accessible.

See the 3D Visualizer on GitHub

Why These Projects Matter: Impact & Applications

Public Health Safety

Air quality forecasting helps issue early warnings for pollution events, protecting vulnerable populations.

Planetary Defense

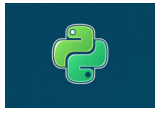
Asteroid classification and visualization are crucial for assessing collision risks and informing mitigation strategies.

Educational Advancement

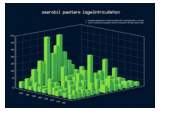
These projects provide hands-on experience with real-world data and advanced ML techniques, fostering future data scientists.

Key Technologies Driving Innovation

A concise look at the essential Python libraries and frameworks powering these groundbreaking projects.





Future Directions & Community Contributions

These projects are not static; they represent a foundation for continuous innovation and collaborative development.

1

Enhanced Forecasting

Integration of more diverse environmental factors and ensemble modeling techniques for improved accuracy.

2

Advanced UI/UX

Developing more sophisticated dashboards with customizable alerts and predictive analytics for broader accessibility.

3

Global Data Integration

Expanding data sources to cover more regions, enabling a more comprehensive worldwide air quality and asteroid monitoring system.

Thank You

For more details on these projects or to contribute, please visit the respective GitHub repositories. Your interest and collaboration drive the future of scientific Python development.

Air Quality Forecasting

Asteroid Hazard Classification