



Earthquake Prediction Dashboard: Data Science in Action



A Machine Learning Approach to Seismic Analysis

What Does This Dashboard Do?

The screenshot displays the Earthquake Prediction Dashboard, a web application designed for exploring seismic activity worldwide. The dashboard has a dark theme with red and white text.

Top Navigation: The title "Earthquake Prediction Dashboard" is centered at the top, with a subtitle "Explore, analyze, and predict seismic activity worldwide" below it. A "Deploy" button and a three-dot menu icon are in the top right corner.

Left Sidebar: Labeled "Earthquake Dashboard" and "Explore seismic data and predictions". It includes a "Navigate to:" section with links to Home, Data Explorer, Earthquake Types, Date Predictor, Location Analysis, and Prediction Lab. Below this are sections for "Earthquake Resources" (links to USGS Earthquake Hazards Program, How Earthquakes Work, and Earthquake Preparedness Guide) and "Data Source" (information about using data from USGS Earthquake Catalog and Global Seismic Monitor).

Content Area: The main content area contains four cards:

- About This Dashboard:** Describes the dashboard's purpose: exploring historical earthquake data, visualizing seismic activity patterns, and using machine learning models to predict various aspects of earthquakes including type, date, and location.
- Key Features:** Lists six features: Interactive Global Map, Data Explorer, Type Analysis, Date Predictor, Location Analysis, and Prediction Lab.
- Dataset Overview:** Provides summary statistics: Total records: 23,409, Date range: 1965-2016, Magnitude range: 5.5 - 9.1, and Depth range: -1.1 - 700.0 km.
- Safety Tip:** Offers a tip: "During an earthquake: Drop, Cover, and Hold On!"

- Interactive visualization of global earthquake data
- ML-powered predictions for earthquake type, date, and location
- Tools for exploratory data analysis (EDA)

🔍 Key Features

Date Predictor

Watch the years go by as the date predictor based on regression analysis. It's model predicts the regional pattern of seismic activity.

Input Features:
Enter the starting year for the prediction period.

Model Performance:
How well does the model predict the seismic activity?

Magnitude (Richter scale): 6.00

Depth (km): 50.00

Location (lat, lon):
• Global Seismometer
• Linear Regression (Ridge)

Predict Year: 2025

Actual vs. Predicted Year Distribution: A histogram comparing actual and predicted years.

Prediction Lab

Experiment with different machine learning models to predict earthquake characteristics. Compare model performance and adjust parameters to see how predictions change.

Model Settings:
Configure the prediction experiment.

Machine Learning Model: Random Forest Classifier

Classification Metric: Magnitude (Richter scale): 5.00

Model Performance:
How well does the selected model perform?

precision	recall	f1 score	support
1.00	1.00	1.00	1000000
1.00	1.00	1.00	1000000
1.00	1.00	1.00	1000000
1.00	1.00	1.00	1000000

Location Analysis

Find epicenters for the last 100 days based on magnitude and depth from the last 100 days. Explore geographical patterns of seismic activity.

Input Features:
Enter earthquake characteristics to predict locations.

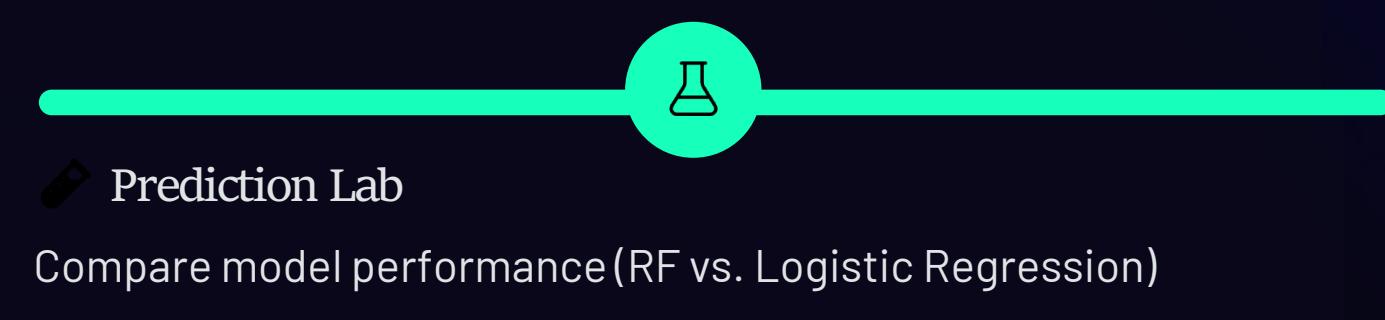
Global Earthquake Hotspots:
Historical earthquake distribution showing current activity.

Magnitude (Richter scale): 5.00

Depth (km): 10.00

Predict Locations

Global Earthquake Distribution: A heatmap showing the distribution of earthquakes around the world.





Under the Hood

- **Languages:** Python
- **Libraries:** Pandas, Scikit-learn, Plotly, Streamlit
- **Models:** Random Forest, Logistic Regression, Linear Regression
- **Deployment:** Streamlit Cloud





How the Models Work

Comprehensive Earthquake Data Pipeline Architecture

Data Ingestion & Preprocessing

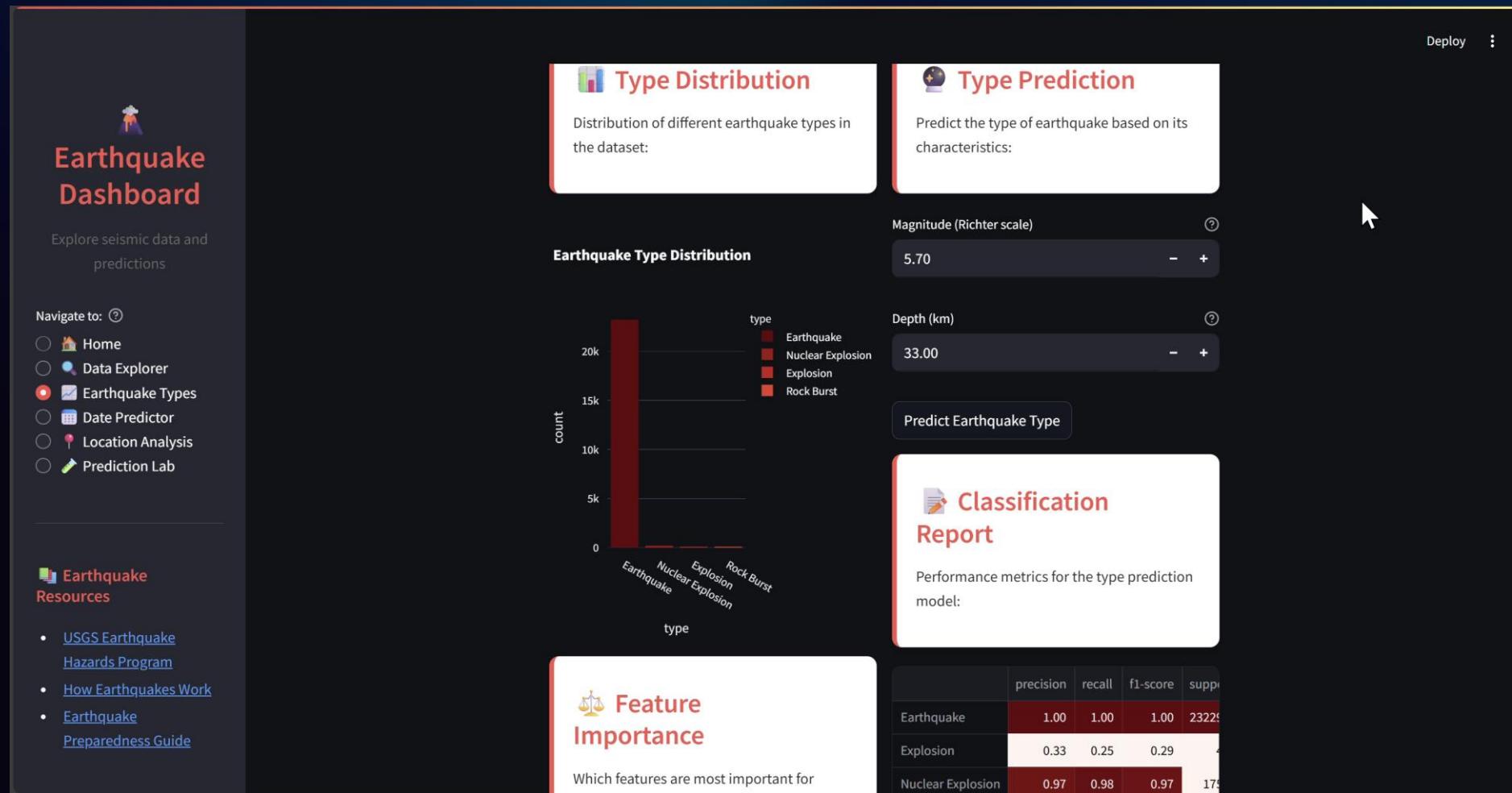
Model Preparation & Training

Visualization & User Interface

Prediction Operations & Evaluation

- **Data:** USGS/Global Seismic datasets → Cleaned with Pandas
- **Features:** Magnitude, Depth, Coordinates → Encoded with LabelEncoder
- **Training:** 70/30 train-test split
- **Evaluation:** Classification reports, confusion matrices

Example: Type Prediction

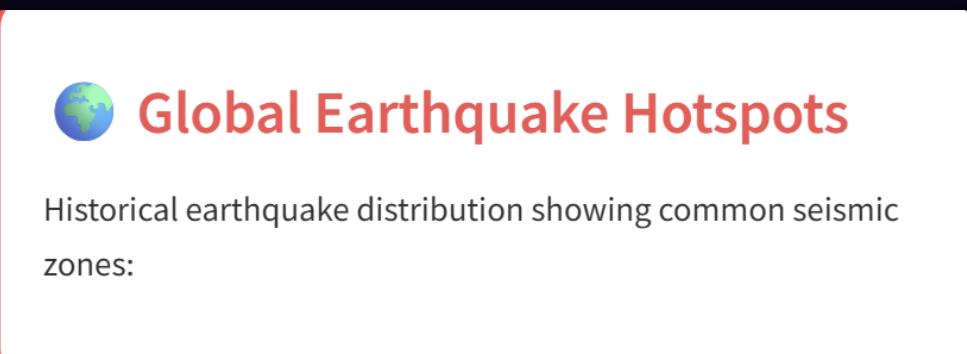
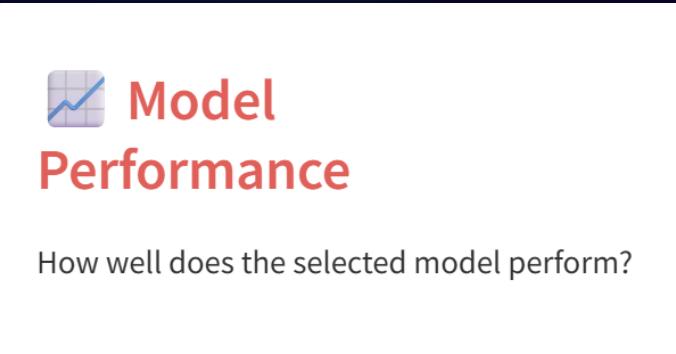
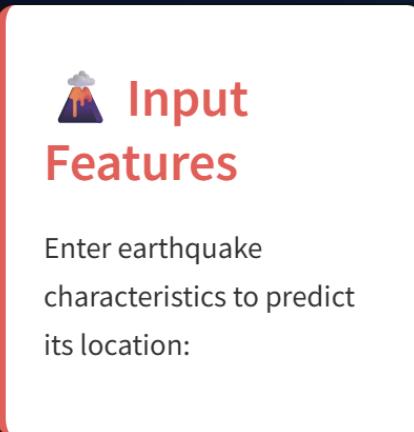


- Input: **Magnitude=5.70, Depth=33km** → Output: **Type=Earthquake (92% confidence)**
- Feature importance: Magnitude > Depth



Why This Matters

- Helps governments prioritize disaster preparedness
- Demonstrates how ML can analyze geospatial patterns
- Open-source template for seismic research



Catch up the Project!



 **GitHub** : [[nour43210 \(Nour Elbanna\)](#)]

-  **Live Demo**: <http://localhost:8501>
- Network URL: <http://192.168.1.4:8501>

 **Let's Connect**: [[\(3\) Nour El banna | LinkedIn](#)]

