Earthquake Prediction Model using Python

Problem Definition:

The project objective is to develop a sophisticated earthquake prediction model using aKaggle dataset. This involves comprehensive exploration of key earthquake data features, global visualization on a world map, and data segmentation for training and testing. Utilizing advanced machine learning techniques, the aim is to build a robust neural network model, enhancing its accuracy through meticulous feature engineering, hyperparameter tuning, and comparative analysis of multiple algorithms, ensuring a reliable prediction system for real-world applications.

Data Source

Data Source: Kaggle dataset containing earthquake dataFeatures:

- Date
- Time
- Latitude
- Longitude
- Depth
- Magnitude

Feature Exploration

Feature Distribution

- Date: Analyzed the distribution of earthquake occurrences over time.
- Time: Examined the time of day when earthquakes are more likely to happen.
- Latitude and Longitude: Explored the geographic distribution of earthquakes.
- Depth: Investigated the distribution of earthquake depths.
- Magnitude: Studied the distribution of earthquake magnitudes.

Feature Correlations

- Analyzed correlations between features to identify potential relationships.

- Calculated correlation coefficients to quantify relationships.

Feature Characteristics

- Examined the statistical characteristics of each feature (mean, median, standard deviation, etc.).
- Detected and handled missing values if present in the dataset.

Visualization

World Map Visualization

- Utilized geospatial libraries (e.g., Folium, Plotly) to create a world map visualization.
- Plotted earthquake occurrences on the map, using color-coding to represent magnitude.

Data Splitting

- Split the dataset into a training set and a test set.
- Reserved 80% of the data for training and 20% for testing.

Model Development

Neural Network Model

- Designed a neural network architecture for earthquake magnitude prediction.
- Defined the number of layers, neurons, and activation functions.

Training and Evaluation

- Trained the neural network model on the training dataset.
- Monitored training progress and evaluated the model's performance using the following metrics:
    - Mean Squared Error (MSE)
    - Mean Absolute Error (MAE)
    - R-squared (R^2) score