EARTHQUAKE PREDICTION MODEL USING PYTHON

PHASE 1: PROBLEM DEFINITION AND DESIGN

THINKING

An earthquake prediction must specify the expected magnitude range, the geographical area within which it will occur, and the time interval within which it will happen with sufficient precision so that the ultimate success or failure of the prediction can be readily judged.

- **Objective**: Develop a predictive model for earthquake magnitudes.
- **Data Source:** Utilize a Kaggle dataset containing earthquake-related information, including date, time, latitude, longitude, depth, and magnitude.
- **Tasks**:

1. Explore and understand the dataset's structure and contents. 2. Visualize the data on a world map for a global overview. 3. Split the dataset into training and testing subsets for model validation.

4. Develop a neural network model for earthquake magnitude prediction.

5. Train the model on the training data and evaluate its performance on the test data.

Design Thinking

Data Source Selection:

We will begin by selecting a suitable Kaggle dataset that contains earthquake data with the necessary features, including date, time, latitude, longitude, depth, and magnitude. The dataset should be comprehensive and up to date for accurate predictions.

Feature Exploration:

Upon acquiring the dataset, we will thoroughly analyse and explore its features. This exploration will include understanding the distribution, correlations, and characteristics of key features. This step is crucial for feature engineering and model development.

Visualization:

To gain a global overview of earthquake frequency and distribution, we will create a world map visualization using latitude and longitude data. This visualization will provide valuable insights into the geographic patterns of earthquakes and can aid in feature selection.

Data Splitting:

To ensure the model's reliability, we will split the dataset into two subsets: a training set and a test set. Typically, an 80/20 or 70/30 split will be considered, with the larger portion allocated to training. This will allow us to train the model on one subset and evaluate its performance on an independent subset.

Model Development:

We will design and build a neural network model tailored for earthquake magnitude prediction. The architecture of the neural network, including the number of layers and neurons, will be determined based on experimentation and optimization.

SVM:

- In another terms, Support Vector Machine (SVM) is a classification and regression prediction tool that uses machine learning theory to maximize predictive accuracy while automatically avoiding over-fit to the data.

NN:

-Neural networks are investigated for predicting the magnitude of the largest seismic event in the following month based on the analysis of eight mathematically computed parameters known as seismicity indicators.

Training and Evaluation:

The model will be trained on the training dataset using suitable optimization algorithms. We will monitor the model's training progress and evaluate its performance using regression metrics such as Mean Absolute Error (MAE), Mean Squared Error (MSE), and R-squared. Hyperparameter tuning may be performed to enhance performance.

Conclusion

This design document outlines the initial phase of our project to develop an earthquake prediction model. It defines the problem statement, highlights key tasks, and outlines the design thinking approach. The next steps involve dataset acquisition, feature exploration, visualization, and model development. Subsequent phases will focus on model refinement, validation, and reporting of results. An earthquake prediction must specify the expected magnitude range, the geographical area within which it will occur, and the time interval within which it will happen with sufficient precision so that the ultimate success or failure of the prediction can be readily judged.