**Earthquake prediction model using python**

**Introduction:**

Earthquake occurs due to the relative movement of the tectonicplates that make up the Earth’s crust. The most of the damage although occurs at places located along plate boundaries,the stable continental regions also occasionally experience disastrous events. The stress caused by this movement travels large distances and therefore places at larger distances from the plateboundary may also suffer.The neural network models developed in this study can provebeneficial to the community because it can be used to create anearly-warning alarm system so that the loss is minimized (Reyeset al., 2013).

**Methodology:**

This study uses two different techniques for earthquake forecast-ing and analysis. First technique compares the performance ofmultilayer perceptron based on different set of inputs and hyper-parameters. Later, the accuracy of nowcasting technique wasevaluated using recurrent neural networks, namely the LSTM neural networks.

**Innovation:**

**1. Hyper-parameters :**

After obtaining the set of inputs, ex-periments were conducted to find an optimal set of hyper- parameters such as the number of layers, the number of neurons in eachlayer and various other attributes like loss function and activationfunctions of different layers.

**2.Inputs:**

Inputs A multilayer perceptron is a class of feedfor-ward ANN that uses backpropagation for training. In this method,the experiments are first conducted to find the set of inputs that predict the magnitude of earthquakes with highest accuracy. To forecast the earthquakes, the data points are divided into fourclasses based on their magnitude values.

**3.Nowcasting using recurrent neural networks:**  After achieving the optimal set of inputs and hyper-parametersanother model is formulated to analyze the time of occurrence of earthquake using nowcasting techniques. Nowcasting is a surrogate method to find the current progression of occurrence of large earthquakes using the count of small events that occur be-tween two large earthquakes. The definition of large magnitudeearthquakes changes throughout the study (Rundle et al., 2016).We use different threshold magnitude in different experiments todefine large earthquake events. For instance, at the beginning, weconsidered a threshold magnitude of 5.0 for large event. Later,the magnitude threshold was changed to 6.0 to carry out the ex-periment. It may be noted that the homogeneity in magnitudes inthe nowcasting approach is not an important issue.

**Techniques and ensemble methods:**

Creating an earthquake prediction model is a complex task that typically relies on seismological data and machine learning techniques.

**1.Data Collection:**

Obtain earthquake data from reliable sources like the USGS Earthquake Catalog.

**2.Data Preprocessing:**

Clean and preprocess the data, including handling missing values, scaling features, and converting timestamps.

**3.Feature Engineering:**

Extract relevant features from the data. This might include geographical coordinates, depth, magnitude, historical earthquake data, and geological information.

**4.Split Data:**

Split your dataset into training and testing sets to evaluate the model's performance.

**5.Select a model:**

Choose a machine learning algorithm suitable for your problem. Common choices include Random Forest, Support Vector Machines, or Neural Networks.

**6.Model Training:**

Train your chosen model using the training dataset.

**7.Model Evaluation:**

Evaluate your model's performance using appropriate metrics like Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), or others, depending on your specific goals.

**8.Hyperparameter Tuning:**

Optimize the model by adjusting hyperparameters to improve its performance.

**9.Predictions:**

Use the trained model to make predictions on new data.

**10.Deployment:**

If the model performs well, you can deploy it to predict earthquakes in real-time or on historical data.