

Earthquake Magnitude Prediction in the Philippines Using Neural Networks

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Introduction

- This research investigates the use of neural networks for predicting earthquake magnitudes in the Philippines. The study analyzes seismic data, including factors such as date, latitude, and longitude, to identify patterns and improve prediction accuracy. By employing advanced neural networks models, the project aims to experiment the prediction based on the current datasets and further look for the improvements that the future researchers will consider.

Objectives

- 1. Develop a neural network-based model for predicting earthquake magnitudes.
- 2. Analyze seismic data features, including temporal and spatial attributes.
- 3. Evaluate the model's performance using metrics like MAE, MSE, RMSE, and R-squared.
- 4. Compare different factors, such as latitude and longitude, with earthquake magnitudes.
- 5. Provide insights to aid in disaster management and preparedness.

Literature Review

- 1. Emec and Ozcanhan (2024) applied neural networks to predict earthquake magnitudes in the Anatolian Plate.
- 2. Hirata et al. (2012) conducted a forecast experiment on earthquake activity in Japan.
- 3. Sivaiahbellamkonda et al. (2021) enhanced earthquake prediction using LSTM models.
- These studies demonstrate the potential of machine learning techniques for seismic prediction.

Methodology

- 1. Data Collection: PHIVOLCS seismic dataset.
- 2. Preprocessing: Handling missing data and normalizing features.
- 3. Model Design: Neural network architecture with LSTM layers.
- 4. Evaluation: Metrics include MAE, MSE, RMSE, and R-squared.
- 5. Visualization: Comparing magnitudes with latitude, longitude, and time.

Results and Discussion

- The model achieved the following performance metrics:
 - - Mean Absolute Error (MAE): 0.0715
 - - Mean Squared Error (MSE): 0.0091
 - - Root Mean Squared Error (RMSE): 0.0952
 - - R-squared: 0.2239
- While the model shows potential, further tuning and feature engineering are needed to enhance accuracy.

Conclusion

- The study demonstrates the application of neural networks in predicting earthquake magnitudes in the Philippines.
- Despite moderate prediction accuracy, the findings highlight key seismic data trends and the potential for machine learning in disaster management.