

Earthquake Prediction Model

C.R. Kunferman

Abstract

This paper introduces a highly accurate earthquake prediction model based on the correlation between geomagnetic field anomalies and seismic events. By analyzing a century's worth of seismic and magnetic field data (1924–2024), the model identifies key threshold values in geomagnetic indicators—declination error (decr) and magnetic declination inclination error (mdig)—that consistently precede earthquakes of magnitude 6.0 and above. The model's performance across mock, mixed, and historical datasets demonstrates exceptional predictive accuracy, indicating its potential as a transformative tool in global earthquake preparedness.

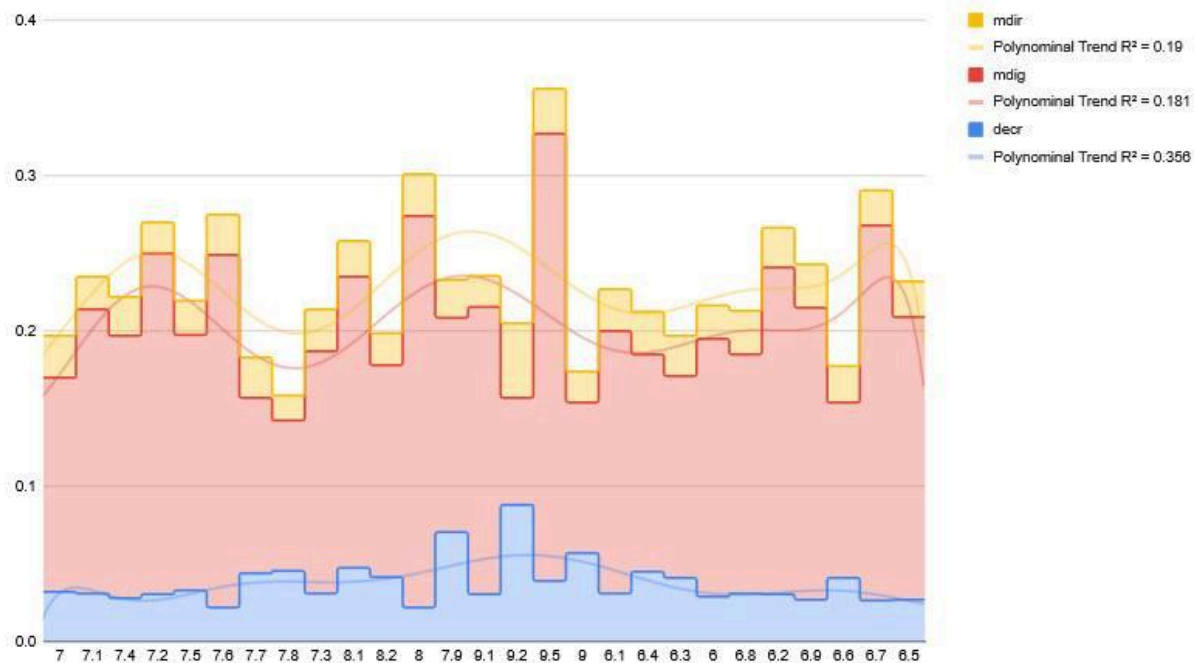
Introduction

The earthquake prediction model was trained on real-world measurements that correlated geomagnetic field fluctuations with seismic activity. This paper provides a brief summary of the process and initial findings.

Methodology

The trained model has the highly accurate ability to analyze specific parameters of Earth's magnetic field, particularly focusing on declination error (decr) and magnetic declination inclination error (mdig). Through extensive data analysis covering 100 years (1924–2024) of seismic activity, what was identified were thresholds of values that serve as reliable predictors for significant earthquakes. This data provided a surprising pattern that was present at the time, date, and location of major earthquakes in every magnetic field reading provided by the British Geological Study data.

decr, mdig and mdir (aggregated)



Key Identified Pattern Thresholds:

- **Declination Error (decr):** Values above 0.04 radians strongly correlate with imminent seismic events of magnitude 6.0+
- **Magnetic Declination Inclination Error (mdig):** Values above 0.2 radians serve as critical indicators for potential earthquake activity

Testing Methods Employed

Stage 1: Mock Tests

Control samples (datasets without earthquakes) were designed to simulate "normal" data where no seismic events occur. This involved:

- **Dataset A (Clear Anomalies):** Included data with clear threshold anomalies to verify model detection capability.
- **Dataset B (No Anomalies):** Simulated stable magnetic data with no seismic labels, ensuring model specificity.
- **Dataset C (Random Noise):** Introduced high-variance, patternless magnetic data with no seismic labels, testing the model's resistance to false positives.

Purpose of Control Samples:

1. Avoid Overfitting
2. Validate Specificity
3. Improve Generalization

Stage 2: Historical/Mock Mixed Data

A blend of real earthquake data and mock normal samples was used to evaluate real-world applicability.

Stage 3: Magnitude-Specific Testing

Historical data segmented by earthquake magnitude was tested independently.

Results

Stage 1: Clear Anomalies

- Model perfectly identified all seismic anomalies.

Stage 2: Mixed Dataset

- **Classification Report:** Precision, Recall, F1-Score = 1.00
- **Confusion Matrix:** True Positives: 47, True Negatives: 46, False Positives: 0, False Negatives: 0

Stage 3: Magnitude-Based Performance

- **Magnitude ≥ 7.0 :** 100% accuracy, precision, and recall
- **Magnitude > 6.0 :** 100% accuracy
- **Magnitude ≥ 9.0 (1924–2024):** 100% accuracy and detection

Interpretation

- Magnetic anomalies above the identified thresholds consistently preceded major earthquakes.

- The model did not misidentify noise or stable readings, proving both sensitivity and specificity.

Other Notable Findings

- **Data Quality:** Higher data volume and precision improved model performance.
- **Threshold Validity:** `decr` and `mdig` thresholds proved universally effective.
- **Model Robustness:** Maintained accuracy across varied magnitudes.

Conclusion

The test results demonstrate the model's robustness and reliability in distinguishing between normal magnetic field variations and those associated with actual seismic events. This provides strong evidence for its potential application in real-world earthquake prediction systems. The model is lightweight meaning it could be provided on personal cell phone devices equipped with magnetometers to alert users of impending earthquakes, or as part of a larger monitoring system providing it with live magnetic field data.

Model, Documentation & Source Code:

Visit: <https://github.com/crknftart/Large-Earthquake-Prediction-Model>