# Predicting Earthquake Aftershocks with Machine Learning

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The toll of earthquake aftershocks, which are potentially even more dangerous than mainshock earthquakes, presents a problem well-suited to machine learning. The occurrence of aftershocks over time is difficult to predict using traditional methods, and such information could have substantial benefits for public safety in earthquake-prone areas. The purpose of this project is to find a machine learning model that is capable of predicting earthquake aftershocks with high precision. Neural network models were created with varying parameters and architectures, and each was trained and tested on a dataset of 40,000 earthquakes. Performance was assessed by training loss, validation loss, prediction accuracy, and false positive rate. Two models were identified as high performing based on these criteria, one with the lowest training and validation loss, the other with the highest prediction accuracy and lowest false positive rate. The high-accuracy model predicted 95.6% of the aftershocks in the test set within 24 hours, and 98.5% of the earthquakes predicted by the model occurred. The low-loss model had a training loss of 0.0174 (mean-squared-error) and a validation loss of 0.0170. The success of these models suggests that aftershocks can be accurately and reliably predicted using neural networks, particularly with the architectures used in those models. The project provides both a tool capable of predicting aftershocks from mainshock earthquakes as well as potential insight into the relationship between mainshocks and aftershocks through further analysis of the structure of the models.