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EARTH OBSERVATION SATELLITE BASED ANALYSIS OF EARTHQUAKE-TSUNAMI
DYNAMICS: PREDICTIVE MAPPING FOR DISASTER MANAGEMENT

Abstract

The dynamic interplay between tsunamis and earthquakes constitutes a compelling area of scientific inquiry, reflecting the intricate relationship between tectonic processes and catastrophic natural events. This correlation lies in their shared origins within tectonic activity, often occurring together in regions prone to seismic events. Certain tsunamis have the potential to reactivate dormant faults or initiate new fault movements, resulting in seismic activity on nearby land. The combined impact of an earthquake-triggered tsunami can be devastating. Therefore, by recognizing the correlation between earthquakes and tsunamis, communities can better anticipate and mitigate the impact of these catastrophic events, ultimately saving lives.

The data sourced from public domain has duly been analyzed looking into various aspects as to how a particular event has occurred at a place in a given time as well the havoc it has created resulted in unmeaningful loss of life. In order to accurately map the data available, a predictive modelling approach has been used to give an accurate prediction of such disastrous events in the future to the extent possible using machine learning algorithms.

In this regard, Machine Learning is employed where the model undergoes training using diverse methods such as Multivariate Time Series Forecast VARMAX model, Linear Regression, Random Forest Regression, following feature selection to make accurate predictions based on historical data analysis of seismic events and tsunami occurrences.

The datasets have been analytically examined and found that it is possible to a greater extent to predict the possibility of earthquakes/tsunami that may happen in future by exactly predicting the latitude and longitude at which such an event may occur in future. It has also been practically tested by taking into account the event that has occurred in the past and matching with the latitude and longitude at which such event has occurred subsequently for which the dataset has been split: data of events till year 2000 and data of events occurred from 2000 to 2024.

The findings of this research highlight the importance of leveraging Earth Observation data for efficient monitoring and prediction of seismic events and tsunamis. One of the significant purposes of this research of analyzing the big data is to safeguard and protect the human existence and minimize the casualties by predicting these disastrous events well in advance so that all precautionary measures could be ensured in protecting the life of humans to be affected in that particular region.