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Constructing artificial features with Grammatical Evolution for earthquake prediction

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Abstract

Over the course of centuries, humanity has evolved, acquired knowledge, and developed an understanding of the geological phenomenon known as the earthquake. Earthquakes are not the result of the wrath of mythological beings, but rather of the dynamic processes occurring beneath the Earth's crust specifically, the movement and interaction of tectonic / lithospheric plates. When one plate shifts relative to another, stress accumulates and is eventually released as seismic energy. This process is continuous and unstoppable. This phenomenon is well recognized in the Mediterranean region, where significant seismic activity arises from the northward convergence (4–10 mm per year) of the African plate relative to the Eurasian plate along a complex plate boundary. Consequently, our research will focus on the Mediterranean region, specifically examining seismic activity from 1990 - 2015 within the latitude range of 33–44° and longitude range of 17–44°. These geographical coordinates encompass 28 seismic zones, with the most active areas being Turkey and Greece. In this paper we achieved the construction of artificial features for the more effective discrimination of seismic events, utilizing the capabilities offered by Grammatical Evolution. Our results, as will be discussed in greater detail within the research, yield an average error of approximately 9%, corresponding to an overall accuracy of 91%.

Keywords: Earthquakes; Machine learning; Neural networks; Grammatical Evolution; Feature Construction

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