University of Genova

Department of Earth, Environmental and Life Sciences

Doctorate Course in Earth and Environmental Science and Technology

Earth Science Curriculum

Università degli Studi di Genova

STAT

Dottorato in Scienze e Tecnologie per l'Ambiente e il Territorio

Research Theme n. 4

Titolo (Italiano): ""Svelare l'Interno della Terra: Utilizzare Ampi Insiemi di Dati Sismici per l'Analisi" Title (inglese): "Unraveling Earth's Interior: Harnessing Extensive Seismic Data Sets for Analysis"
Tutor Daniele Spallarossa (daniele.spallarossa@unige.it) and eventual co-tutor: Carla Barnaba (cbarnaba@ogs.it) (OGS - CRS)
Program description including the formation program abroad The analysis of seismic data has always played a fundamental role in the study and understanding of seismic phenomena on Earth. In the last decade, significant advances in recording and analysis techniques have made it possible to create huge data sets of seismic data. In this context, the data collected during the seismic crises in Turkey (2023) and central Italy (2016-2017) are a source of invaluable information. Indeed, recent studies have shown that microseismicity analysis can be effectively used not only to study local and regional phenomena that modify the characteristics of seismic motion, but also to identify the preparatory phase of major seismic events. However, one of the main challenges is to identify the best features of seismic data sets and the most promising analysis techniques to effectively detect and characterize spatio-temporal variations in source or site parameters. The candidate will address these open questions using different seismic data sets represented, for example, by extended seismic catalogs or specific features extracted from seismic signals. The main objective of the project is to identify spatial and temporal variations of seismic features (such as ground motion anomalies, site effects, etc.) that can be correlated with the physical properties of the Earth's interior (e.g. attenuation, stress conditions, seismic wave velocities, etc.). In order to achieve the defined goals, traditional analysis techniques will be complemented by machine learning techniques, which are particularly suitable for dealing with very large data sets. This research will be carried out within the PRIN/MUR and PNRR projects, involving multidisciplinary research groups with expertise in both observational seismology and seismic hazard analysis. The PhD student will have the opportunity to develop the research program within the existing collaboration with OGS (Istituto Nazionale di Oceanografia e di Geofisica Sperimentale, Trieste, Italy), GFZ German Research Centre for Geosciences (Potsdam, Germany) and INGV (Istituto Nazionale di Geofisica e Vulcanologia, Milan, Italy).
Financial support: Borsa Istituzionale
Tutor's publications (max 3) 1) Iaccarino, A.G., Cristofaro, A., Picozzi, M., Spallarossa, D., Scafidi, D. "Real-time prediction of distance and PGA from P-wave features using Gradient Boosting Regressor for on-site earthquake early warning applications", Geophysical Journal International, 2024, 236(1), pp.

675–687.
2) Picozzi, M., Iaccarino, A.G., Spallarossa, D. “The preparatory process of the 2023 Mw 7.8 Türkiye earthquake”, Scientific Reports, 2023, 13(1), 17853.
3) Picozzi, M., Iaccarino, A.G., Spallarossa, D., Bindi, D. “On catching the preparatory phase of damaging earthquakes: an example from central Italy”. Scientific Reports, 2023, 13(1), 14403.