

, Localization and Characterization of the Seismicity: Deep Learning Methods for Accuracy Improvements of Regional Seismic Bulletins

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The recent strong densification of seismic networks and the increase of data availability from different type of sensors/networks (low-cost, Raspberry-shake, temporary deployments with hundreds of nodes, etc.) questions our ability to automatically and accurately detect, locate and characterize seismic events combining these composite and large data sets. These steps are however key issues to monitor natural and anthropogenic seismic activity, an important goal of the CTBTO community. Here we present a protocol/workflow that takes into account the latest advances in deep learning methods for seismology, aiming to automatically build seismic bulletins and discriminate/label events, for national needs as for scientific research. We validate this protocol/workflow and proved its robustness to different sets of data, from the local scale of a dense seismic network (200 nodes), to a regional scale of a temporary broadband network completed by Raspberry-shakes (Pyrenees and Bolivian Altiplano). We show the gain reached both in terms of calculation time and hypocentral location accuracy. The increase in accounted phase picks due to joint use of permanent/ temporary/low-cost sensors, and automatic deep learning based approaches, provides more exhaustive and accurate seismic bulletins, leading to a better characterization of the regional seismicity and allow the construction of trustable natural and anthropogenic seismic events database.

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Promotional text

We present results on the methodological use of multiple automatic deep learning algorithms to detect, pick, locate and characterize the natural and anthropogenic seismicity by using the regional seismic networks diversity.

Oral preference format

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