

## Application of Diffusion Maps for Seismic Event Characterization in Israel

In this work, we apply an advanced machine learning technique named diffusion maps for automatic earthquake-explosion discrimination and for explosion classification in Israel. The proposed methods construct a low-dimensional model of the original data. In this new low-dimensional space discrimination and classification analysis is carried out. In addition, the new construction allows visualizing the pair wise distances between all of the events. The method is applied for discrimination and classification of seismic data that was recorded at the Israel Cooperating National Facility (CNF) stations. These stations are defined by the Comprehensive Nuclear-Test Ban Treaty and are built according to the same standard as the IMS stations. The algorithm's performance is demonstrated on several seismic data sets, high accuracy discrimination and classification rates are achieved. For instance, the diffusion-based algorithm provides a correct discrimination rate that is more than 90% for a data set comprising seismic events from the Dead Sea area. These events were taken from the seismic catalog of the Geophysical Institute of Israel for years 2004-2014 with duration magnitudes  $M_d \geq 2.5$ .

**Primary author:** BREGMAN, Yuri (Soreq Nuclear Research Center)

**Presenter:** BREGMAN, Yuri (Soreq Nuclear Research Center)

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