Session 18

Machine learning and other novel approaches in site response and ground motion predictions

Conveners:
Fabrice Cotton[1], Chuanbin Zhu[2], Sreeram Reddy Kotha[3]

[1] GFZ German Research Centre for Geosciences & University of Potsdam, Potsdam, Germany
[2] GFZ German Research Centre for Geosciences, Potsdam, Germany
[3] ISTerre - Gustave Eiffel University, Grenoble, France

Accurate modellings of earthquake ground motion and site effects are essential in seismic hazard/risk analyses, but remain elusive. We have heard the success stories of machine learning (ML), including deep learning, in solving challenging tasks in many disciplines, e.g., protein structure prediction. Some have also explored ML techniques in ground motion and site effects modellings. The application of ML is further fueled by the need to process and analyze the exponentially growing number of ground-motion observations. Besides, the rapid growth in computational resources facilitates large-scale and collaborative ML-enabled scientific discoveries. However, ML is not without challenges, e.g., interpretability and extrapolation, which hindered the wide-spread adoption of ML. Could we overcome the limitations and harness the opportunities brought by ML in our specific field?

In this session, we cordially welcome submissions related to the application of ML and other novel methodologies/technologies in ground motion and site effects modellings and its implications on seismic hazard/risk evaluations. Topics of interest include but not limited to: the development of large and open datasets for ML based site-response and ground-motion modelling (e.g., outlier/anomaly detection); site classification; modelling of linear site response, soil nonlinearity, topographic and basin effects; city-scale or regional site-response mapping; detection of temporal variation in site response; modeling of repeatable, secondary physical phenomena in ground motion (e.g., spatial and cross-correlation); evaluation of assumptions in ground-motion modelling (e.g., the heteroscedasticity of ground-motion variability); advanced statistical methods aimed at developing non-ergodic ground-motion models, spatially varying coefficient models; (near) real-time mapping of ground-motion intensity.