ESR 1.1 : Uncertainty characterisation of ground motion from large earthquakes in urban areas
A Research PhD position in the URBASIS ITN funded by the EC

Supervisors: Marco De Angelis (University of Liverpool) - Ben Edwards (University of Liverpool) - Danijel Schorlemmer (GFZ Potsdam)

Recent devastating earthquakes and induced seismicity near infrastructures must become the centrepiece of analysis in reducing risk and increasing resilience, facing up to global urban population growth in the coming decades and the concentration of wealth in cities. The prediction of seismic ground motion and response of structures are key issues in reduction of seismic urban risk. There is therefore a demand for highly trained scientists with a broad understanding of engineering seismology and earthquake engineering, skills being essential in academic research, in private companies with activities related to risk mitigation and energy facilities and for policy makers. The URBASIS-EU project aims to provide a multi-disciplinary training platform for young scientists in order to develop their individual project and to promote their entrepreneurship and their employability toward the academic, private and insurance or decision-making sector. High-quality supervision of the young scientists will be ensured through the international recognition of the URBASIS-EU partners. A comprehensive set of transferable skills will be developed through innovative and interdisciplinary joint research projects between academic and non-academic partners on the prediction of seismic hazard in urban areas considering low-probability/high-consequences events and induced seismicity related to the exploitation of energy resources; the seismic ground motion prediction within the non-free-field urban area; the coupling between ground motion and structures/infrastructures responses for natural and induced seismicity including time dependent vulnerability; and the systemic risk of interconnected urban systems. URBASIS-EU will create a lasting collaboration for the establishment of a European network of academic and non-academic experts, improving the interface with decision-makers.

More information: https://urbasis-eu.osug.fr/?lang=en

Job Description
Statistical and numerical algorithms that can rigorously process the data collected from low accuracy/precision devices are urgently needed. Epistemic uncertainty arises from the inability to gather sufficiently precise/accurate measurements. These algorithms will allow for coherent seismic characterisation from such devices, as all the uncertainties will be carried through the computations. Error propagation strategies will be developed to rigorously characterise the ground motion from different devices with given specifications. This will encourage scientists to have an “inclusive” approach to seismic data collection, in opposition to discarding potentially useful data as a result of misclassification. The analysis of the data on a network scale will give scientists and engineers a better insight into what is the cause/effect of strong shaking in different urban areas. The key parameters that define and limit the extreme ground motion will be investigated. The ground motion obtained from such characterisation will then be converted into input stochastic excitation and propagated through engineering models to assess the fragility of urban critical installations.
The candidate will develop open-source numerical libraries for the unified modelling of epistemic and aleatory uncertainty in ground motion time history data. This will be linked to existing geotechnical and geophysical models of the near-surface and crustal structure for the assessment of the expected ground shaking in the near field.

The student will join multi-disciplinary research groups at the University of Liverpool and within the URBASIS-EU consortium. The University of Liverpool’s School of Environmental Sciences and the Institute for Risk and Uncertainty are home to more than 200 PhD students from several disciplines in relation to science and engineering. This project will involve close collaboration with GFZ Potsdam, where the researcher will spend several months under the supervision of Dr Danijel Schorlemmer. The project will also involve secondment with an industrial partner (GEOTER).

The URBASIS consortium is funded by European Commission’s Innovative Training Network (ITN) program. This research project will take place at the University of Liverpool, UK, within the Faculty of Science and Engineering (School of Environmental Sciences and the Institute for Risk and Uncertainty).

Requirements and Application
The successful applicant must have a Master’s degree in engineering, mathematics, physics, geophysics, engineering seismology or similar. The applicant is expected to have a strong background in the analysis of large datasets, development of numerical models, inversion methodologies and computer programming. Good programming skills in scientific computing with Python or Java are required. Understanding of practical C programming is also desirable. Knowledge of concepts in seismology and engineering seismology and Python programming is an advantage. Excellent undergraduate and Master’s degree grades are expected as well as a high level of written and spoken English.

PhD stipends are allocated to individuals who hold a Master's degree. PhD stipends are normally for a period of 3 years. It is a prerequisite for allocation of the stipend that the candidate is to be enrolled as a PhD student at the University of Liverpool. According to the URBASIS-EU, the progress of the PhD student shall be assessed every 12 months. It is a prerequisite for continuation of salary payment that the previous progress is approved at the time of the evaluation.

The qualifications of the applicant will be assessed by the Selection committee. On the basis of the recommendation of the Selection committee, the Administration of University of Liverpool will make the final decision for allocating the stipend.

URBASIS-EU wishes to reflect the diversity of society and welcomes applications from all qualified candidates regardless of personal background or belief. We encourage applications from everyone irrespective of gender and ethnic group but, as women and members of ethnic minority groups are currently under-represented at this level of post, we would encourage applications from members of these groups. Appointment will be based on merit alone.
Application must be in a form of a single PDF file including a CV, a cover letter, academic transcripts, and the names and complete contact information and letter of two referees sent through:

- the consortium web-page https://urbasis-eu.osug.fr/?lang=en
- the EU EURAXESS portal https://euraxess.ec.europa.eu/

Vacancy number: URBASIS-EU ESR1.1 (to be reminded in the application form)
Deadline: February, 23rd 2019
Salary: According to the European Commission and local standards; minimum gross wage is 3500 euros before local taxes

Contact Information
You may obtain further information from:

- Philippe Guéguen, URBASIS project coordinator: philippe.gueguen@univ-grenoble-alpes.fr (Earth Science Institute, Université Grenoble Alpes) for general questions regarding the URBASIS consortium or concerning the scientific and training aspects of the ITN program
- Ben Edwards: ben.edwards@liverpool.ac.uk, School of Environmental Sciences, University of Liverpool or Marco De Angelis: mda@liverpool.ac.uk, Institute for Risk and Uncertainty, University of Liverpool for specific questions regarding this PhD project
- Florence Cataye, URBASIS project manager: florence.cataye@univ-grenoble-alpes.fr for administrative questions