PROJECT 4: Assessing and Sharing Risk with a Rapid Earthquake Damage Estimation Tool for the Cascadia Region of Western Canada

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Project Summary:
The goals of this project are twofold: (1) to understand the potential impact of earthquake scenarios in the Cascadia region of western Canada and (2) to further develop tools to share this information with users in a timely fashion. The first goal involves modelling the hazard and risk posed by seismic scenarios in western Canada, using the methodology of the First-Generation Seismic Risk Model. Per the second goal, the results will then be communicated to practitioners and the public using the RiskProfiler.ca website. More importantly, the student will help to code a script to generate static products for a Rapid Earthquake Damage Estimator (RED-E) tool, similar to the PAGER and TwoPAGER products produced by the USGS. This will include a text-only product and a pdf product with maps and charts. Wireframes of these products were already developed by Patchett (2024), based on consultation with a wide range of practitioners, but have not yet been prototyped. The end product will be a catalogue of scenario events and a script to translate scenario results into usable information products for first responders and emergency managers. This will mark a significant step forward in understanding risk from future earthquakes in western Canada, sharing that information, and operationalizing a tool that will help practitioners best direct limited resources in the first 24-72 hours after a major earthquake.

Patchett, M. (2024). Characterization of End-User Needs to Optimize the Development of the Rapid Earthquake Damage Estimation (RED-E) System in Canada (Doctoral dissertation, University of Victoria).

Role and probable activities for a student researcher in this project:
The student researcher will be running scenarios, using the OpenQuake Engine, and writing code to turn scenario outputs into static products for the RED-E tool. Specifically, they will:
- Perform background reading, at the discretion of advisors, to familiarize themselves with the OpenQuake Engine, seismic hazard, seismic risk analyses, risk communication, and western Canadian tectonics.
- Complete online training on the use of the OpenQuake Engine.
- Run a test scenario, to confirm they can generate reproducible results.
- Run a series of scenarios, as progress allows, to quantify the impact of hypothetical earthquakes in the Cascadia region of Western Canada.
- In discussion with advisors, create a mock-up of the static products: (1) text-only and (2) pdf. These will be based on wireframes developed by Patchett (2024), subject to revision in light of best science communication practice.
- Compare the prototype design to PAGER and TwoPAGER products from the USGS.
- Create one or more scripts to automatically generate the RED-E static products from OpenQuake outputs.
- If time and interest allows, create a containerized environment to run OpenQuake and produce the static products.
- Create a short report on the work.

Preferred Skills
Some experience with coding in Python is essential. Exposure to topics in geophysics, geoscience, civil or structural engineering are an asset. Beneficial to have experience working with Docker, Podman, or similar, but not required.