



**Oregon State University**  
**College of Engineering**

**Barbara G. Simpson, Ph.D.**

Assistant Professor in Structural Engineering  
School of Civil and Construction Engineering  
Oregon State University, Owen Hall, Rm 340,  
Corvallis, OR 97331

**e:** [barbara.simpson@oregonstate.edu](mailto:barbara.simpson@oregonstate.edu)

**p:** +1-541-737-7168 **m:** +1-314-941-2222

**w:** <https://simpsoba.wordpress.com/>

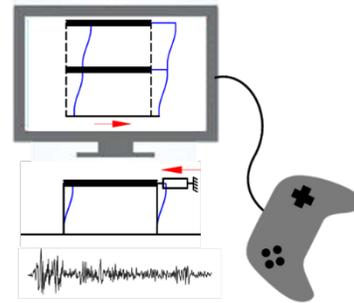
2/6/2022

**Oregon State University**

**Postdoctoral Scholar in Accelerating Simulations in Natural Hazards Engineering  
with Graphics Processing Units (GPUs)**

A postdoctoral scholar is sought for a position in *Accelerating Simulations in Natural Hazards Engineering with GPUs* working with Dr. Barbara Simpson in the College of Engineering, School of Civil and Construction Engineering at Oregon State University.

Many numerical simulations, such as finite-element analysis, were originally formulated to run serially or in parallel on central processing units (CPUs). However, computer engineering has seen a paradigm shift towards massive parallelism using graphics processing units (GPUs), which have become the default accelerators in many data-driven scientific disciplines outside of civil engineering. To enable higher-resolution simulations of civil structures, this work will harness the massive parallelism of GPUs – originally developed for graphics rendering – to overcome computational bottlenecks in structural simulations. The GPU acceleration will be demonstrated in a real-time hybrid simulation (RTHS) environment to study the seismic response of tall buildings, including soil-structure interaction (SSI) effects.



The postdoctoral scholar will play an important role in the development and verification of a new open-source GPU-accelerated finite-element analysis code for the nonlinear dynamic analysis of civil structures. Finite-element based structural analysis is a common tool used by a wide range of engineering disciplines. However, the resolution of structural models, in terms of both model size and mesh refinement, can be limited by computational runtime, resulting in an ever-increasing need for acceleration. For example, regional-scale modeling, uncertainty propagation, optimization, and many “interaction”-type problems, e.g., soil-structure interaction and fluid-structure interaction, often suffer from long run-times and require large-scale computing resources. While progress has been made to GPU-accelerate simulations of earthquake fault rupture and fluid dynamics, there has been slower progress in GPU-accelerating analyses for civil structures. This lack of progress can be attributed to the prevalence of different element formulations and nonlinearities, coupled equations of motion, implicit integration schemes, and reliance on direct solvers, which are not immediately amenable to fully parallel acceleration on GPUs.

For further details on the research, scope, and position expectations please contact Dr. Barbara Simpson. This project includes collaborations with NSF-supported Natural Hazards Engineering Research Infrastructure (NHERI) sites, including the SimCenter at the University of California, Berkeley; DesignSafe at the University of Texas, Austin; and the RTHS Experimental Facility at Lehigh University. For more information see <https://www.designsafe-ci.org/>. Additional details on the research group with which the postdoctoral scholar will be affiliated can be found at: <https://simpsoba.wordpress.com/> (Dr. Simpson’s webpage) and [https://www.nsf.gov/awardsearch/showAward?AWD\\_ID=2145665&HistoricalAwards=false](https://www.nsf.gov/awardsearch/showAward?AWD_ID=2145665&HistoricalAwards=false) (NSF Award Abstract).

**Qualifications:** Candidates should have been awarded a Ph.D. in Civil Engineering, Structural Engineering or a related field within less than five years, and have an excellent record of research, publications, and strong

communication skills. Advanced skills in computer programming are required. Enthusiasm for multi-disciplinary research and existing experience with computational modelling and C/C++ and/or CUDA programming will be considered highly during the selection process.

Successful candidates will ideally have a strong background in finite-element analysis, solid mechanics, and structural dynamics and demonstrated experience (3–5 years) in two or more of the following: (1) software engineering and software design; (2) scientific workflow systems; (3) community software development, version control, documentation, and maintenance; (4) proven knowledge of computer languages used in scientific computing (e.g., C, C++, CUDA) and knowledge of scripting languages used in scientific data processing (e.g., Matlab, R, Python); and (5) proven experience/knowledge of parallel and multi-threaded programming (e.g., MPI, OpenMP, CUDA) and I/O tools for parallel access and management of large datasets.

**Appointment:** The appointment is expected with an anticipated latest start date of **September 1, 2022**. Earlier start dates can also be discussed, and this date may be adjusted as needed. The duration of the appointment is two years, contingent upon successful performance in year one. The salary and benefits are competitive, and funding is available for the postdoctoral fellow for travel and training purposes.

**To Apply:** Please contact Dr. Barbara Simpson ([barbara.simpson@oregonstate.edu](mailto:barbara.simpson@oregonstate.edu)) with the subject heading “CAREER: Post-Doc Application” and provide a cover letter, CV, two sample publications, and the contact information of at least two references. Review of applications will begin immediately but is expected to close by **March 1, 2022**. Additional supporting information may be requested upon review.

**Additional Information:** Information on the School of Civil and Construction Engineering can be found at <https://cce.oregonstate.edu/>. Oregon State University, as one of the largest land grant institutions in the U.S., is located in Corvallis, Oregon, which has been ranked as the 5<sup>th</sup> best college town in the US, <https://livability.com/top-10/college/10-best-college-towns/2019/or/corvallis>, and was named the best city to live in Oregon by the US Chamber of Commerce <https://www.chamberofcommerce.org/best-cities-to-live-in-oregon/>. With proximity to the ocean and mountains for outdoor activities and a supportive, inclusive community, Corvallis offers excellent work-life balance for all who come to live in Oregon.

Sincerely,



Barbara Simpson  
Assistant Professor  
Oregon State University