

The Center for Computational Geosciences (CCoG) at the University of Nevada, Reno

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CCoG Mission

The Center for Computational Geosciences will establish at the University of Nevada, Reno a facility for massively parallel computing. This effort is sponsored by the Nevada Applied Research Initiative, Optim LLC, the Nevada Seismological Laboratory, and Lawrence Livermore National Laboratory. CCoG will serve as a center for teaching, research, and technology transfer on computational solutions to problems in the geological sciences, geoenvironment, and environmental sciences.

CCoG will enhance educational and research programs at the University of Nevada, Reno by:

- Building a massively parallel computation facility devoted to the geological sciences, geoenvironment, and environmental sciences.
- Enabling UNR researchers in these areas to compete effectively for sponsored projects requiring massive computation.
- Through funded research and commercial projects, hiring UNR students to develop and operate the computational facility.
- Making massively parallel computation facilities available to undergraduate and graduate students in the geological sciences, geoenvironment, and environmental sciences.
- Developing, as a first step, class exercises within senior-level courses that exploit and explore massively parallel computational solutions to earth science problems.
- Developing, as an intermediate step, courses covering parallel computation techniques that will benefit students in the geological as well as computer sciences.
- Developing, as a final step, degree options and minors that demonstrate skills in parallel computing tools in the geological sciences.

CCoG research will focus initially on a project, sponsored by the Center for Complex Distributed Systems at Lawrence Livermore National Laboratory, to investigate geological influence on the level of ground shaking to be expected in the Las Vegas basin from regional seismic events.

CCoG Vision

The geological sciences and engineering disciplines study and make commercial use of the very complex Earth system. Researchers and resource managers must develop, invert, and forecast with earth-system models that have millions of parameters and essentially infinite solution spaces. Cutting-edge research, as well as commercial activities, are demanding a constantly larger scale of computation. These computational

needs are currently met with increased deployment at universities and industry of massively parallel machines.

However, the computational codes used to date in the geological sciences are by and large traditional procedural programs that do not offer much speed or scalability to parallel machines. Any students who intend a career in the geological sciences or engineering will now upon graduation face the task of adapting procedural codes to parallel machines. Few research projects or commercial consultants have the resources to employ both qualified geological and computer scientists. Thus geological science and engineering graduates who have training in parallelized coding and execution will enjoy many more opportunities and higher salaries than graduates with traditional training.

The Center for Computational Geosciences at the University of Nevada, Reno is established to provide training in parallel computation to both undergraduate and graduate students. This training will occur through both enhancements to curricula in the Geological Sciences, and through student work on research and commercial projects using parallel computation. Graduates following both academic and industrial career paths will enjoy increased employability, through their experience with the most important new tool in their field. CCoG will assist in this way with developing a technologically savvy workforce for Nevada, diversifying the State's economy. The geological sciences and engineering industries in Nevada will benefit from the presence in the State of a leading center for research and education.

CCoG Website: <http://www.seismo.unr.edu/ccog>