Surf’s Up!

Students participants in the University of Hawaii, Mānoa’s summer REU program.
Students benefit from a unique Research Experience for Undergraduates program at the University of Hawaii.

Susan Brown, Adjunct Professor in the College of Engineering at the University of Hawaii, Mānoa, has been a TeraGrid Campus Champion, a local source of knowledge about high performance computing opportunities and resources on her campus, for three years.

Being connected to TeraGrid has opened doors to new opportunities for fellow faculty and students. One of these opportunities is a three-year Research Experiences for Undergraduates (REU) grant from the National Science Foundation that will immerse undergraduate students in computational fluid dynamics research.

The eleven-week REU project, piloted this past summer and entitled High performance computing Applications Research experience for undergraduates Program for computational fluid dynamics (HARP), introduced ten undergraduate students, seven of whom were underrepresented, in the use of TeraGrid with support from the Pittsburgh Supercomputing Center (PSC).

“To support this project, we needed to provide the students with access to the ANSYS Fluent software package to study computational fluid dynamics,” said Brown. “We only had limited access to this package on our local systems. If it were not for my connections with TeraGrid, I would never have learned about the availability of Fluent running on the Pople system, the Silicon Graphics International (SGI) Altix shared-memory system, at the PSC. The range of problems the students were studying were computationally intensive, and the students benefitted tremendously from being able to use Pople to conduct their research projects.”

The students began their REU experience with a two-week intensive introduction to theory, tools and resources. They learned about fluid dynamics, how to program in Fluent, UNIX, Fortran, and the use of high performance computing to facilitate their research. Following their two-week training, the students were paired with mentors who were faculty and graduate students from the University of Hawaii. Some students worked in groups and others worked alone on a variety of research topics, including shipment container acceleration during tsunami conditions, optimization of a micro-channel heat sink using bifurcating geometry, the effects of unsteady forces and the effect of tsunamis on coastal structures, among other projects.

“We had a great experience using the TeraGrid resources at the PSC. I have found TeraGrid resources to be very convenient for academic use,” says Brown. “I was impressed on two fronts. We were able to teach the students in interactive mode, and the students were able to run their codes in batch mode. The systems were responsive and always available.”

At the end of the summer experience, the students responded through surveys indicating that they learned a lot about fluid dynamics, high performance computing, and felt that their research projects were very successful. Huilin Lin, remarked that, “HARP is a perfect way to learn to conduct computational research in a professional setting. The experience was invaluable for me.” Leon Santanizio said that, “As an undergraduate student studying mechanical engineering, my experience with the HARP program was very rewarding. During the program, I gained knowledge and experience in computational fluid dynamics and supercomputing. I highly recommend the HARP program to other undergraduate students and am grateful to all the sponsors, administrators, and mentors responsible for the success of the program.”

Weillin Qu, Professor in the Mechanical Engineering Department, says, “My experience with HARP in the past summer has been very positive. The REU students that were assigned to our lab were able to grasp the use of the computational fluid dynamics software package in a short period of time and made substantial contribution to our ongoing research. Upon completion of summer HARP, the two students become part of our research team by working as undergraduate lab assistants, and continue contributing to our projects.”

“My participation in the TeraGrid Campus Champions has been of benefit to our project and to our campus. I look forward to continuing to be a Champion as it allow me to be more responsive to our researchers when they need TeraGrid resources,” says Brown. “I can quickly get responses to my questions from the Campus Champions team and I feel that we have easy access to resources for research and education purposes for our campus, resources that were an invaluable part of our HARP program.”

Relevant links:
HARP: https://sites.google.com/site/harpreuprogram/
University of Hawaii, Mānoa:
http://www.hawaii.edu/campuses/manoa.html