

Capstone Students Working on Real Projects in Real World Situations

By Janet Dawald

A record number of Computer Science and Engineering students are completing their capstone projects this spring. Ken Christensen, PhD, PE, professor and director of Undergraduate Program in the Department of Computer Science and Engineering, is now in his thirteenth year of turning students into industry professionals. "We usually have 20 to 25 students at a time in this course," Professor Christensen explains, "but this capstone semester we have 38 students. Computer science and computer engineering is booming in enrollment in the college."

Originally conceived as a course for graduating seniors to demonstrate their abilities and literally show what they have learned in college, engineering capstone courses have evolved into an opportunity for students to design and produce a useful product. The latest incarnation of capstone courses work directly with industry partners to not only develop useful products, but also to learn the soft skills necessary to work in teams, understand project planning and scheduling, give presentations, and deal with uncertainties and ambiguities in a professional manner.

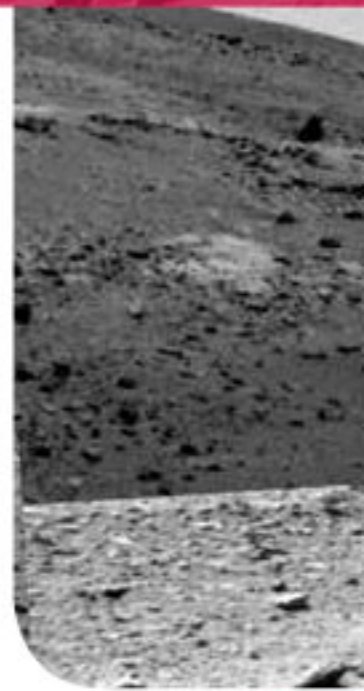
The Computer Science and Engineering capstone course (CIS 4910) at USF has taken the concept of working with industry to the next level. Many corporations have benefitted from having students tackle an engineering problem. It is win-win situation for students and for businesses. Under the leadership of Christensen since 2000, many of these projects also have a third tangible benefit: to society. Projects range from cutting edge technology to assisting handicapped people, detecting fallen patients in hospitals, educating children with diabetes, modeling manatee-boat collisions in Tampa Bay, and bringing Martian geology to the public are just a few of the projects that students have tackled. These projects provide serious professional experience for students and far-reaching benefits for industry and society.

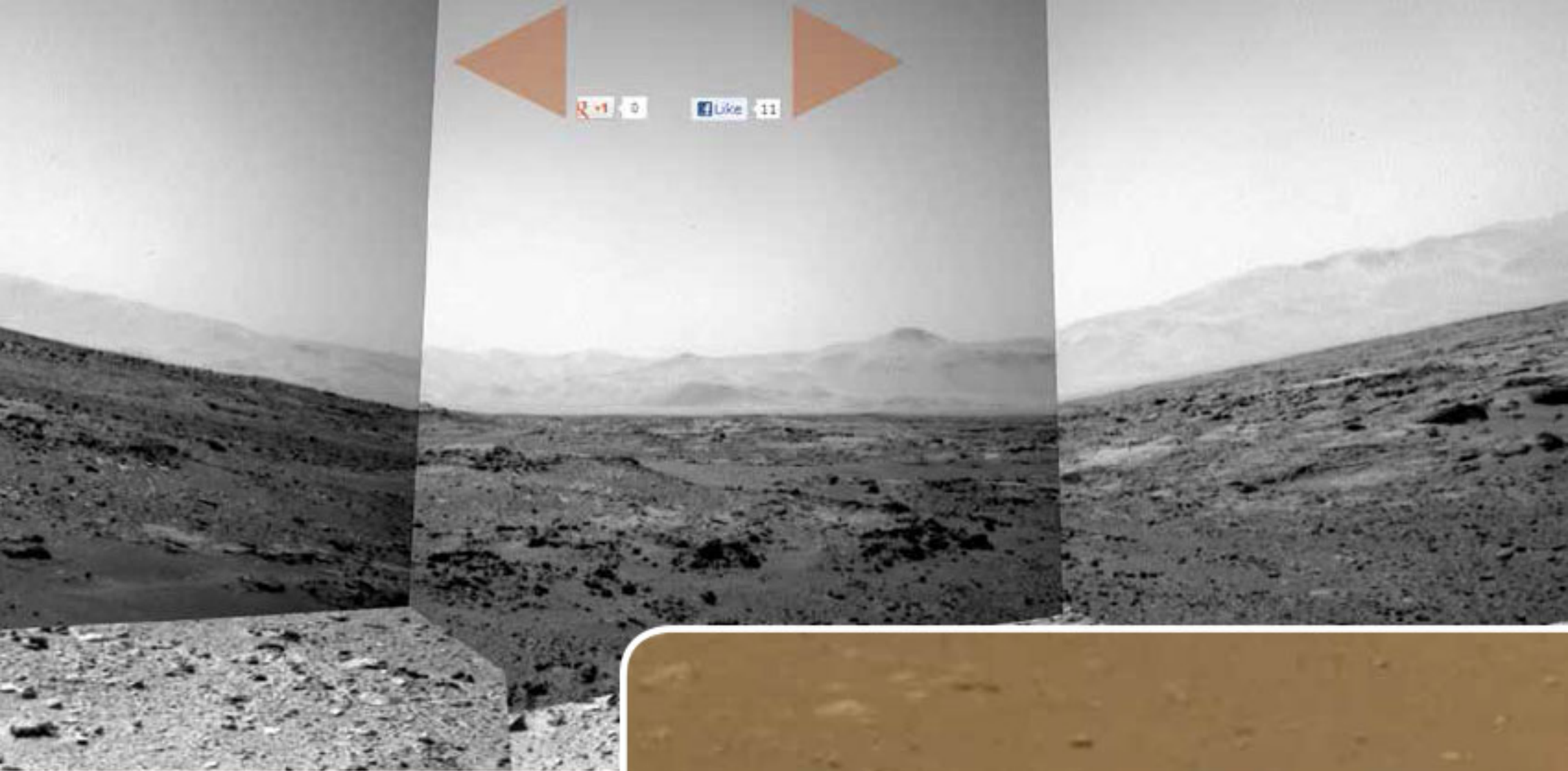
Every semester, Prof. Christensen works with his industry and university contacts and puts together from five to ten carefully selected projects for students to choose from. Each project consists of a team of students, from

three to five members, who select their project, develop requirements and specifications, prepare a test plan, implement their design, test it, demonstrate it, and produce a final written and oral presentation.

The companies involved have the first look at the upcoming graduating class. They also have the opportunity to have a non-critical "back burner" problem solved. Many companies choose to have students look into a new technology, so the company can "get smart" about the technology. "For example," explains Christensen, "a company wants to look into touch screen products, so they tell the students to prototype a product, let us know how we could use touch screens in our business." Or, perhaps they are interested in mobile applications, but currently have limited resources to devote to what is becoming the wave of the future.

A well thought-out project can have far reaching benefits for both the company and society. A recent capstone project involved designing and building the interface software for a wheelchair mounted robotic arm (WMRA) for patients whose body motions have been reduced to eye movement only. Using an "eye gaze" and voice recognition system, the students developed software that integrated with the robotic arm and a power wheelchair control software. They tackled problems such as speech homophones (words that sound alike) and background noise. The resulting hardware and software enabled the arm to pick up a cup, open a drawer, and take a book off a shelf in a reasonable amount of time. "This project was so interesting to me that it became the focus of my graduate studies," says Christine Bringes, one of the students who worked on this project. "This was a unique undergraduate experience and offered real-world work opportunities." This project was done for the Center for Assistive, Rehabilitation & Robotics Technologies (CARRT), an interdisciplinary center involving various colleges and departments at USF.





Redwan Alqasemi, adjunct professor at CARRT, when asked about the capstone projects and working with the Department of Computer Science and Engineering explains: "A mutual benefit serves everyone in these projects. A student needing a project to work on, a professor needing students to work on a project, a project needing to be done, and a user wanting to use such an innovation - everyone wins!"

Capstone projects are not necessarily earth bound. NASA's Curiosity Rover has produced thousands of pictures that can be bewildering to the general public. Students are working on a website that will help the public navigate and express interest for favorite Rover images. According to the students on this project, this application will be "dynamic, fast, fun and sticky." It will help NASA roll out more services to the public, and is an exciting opportunity for the students to be part of NASA's public outreach program. Industry take note: it is not just interest in Martian rocks that can be measured with this project. Like many of Christensen's corporate connections, the NASA capstone project has far-reaching benefits beyond the original scope of the project. According to Mark Powell, '92, '97 MSCS, '01 PHD, senior computer scientist at

Photos taken by NASA's Curiosity Rover will be featured on a new public outreach website developed by USF students.

NASA - Jet Propulsion Laboratory (JPL), "The new 'Like a Rock' application is another big step forward in engaging people in an interactive forum about exploring Mars: people vote for the images that they want to hear more about, and NASA's science investigation team responds back to the most popular requests. The aim is to keep people connected to the mission week after week and to get more of the kinds of stories people are most interested in published online for their enjoyment."

The experience working with USF students has been very positive, according to Mark who says, "The USF student teams that I worked with both last fall and this spring have the kind of can-do attitude that JPL looks for in everyone we choose to work with. Mentoring these projects is a very rewarding relationship for me."

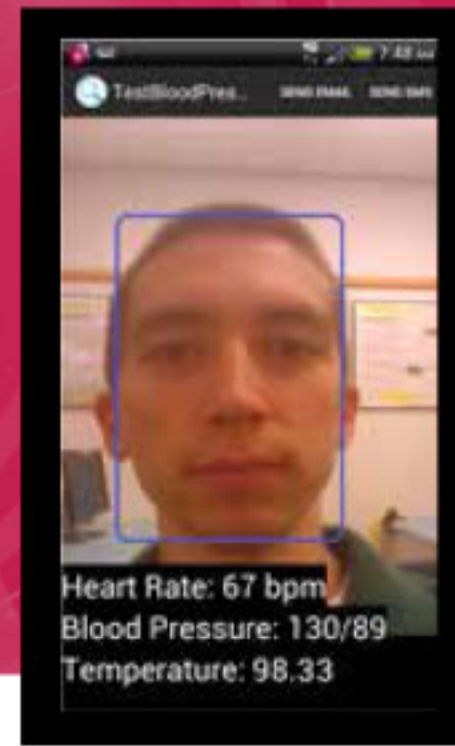
Start Screen



Scan Screen



Send data to 911



Raytheon works with USF student to produce an Android mobile phone that reads vital signs.

Raytheon has partnered with several capstone projects in the past, ranging from an apparatus to automatically aim antennas to communications software to touch screen applications. A current project involves using a commercially available Android smart phone to measure vital signs of an individual. This potential product can send the user's vital signs to a specially-equipped 911 system and provide responders with valuable information before arriving on the scene. The ability to monitor pulse/heart rate, respiratory data, blood pressure, temperature and even pupil dilation before arriving on the scene is invaluable. Such a technology would also be deployed on battlefields, providing early data to Medevac personnel.

Like many large companies, Raytheon uses the capstone projects to explore concepts and requirements of an idea prior to allocating scarce resources. They also get a bargain basement price. Jay Schroder, senior principal systems engineer at Raytheon, adds that students in their projects also are put through the Raytheon engineering design process in only 17 weeks, usually a two-year cycle. "We have the engineering students go through the identical design reviews that they would face if they were actually employed by us," he explains. "The student engineering team goes through four major reviews during the semester, with each one bringing on more senior engineers and managers to evaluate their design. If the student does well on these projects, we are pretty confident that they can handle a real assignment at Raytheon."

If your company would like to be involved with Computer Science and Engineering capstone projects, please contact Ken Christensen at christen@cse.usf.edu. "A good project involves both hardware and software," he explains, "and is slightly open-ended to allow for student creativity and

innovation. Key benefits to companies include recruiting of future employees, having a non-critical path project completed that they may not otherwise have the resources for, and a meaningful way to give back to the university and the community."

BEST Stands for "Bulls Engineering Success Training"

Through an initiative started by its Advisory Board, the College of Engineering is moving forward with a college-wide capstone course called Bulls Engineering Success Training (BEST) that will provide selected engineering students a multidisciplinary, industry-based design and development experience. It will be available to students in all programs.

Slightly different than a traditional capstone course or senior semester, a BEST team will complete an industry project in two semesters and earn 6 credit hours. Students will receive mentoring from industry engineers and supervision from faculty.

It will be a great learning experience that will better prepare students for their first job. Industry benefits by completing a project of direct value, while having access to recruit the top students. It's also a meaningful way to give back to the university.

This spring and summer BEST faculty will visit with companies to define the projects as well as recruit students. The first BEST projects will get underway in the fall semester.

For further information about the BEST program or to participate, contact Ken Christensen at christen@cse.usf.edu.