# *IGEM*

## *An Investment in Idaho's Future*

### *2013-2014 Progress Report*

BOISE STATE UNIVERSITY

# IGEM

## An Investment in Idaho's Future

***2013-2014 Progress Report***

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# IGEM – An Investment in Idaho's Future

*Computer Science at Boise State University*

*2013-2014 Midyear Progress Report*

**Project Summary:**

The Idaho Global Entrepreneurial Mission (IGEM) and State Board of Education Higher Education Research Council (HERC) have provided three years of funding to expand and restructure the Boise State University Computer Science Department to help meet compelling state economic development, research, and workforce needs. The five-year Idaho Strategic Research Plan for Higher Education identifies Information Management and Software Development as a strategic research area that has tremendous potential to drive future economic growth within the state. Responding to this need, Boise State identified the expansion of the Computer Science Department as an institutional priority. This is the second year for the IGEM grant at Boise State.

**Task Performance Summaries:**

The project plan identified three primary strategies to achieve this goal:

1) *Hiring Faculty;*
2) *Tighter Industry Integration;*
3) *Enhancing the Student Pipeline*.

Progress to date toward implementing these strategies is detailed in this report.

***Strategy One: Hiring Faculty*** - Last year, the Computer Science Department was successful in hiring four new faculty members (one full professor, one associate professor, one assistant professor and one clinical faculty) – Dianxiang Xu, Vijay Dialani, Elena Sherman and Jim Conrad. Three of the new faculty are in the area of software engineering while one is in the area of databases. This year, the department was able to recruit another highly qualified faculty Dr. Steve Cutchin in the area of Visualization, another area of strong interest from local industry. We were able to do this by moving Dr. Jim Conrad to another line in the department. Dr. Cutchin's brief bio is given below.

*Steve Cutchin*

Dr. Steve Cutchin joined the faculty at Boise State University in August 2013. From 2008 to 2013 he was the manager of the KAUST Visualization Laboratory Core Facility and the Supercomputer Facility at King Abdullah's University of Science and Technology (KAUST) in Thuwal, Saudi Arabia. At KAUST he recruited a technical team of engineers and visualization scientists while managing the building of the state of the art scientific data visualization laboratory on the KAUST campus, forged relationships with international university and corporate partners, and continued to improve the laboratory and recruit new staff. Prior to his work in Saudi Arabia, Dr. Cutchin worked at the University of California, San Diego (UCSD) first as manager of Visualization Services at the San Diego Supercomputer Center and later at California

Institute for Telecommunications and Information Technology (Calit2). He has worked as a Sr. Software Engineer at Walt Disney Feature Animation developing software tools to improve animation production on feature films. He has published articles on Computer Graphics and Visualization, created animations for Discovery Channel and images for SIGGRAPH and Supercomputing conferences and journals. He received his doctorate from Purdue University in Computer Science.

These five new faculty members will lead to an increase in computer science research as well as bring expertise that will help prepare our students for careers in software engineering, big data, databases and visualization. In a short period, they are already off to a good start as detailed later in this report.

***Strategy Two: Tighter Industry Integration*** **-** The Industrial Advisory Board for the Computer Science Department was chaired last year by Jay Larsen, President of the Idaho Technology Council. The board has been expanded and revitalized and now meets regularly to provide direct feedback from industry to the department. This year, Alden Sutherland (CIO, MWI) will lead the board.

A second effort to increase industry integration has been the creation of a senior capstone design class, COMPSCI 481. This class, taught by Dr. Jim Conrad, engages students in a fast-paced software development team project with industry partners, applying knowledge acquired throughout the undergraduate Computer Science curriculum. This two semester project will provide a "real world" project-based environment to the students and aid in their transition from the classroom to a career in industry. In Spring 2014 semester, we have enrolled 21 students in CS481, our Senior Design (Capstone) course. The students are organized into five teams each with one project. Our sponsors include **Balihoo**, **Clearwater Analytics**, the **Idaho Digital Learning Academy**, the **United States Department of the Interior**, and **Cradlepoint**. The projects include *Local Search Engine Optimization Audit*, *Security Price Correlation*, *Predicting Student Outcomes with Big Data*, a *Mobile Application for Pilots*, and a *Router API Solution*. All of our projects employ an agile lifecycle incorporating scrum and software engineering practices. Each student will have an opportunity to serve in each of the scrum roles including Developer, Product Owner and Scrum Master. Potential future project sponsors can learn more from our web site at, http://coen.boisestate.edu/jconrad/cs481sponsors.

Dr. Vijay Dialani made a presentation on Cassandra at Clearwater Analytics in Fall 2013. Dr. Vijay Dialani and Dr. Amit Jain met with Jim Gasaway at Keynetics for a potential joint research project. The legal paperwork is currently under negotiation. Dr. Dialani also consulted with IDLA on Data Science. He taught a class on Big Data that drew several industry people to it and received high praise from them. Dr. Elena Sherman offered a new class in software quality that also drew industry people to it. Dr. Dianxiang Xu is offering a new class in Secure Software Engineering this spring that is unique and of relevance to many industries. The arrival of the new faculty has increased the interest in the department from prospective students, both in-state and out of state.

The department has now developed and made permanent a Web Development class and is in the process of making permanent a Mobile Development classes. The department is leveraging industry experts for these courses. Currently, we have industry experts from Keynetics, Z Studio Labs, Cradlepoint, Clearwater Analytics, Micron and HP teaching courses and interacting with department faculty and students.

Boise State was recently awarded a grant from the National Science Foundation to purchase a GPU supercomputer with a visualization facility. The $555,384 grant was awarded under NSF's Major Research Instrumentation (MRI) Program (Dr. Tim Andersen is a Co-PI on this grant). This new computing cluster significantly extends Boise State's ability to use advanced computing in science and engineering projects and substantially decrease the computational time required to generate results. The benefits of this grant will be felt far beyond Boise State University. The plan is for the parallel computing and visualization cluster to be housed at a facility open to university researchers, as well as local technology companies and partners. As part of the revised budget, IGEMs funds ($91,375) were used in addition the MRI grant funds to enable the purchase of the latest hardware and a larger tiled display that will provide expanded capabilities for use by computational scientists throughout the region.

A primary outcome of the IGEM effort is to increase funded research activity and technology transfer in collaboration with industry partners. To achieve this goal, the new faculty hires will increase the research capacity of the department and existing faculty members.

For the first six months of the year, a total of eleven new proposals were written and submitted to various institutions for a total amount of $5,097,610. From these submissions, two have been awarded, eight are pending, and one was not awarded. The following table shows the proposals submitted in the first six months of the current reporting year.

| Submitted Proposals 7/1/2013 – 12/31/2013 | | | | |
|---|---|---|---|---|
| Faculty | PI/co-PI | Title | Agency | Amount |
| Xu, Dianxiang | PI | MRI: Acquisition of an Online Banking System for Information Assurance Research | NSF | $145,000 |
| Xu, Dianxiang | PI | TTP: Small: Automated Conformance Testing of Access Control and Obligation Policies | NSF | $499,772 |
| Xu, Dianxiang | PI | EDU: Developing a Software Artifact Repository for Software Assurance Education | NSF | $299,892 |
| Jain, Amit | Co-PI | S-STEM: Idaho Scholars in Engineering and Computer Science | NSF | $626,375 |
| Jain, Amit | Co-PI | IBSS: Discovering the Tipping Point in Collaborative Decision Making: A Means to an End for the Wicked Problems in Regional Planning? | NSF | $729,056 |
| Andersen, Tim | PI | EXPAND CS Expand Computer Science Industry and University Partnerships to grow the Workforce and Idaho's Economy | Idaho Dept. of Labor | $1,000,000 |
| Andersen, Tim | PI | DockoMatic: A Fully Integrated Software Suite for High Throughput Virtual Screening | NSF | $785,224 |
| Buffenbarger, Jim | PI | Enhancing a Caching Software-Build Tool To Reduce Costs | Google Research | $36,816 |

| | | | | |
|---|---|---|---|---|
| Dialani, Vijay | PI | CONCEPT: Creating On-line Content for Enhancing and Personalizing STEM Education | NSF | $575,385 |
| Uh, Gang-Ryung | PI | Self-organizing Air Vent (SAVE) System | Idaho Commerce dept | $100,000 |
| Uh, Gang-Ryung | PI | CSR: Medium: Collaborative Research: Portable Loop Acceleration Through an Efficient Accelerator Unit (PLATEAU) | NSF | $300,000 |

The following proposals were awarded to Computer Science faculty members, totaling $616,988. Note that this doesn't include the IGEM grant itself nor does it include continuing grants from before the current reporting time period.

| Proposals Awarded 7/1/2013 – 12/31/2013 | | | | |
|---|---|---|---|---|
| Faculty | PI/co-PI | Title | Agency | Amount |
| Uh, Gang-Ryung | PI | Development of Virtual Sensor Terminal Environment that Assists Personalized Mobile Application Development | Moneual, Inc. | $71,417 |
| Uh, Gang-Ryung | PI | Self-organizing Air Vent (SAVE) System | State of Idaho | $45,800 |
| Xu, Dianxiang | PI | TTP: Small: Automated Conformance Testing of Access Control and Obligation Policies | NSF | $499,772 |

***Strategy Three: Enhancing the Student Pipeline*** **-** The third strategy of the IGEM proposal is to focus on the student pipeline to attract, retain, and graduate a larger number of high-quality students. The Computer Science curriculum in the primary, lower-division courses is challenging, resulting in retention issues. One strategy to improve retention is to allow students more time to absorb the material. The core sequence of COMPSCI 125, 225 and 342 (each a four credit class) has been restructured into COMPSCI 121, 221, 321 and 421 (one four credit and the rest are three credits). The new COMPSCI 121 (Computer Science I) course also have an associated structured laboratory component. The new courses started in fall of 2013 and are in their second iteration this spring. While it is too early to see the full impact of the change in the curriculum, other changes are already having a significant impact as noted below.

A second retention strategy was to develop a Computer Science Tutoring Center that will employ graduate-level teaching assistants (TAs) to aid undergraduate students in a one-on-one instructional environment. The tutoring center has been extremely popular last year with freshmen and sophomores. As a result, we are retaining higher numbers of students. Please see the figures on page 8 for increases in enrollment in critical sophomore and junior-level courses. As an example, the total output of the department has gone from 25 to 42 graduates over the last two years. The critical junior-level 354 course has gone from 35 to 64 students over the last two years while critical sophomore-level 253 course has gone from 41 to 107 students over the last three years. Since we are only in the second year of the grant, this data is still preliminary and we would have more data in another year.

The IGEM funds have also supported graduate students in their research efforts. As a result, the number of Masters degrees in Computer Science went up from 4 to 16 last year. We expect the number of bachelors in Computer Science to also go up significantly over the next two years. Especially, since the department has very recently received a $1.28 million grant from Idaho Department of Labor to build up the teaching capacity to allow doubling of the number of Bachelor's degrees in computer science. As part of that grant, the department received $280,000 in matching money from eight local software companies. We feel that this was a result of the focus on the department due to the IGEM grant and shows a high degree of integration with local tech industry.

**Demonstrated Economic Development**

As previously mentioned, external funding is strong with a total awards of $616,988 thus far this year from a total of $5,097,610 applied. This is significantly higher activity than the department had prior to the IGEM award. Note that the faculty hired under the IGEM grant were responsible for $1,500,000 of the grants submitted in a short period of six months.

**Future Plans**

Work will continue on the planned tasks while focusing on mentoring the new hires for the department, managing the growth in the enrollment to keep improving retention and graduation and continued integration with industry.

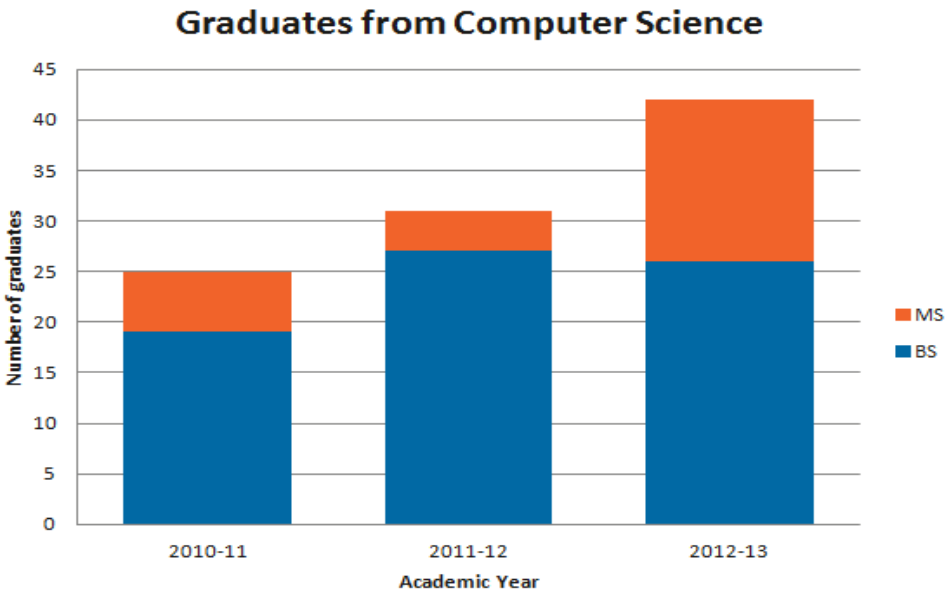
**Commercialization Report**

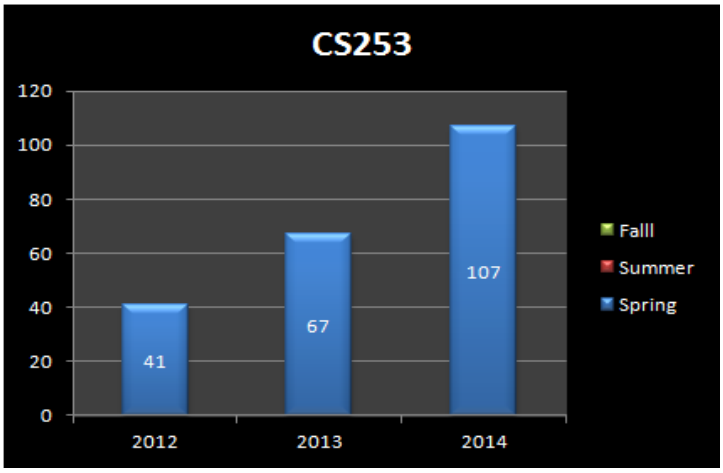
There is no commercialization revenue to report at this time.

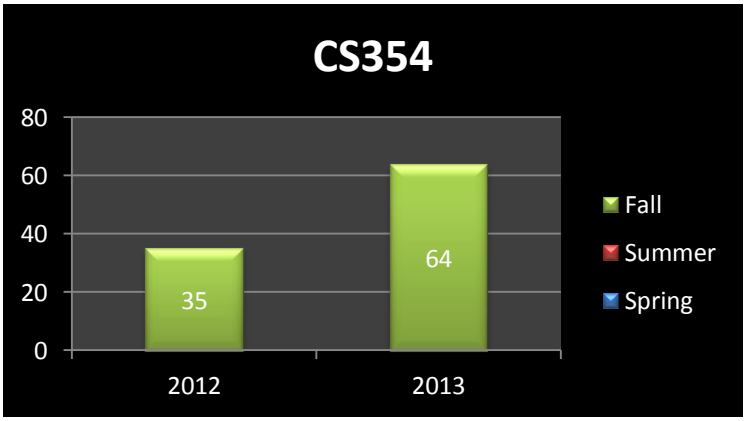
**Expenditure Report**

The table below reflects the modified budget approved earlier this year.

| Category | Salary | Fringe | Tuition | Computer Equipment | Total |
|---|---|---|---|---|---|
| Faculty | $ 220,061.01 | $ 66,627.33 | $ - | $ - | $ 286,688.34 |
| Graduate Students | 61,696.31 | 1,900.05 | 18,668.00 | - | $ 82,264.36 |
| Other Expenses | - | - | - | 91,381.23 | $ 91,381.23 |
| | **$281,757.32** | **$68,527.38** | **$18,668.00** | **$91,381.23** | **$460,333.93** |


Graduates from Computer Science
Number of graduates
45
40
35
30
25
20
15
10
5
0
2010-11
2011-12
2012-13
Academic Year
MS
BS


CS253
120
100
80
60
40
20
0
41
67
107
2012
2013
2014
Falll
Summer
Spring


CS354
80
60
40
20
0
35
64
2012
2013
Fall
Summer
Spring