

IGEM# 16-01

***Computer Science at Boise State University:
An Investment in Idaho's Future
1st July 2017 –1st January 2018 Progress Report***



BOISE STATE UNIVERSITY

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1st July 2017 – 1st January 2018, Annual Report***

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IGEM 16-01: Computer Science at Boise State University: An Investment in Idaho's Future *1st July 2017– 1st January 2018 Progress Report*

Project Summary

The Idaho Global Entrepreneurial Mission (IGEM) and the State Board of Education Higher Education Research Council (HERC) have provided three years of funding to continue the strategic forward momentum of the Boise State University Computer Science Department to help meet compelling state economic development, research, and workforce needs.

This progress report summarizes the activities of the first six months during the third year of the project.

Project Accomplishments

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

- 1. Sustain current faculty lines and continue forward trajectory.*
- 2. Increase partnerships with local companies to facilitate knowledge development and transfer*
- 3. Increase CS related research and economic development activity.*
- 4. Produce more computer science graduates that qualify for software and related technical positions in Idaho*

Progress to date toward implementing these strategies is detailed in the following subsections.

Strategy One: Sustain Current Faculty Lines and Continue Forward Trajectory

The current IGEM grant supports five faculty (one full professor, one associate professor, and three assistant professors) – Dianxiang Xu, Steve Cutchin, Elena Sherman, Edoardo Serra, and Sole Pera (partial support). Two of the faculty are in the area of software engineering while two are in the area of data science (and databases) and another in visualization. Dr. Xu led the effort to create the PhD program and the governance of it has now transitioned to two Co-Directors and a steering committee. Dr. Cutchin became the Director of Research Computing (split 50% with his faculty appointment), which is allowing him to increase the reach of his efforts to more researchers across the campus and beyond. Dr. Sherman, Dr. Serra and Dr. Pera have also taken appropriate leadership roles in the department.

Another strong impact of the IGEM grant has been in the additional hiring that the department did in the previous year. Using the eight lines provided by JFAC and other funding, the department

successfully hired eleven faculty in less than one year! Overall, the department now stands at **27 faculty members**, an increase in size of over 300% from four years ago. In each case, the faculty hired were among the top choices in the respective areas. Given the extremely competitive nature of hiring in computer science, the hiring success has been very successful. This fall is the start of the second year for these new faculty. We have retained all the faculty that were hired last year, which is better than many CS departments at other Universities.

Strategy Two: Industry Partnerships

The CS Department continues to increase its formal and informal connections with industry and the IGEM hires are integral to the following initiatives and connections. The new downtown location has been particularly conducive to growing partnerships with industry.

Boise State University supports and encourages CS faculty to establish partnerships with industry via joint research projects, service on industrial boards, consulting and faculty and student involvement. We have several ongoing examples of faculty working with our industry partners:

- The department recently received a \$2 million award from NSF to revolutionize the middle two years of the undergrad computer science program. It was one of seven awards out of 80+ proposals received from across the country. A major goal of this five-year project (titled: *CS Professionals Hatchery*) is to create unique learning experiences (named *Hatchery Units*) for our students in conjunction with industry so students graduate with better professional skills and are able to hit the road running in a way that is an exemplar for other programs everywhere. Seventeen companies are involved in the design of the hatchery units and integration with the curriculum. In Fall 2017, several of these professional Hatchery Unit courses were taught for the first time with help from industry. These include CS-HU 130 (Foundational values), CS-HU 271 (Agile Development), and CS-HU 390 (Technical Interviews, Jobs and Careers). A total of 14 proposals for Hatchery Unit courses were received from teams of faculty and industry partners. These will be implemented over the next two years.
- The new downtown location has led to many informal and formal meetings and visits from industry. For example, several companies and agencies have hosted their strategy retreats/meeting in our space. These include: Micron, HP, Metageek, AppDetex, Idaho Technology Council, Idaho Dept of Commerce, and State Board of Education. Such meetings have led to multiple informal networking opportunities for the faculty and students.
- Dr. Tim Andersen has continued as a consultant at Micron, and is also currently working as a consultant at AppDetex, a local startup company.
- Dr. Sole Pera is working on the advisory board at ReleVent City, a recent Boise startup.



- Dr. Steve Cutchin is working as a consultant for Digital Mechanics, a 3D capture and reconstruction startup.
- Drs. Andersen, Cutchin, Serra, and Spezzano have finished a research project on *Precision Agriculture* with J.R. Simplot Co., that was also funded by IGEM, helping them to fuse information from multiple sources (such as historical yield data, satellite imagery, sensor data, and etc.) to assist farmers in intelligent decision making. This project also involved multiple graduate students and a post-doc. Their research results have been widely circulated inside Simplot and they are looking into ways to put it into production.
- 7 Industry partners committed to donate an additional \$70,000 to the Expand.CS Scholarships program, which has allowed us to offer at least 14 new scholarships to students for the 2017-2018 academic year. These scholarships are designed to encourage and help students to finish their degree faster. The industry partners who donated are AppDetex, Clearwater, HP, Impact Sales, MetaGeek, Paylocity and Whitecloud.

Community Events. The CS Department continues to host *Boise Code Camp* and participate in *develop.idaho* and *Hackfort* to strengthen connections with industry and entrepreneurs. The Boise Code Camp has grown to over 1000 participants in 2017 and continues to be one of the largest code camps in the Northwest.

Senior Design Projects. **In Fall 2017, 10 new senior capstone projects were sponsored by 6 local industry partners, organizations and startups.** We are working with companies from multiple sectors including high-tech, health care, government, transportation, non-profits, and agriculture.

Industrial Advisory Board. Alden Sutherland, VP and Chief Information Security Officer at AmerisourceBergen (a Fortune-16 company that recently bought multi-billion dollar local company MWI), currently heads the board. The board meets at least twice yearly with the department and provides feedback and strong support for curriculum, facilities, and hiring.

Strategy three: Increase research

The rate of research grant submissions continues to increase, with **28 grant proposals submitted** in the first six months of 2017-2018. As a comparison, last year we had 33 grant proposals submitted for the entire year. **Six new grants were funded** during Fall 2017 for a total funding of \$604,397. Most of the others are pending review.

Last year we had nineteen awards for a record \$4.47 million (not including \$700K from this IGEM award). Despite that, the faculty continue to be active in pulling in new funding in the first five months of this year. **Compared to three years before the first IGEM award (2010-2012), the total research funding since then (2013-2017 – 4.5 years) has gone up by 50x!** (From \$209K to \$10.57 million. This does not include the two IGEM awards.)

The inter-disciplinary PhD in Computing program was started in Fall 2016. The program has emphasis in Computer Science, Cyber-Security, and Computational Science and Engineering, with a planned

emphasis in Data Science in the near future. The PhD program now has 15 students, up from 3 last year. It involves faculty from multiple departments across the campus. The PhD program has the potential to significantly increase the research profile of the department and college and to draw top-notch talent to come to Boise State University and potentially end up in local industry.

Last year, with additional JFAC funding, the department had started the work to create the CLICS (Cyber Lab for Industrial Control Systems) lab. The CLICS lab is now operational in the new space in the adjoining US Bank building. It was designed in collaboration with Idaho National Lab and several companies such as GE, Honeywell, Idaho Power, Suez Water and others. . Dr. Hoda Mehrpouyan and Dr. John Stubban are the co-directors of the lab. Several other faculty are also involved in this lab. The lab has state-of-the-art equipment for process control testbed and smart grid testbed.

Strategy Four: Enhancing the Student Pipeline



In Fall 2017, we started the second year in the new City Center Plaza building in downtown Boise. Located at 777 West Main Street in Downtown Boise, adjacent to the Grove Plaza, City Center Plaza (CCP) is in the heart of Boise's technology ecosystem. The Department of Computer Science occupies a first floor lobby that connects by elevator/stairway to the second and third floors where classrooms, offices and labs are located. Recently, the department has also expanded into the 2nd floor of the adjoining US Bank building.

This new location provides computer science students with an unparalleled opportunity for internships and other interactions with industry in a modern and inviting learning environment. The new location is already lead to an increased interest from potential students, both in-state and out-of-state, in the Computer Science department.

The undergraduate program continues to grow each year with **711 students in Fall 2017**, a 3.5% increase from 687 in Fall 2016. The total number of students (majors, minors, graduate students) is now **937**. Last year 69 Bachelors and 16 Masters students graduated. There have already been 35 Bachelors and 15 Masters graduates in Summer/Fall 2017. With around 110 students in senior-level Operating Systems (CS 453 course, F'17-S'18, one of the last classes they take), we expect the total number of graduates this year to go up again significantly. We also expect to have a record number of Masters students completing this year.

The Computer Science major continues to be one of the largest major for incoming freshmen in Fall 2017. Last year 90% of graduates accepted jobs in Idaho versus around 80% historically. So not only is the output increasing, the in-state retention after graduation has also improved. We will have data for this year in time for the annual report but we expect similar results.

The IDoCode project (funded by the National Science Foundation) to introduce high quality computer science in high schools is in its fourth year. We now have 62 teachers in four cohorts. As a result of the

work of the CS faculty and their external partners, we have around **1400+ high school students taking computer science courses in Fall 2017** in Boise and West Ada school districts alone, which is a **32x increase** from three years ago.

All of the above point towards a booming student pipeline that is promising to increase the computer science workforce in Idaho significantly. As an example of its impact, we continue to see software companies locating near the new CS downtown location. Kount, which received an \$80 million investment last year, is planning to move to a remodeled building 2 blocks from the CS department and expect to hire 80-90 new employees¹. Tangocard, a software company from Seattle, opened an engineering office in Boise in the Hoff building, again 2 blocks from the CS department so that they can actively recruit from us. Paylocity is opening a new software development center within a block or two of the CS building in 2018 and holding a special session for CS seniors. The list keeps getting longer each year!

Future Plans

The department is well on its way to further sustained growth in all areas. We expect the number of graduates to be around 80-90 this coming year. The research activity continues to be at a high-level and the interaction with industry continues to increase and deepen with the new downtown location. After some time to settle down after the hectic growth, the department needs to start planning for the next round of growth!

Faculty and Student Participation

Five faculty and twelve graduate research assistants were supported directly on this grant. The supported faculty have in turn worked with more students and staff because of grants they received. As a result there were a total of **five faculty, 49 students/staff** that were supported directly or indirectly (excluding the three PIs). Additionally, several additional students have started internships at local companies because of the renewal of the Expand.CS program this fall.

Name	Undergraduate	Graduate	Post-docs	Visiting Researchers
Steve Cutchin	9	6	0	0
Edoardo Serra	0	3	1	0
Elena Sherman	2	3	0	0
Dianxiang Xu	12	4	1	1
Sole Pera	3	4	0	0
Total	26	20	2	1

Patents and Copyrights

There are no patents or copyrights to report at this time.

¹ <https://idahobusinessreview.com/2017/09/11/kount-will-move-across-the-river-and-into-downtown/>

Startups and Technology Licenses

Students were involved in the following new startups, supported by Co-PI Jim Conrad and Bogdan Dit via the Senior Design course. Some of these startups are in conjunction with Boise State Venture College.

- Nelson Irrigation — water saving system and app for farmers
- LittleAuthors — continued work on startup from last year. Story-telling/creation app for children
- Predictable Ryde — continued work on startup from last year. Real-time bust information to parents and schools

Expenditure Report

Five faculty and twelve graduate assistants were directly supported via the IGEM grant during this period.

Budget from July 2016 to June 2017				
Category	Salary	Fringe	Tuition	Total
Faculty	\$177,130.63	\$51,058.49		\$228,129.12
Graduate Assistants	\$83,601.76	\$11,751.90	\$8,754.00	\$104,107.66
Total	\$260,732.39	\$62,810.39	\$8,754.00	\$332,296.78