

IGEM# 16-01

***Computer Science at Boise State University:
An Investment in Idaho's Future
1st July 2015 – 30th June 2018 Final Report***



BOISE STATE UNIVERSITY

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Table of Contents

PROJECT SUMMARY	3
PROJECT ACCOMPLISHMENTS.....	3
STRATEGY ONE: SUSTAIN CURRENT FACULTY LINES AND CONTINUE FORWARD TRAJECTORY.....	3
STRATEGY TWO: INDUSTRY PARTNERSHIPS	4
STRATEGY THREE: INCREASE RESEARCH	5
STRATEGY FOUR: ENHANCING THE STUDENT PIPELINE.....	6
FUTURE PLANS	7
FACULTY AND STUDENT PARTICIPATION	7
PATENTS AND COPYRIGHTS	8
STARTUPS AND TECHNOLOGY LICENSES	8
EXPENDITURE REPORT	8

IGEM 16-01: Computer Science at Boise State University: An Investment in Idaho's Future *1st July 2015 – 30th June 2018: Final 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 final report provides details of the last year of the project as well as summarizes the overall accomplishments 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!. 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.

All of the faculty lines supported by IGEM have been permanently funded by the University starting in Fall 2018 at the end of the IGEM funding. The graduate assistantships supported by this IGEM grant have been funded for one year by the University. They are expected to become permanently funded next year as there is a MOA in place.

Overall, the department now stands at **26 faculty members**, an increase in size of over 325% from five years ago when it had only eight faculty

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, VisitPay, 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*, *Boise Startup Week* and *Hackfort* to strengthen connections with industry and entrepreneurs. The Boise Code Camp had around 1000 participants in 2018 and continues to be one of the largest code camps in the Northwest.

Senior Design Projects. **In 2017-2018, 15 new senior capstone projects were sponsored by 9 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 **47 grant proposals submitted** in 2017-2018. As a comparison, last year we had 33 grant proposals submitted. **Eleven new grants were funded** for a total funding of \$2.4 million. Most of the others are pending review.

Compared to three years before the first IGEM award (2010-2012), the total research funding since then (2013-2018 – 6 years) has gone up by 59x! (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 30 students, up from 15 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 2018, we are starting the third year in the 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 **714 students in Fall 2018**. The total number of students (majors, minors, graduate students) is now **900+**. Last year 98 Bachelors and 10 Masters students graduated, for a total of **108 graduates**. **A long standing goal of getting to 100+ graduates has been achieved!**

The Computer Science major continues to be one of the largest major for incoming freshmen in Fall 2018. Around 90% of the graduates continue to stay in Idaho. Combined with the fact that 35% of our students are out of state, that is a remarkable brain gain going on at a time where it is very competitive to get computer students to stay.

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 **1200+ high school students taking computer science courses in Fall 2018** in Boise and West Ada school districts alone,. Note that this number is not complete as we did not get data from all schools so we expect the actual number to be even higher.

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 few blocks 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 has expanded to capacity in the new space in downtown. With an expected 100 graduates in the steady state from now on, further growth is constrained by physical space, number of faculty and the support needed in the college and university in other departments. The research activity continues to grow and the interaction with industry continues to increase and deepen with the new downtown location. After some time to integrate after the amazing 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, 43 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
Steve Cutchin	7	4	0
Edoardo Serra	0	3	0
Elena Sherman	2	3	0
Dianxiang Xu	12	4	1
Sole Pera	3	4	0
Total	24	18	1

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

Patents and Copyrights

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

Startups and Technology Licenses

Students were involved in the following new startups over the last year, supported by Co-PI Jim Conrad an faculty Bogdan Dit and Shane Panter 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

Six faculty and thirteen graduate assistants were directly supported via the IGEM grant during this period. Note that some were partially supported by this grant and rest from other sources.

Budget from July 2017 to June 2018				
Category	Salary	Fringe	Tuition	Total
Faculty	\$409,636.18	\$123,645.68		\$533,281.36
Graduate Assistants	\$133,273.60	\$16,284.54	\$17,160.00	\$166,718.14
Total	\$542,909.78	\$139,930.22	\$17,160.00	\$700,000.00