IGEM# 16-01

Computer Science at Boise State University:
An Investment in Idaho's Future
1st July 2016 –30th June 2017 Annual Report

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IGEM 16-01: Computer Science at Boise State University:
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1st July 2016– 30thJune 2017 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 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 second 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 four faculty (one full professor, one associate professor, and two assistant professors) – Dianxiang Xu, Steve Cutchin, Elena Sherman, and Edoardo Serra. Two of the faculty are in the area of software engineering while one is in the area of data science (and databases) and another in visualization. Dr. Xu has taken leadership role as Graduate Program Coordinator and led the effort to create the PhD program. Dr. Cutchin recently became the Director of Research Computing, which is allowing him to increase the reach of his research efforts to more researchers across the campus and beyond. Dr. Sherman and Dr. Serra have also taken appropriate leadership roles.

Another strong impact of the IGEM grant has been in the additional hiring that the department has done in the last year. Using the eight lines provided by JFAC funding and other funding, the department has **successfully hired eleven faculty in less than one year**! Overall, the department now stands at **27**

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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 gratifying. During the current year, the department has added three more faculty (two Assistant Professor and one Lecturer) as listed below.

- *Dr. Hoda Mehrpouyan* (Ph.D., Oregon State University)
    - *Dr*. Mehrpouyan's research focuses on privacy, security, and robustness of mission-critical cyber-physical systems. She is active in the effort to create a cybersecurity research lab that will operate in partnership with the Idaho National Lab and various companies.
    - She also recently received a *Career Initiation Award* from the National Science Foundation.

- *Lucas Hindman* (B.S and M.S. in CS, Boise State University)
    - New lecturer that will bring depth to many areas of teaching in the department
    - 10+ years of industry experience in *DevOps* and *systems engineering.*

- *Dr. John Stubban* (Ph.D. University of Idaho)
    - Will co-lead (along with Dr. Mehrpouyan) the effort to create a cybersecurity research lab that will operate in partnership with the Idaho National Lab and various companies.
    - 25 years of industry experience

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.

Growing partnerships with industry. Boise State University will support and encourage 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. During 2016-2017, we have already involved dozens of industry representatives in the design of the hatchery units and integration with the curriculum.

- The new downtown location has led to many informal and formal meetings and visits from industry. For example, BVEP brought in a company considering relocation to Idaho to the

department to meet faculty and students. That visit turned out to be crucial in their decision to locate their branch in Boise. This story has repeated several times in the last year!

- 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. Sole Pera has also volunteered as an advisor/mentor for B-launch.
- Dr. Steve Cutchin is working as a consultant for Digital Mechanics, a 3D capture and reconstruction startup.

- Drs. Andersen, Cutchin, Serra, and Spezzano are working with the J.R. Simplot Co. on a joint IGEM funded research project in Precision Agriculture, 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 involves multiple graduate students and a post-doc.

- 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 upcoming 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. 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 2016-2017, there were 18 new senior capstone projects sponsored by local industry partners and startups, an increase of 20% over the previous year**. We are working with companies from multiple sectors including high-tech, health care, government, finance, transportation, marketing, merchandising 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 and awards continue to increase, with **33 submitted** grants and **19 funded** during 2016-2017. **The nineteen funded awards total $4.47 million**, of which nine have PI or Co-PIs that are faculty on the HERC IGEM grant.

As a comparison, during the previous (2015-2016) academic year, the department submitted 31 grants and 7 were funded for a total of $1.34 million. **While the number of submissions has increased by 6%, the number of awards has gone up by 271% and amount awarded has gone up by 332%. Compared to three years before the first IGEM award (2010-2012), the average research amount since then (2013-2017) has gone up by 40x!**

The PhD program started in Fall 2016. The program has tracks in Computer Science, Cyber-Security, and Computational Science and Engineering, and with a planned track in Data Science in the near future.

With additional JFAC funding, the department has started the work to create the CLICS (Cyber Lab for Industrial Control Systems) lab. The CLICS lab is being designed in collaboration with Idaho National Lab and several companies such as GE, Honeywell, Idaho Power, Suez Water and others. Seven CS faculty are involved in this lab. The lab will have state-of-the-art equipment for process control testbed and smart grid testbed. The University has leased space in the adjoining US Bank building to house the lab.

Second year of REU (Research Experience for Undergraduates) is being held in 2017 summer. It was funded by the NSF. Additional summer camps are being held to expose high school teachers to security research.

Strategy Four: Enhancing the Student Pipeline

In Fall 2016, the entire department moved to 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.

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 casing 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 687 students in Fall 2016. There were 70 Bachelors graduates in 2016-2017, an 11% increase from last year. Additionally, 112 students took the senior-level Operating Systems (CS 453) course this year. That class is a good predictor of graduation numbers in the coming year so we expect the number of graduates to climb up significantly in 2017-2018.

The Computer Science major was the third largest choice of major for incoming freshmen in Fall 2016 and is expected to become the largest in the next two to three years. Another interesting statistics is

that 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.

The department also started a new inter-disciplinary PhD in Computing program in Fall of 2016. It already has four students in it. The PhD program has the potential to significantly increase the research profile of the department and to draw top-notch talent to come to Boise State University and potentially end up in local industry.

The IDoCode project (funded by the National Science Foundation) to introduce high quality computer science in high schools is in its fourth year and has been recently funded by the National Science Foundation for the fourth year. We now have 62 teachers in four cohorts. These teachers are offering eleven sections of AP Computer Science Principles (most with dual-credit with Boise State) course in Fall 2017. This new national course is designed to get a diverse group of students excited about computer science, which will lead to a bigger and better-prepared pipeline of students going on to college. As a result of the work of the PIs and their partners, we have around 1200+ students taking computer science courses in Boise and West Ada school districts alone, which is more than order of magnitude increase from three years ago.

All of the above point towards a booming student pipeline that promising to increase the computer science workforce in Idaho significantly. As an example of its impact, consider the story of Jelli.com[1], a San Francisco based software company, which plans to locate more than half of its employees in Boise (2 blocks from the CS department!). According to their CEO, one of the main reasons was to be near the Boise State CS department.

Future Plans

The department is well on its way to further sustained growth in all areas. We expect the number of graduates to be over 80 this coming year, which would be a 320% increase from four years ago! The research activity has hit at an all-time record and the interaction with industry continues to increase and deepen with the new downtown location.

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[1] http://coen.boisestate.edu/cs/2017/06/27/dr-amit-jain-noted-influence-courting-silicon-valley-tech-company-boise/

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Faculty and Student Participation

Four faculty and six graduate research assistants were supported directly on this grant. The supported faculty has in turn worked with more students and staff because of grants they received. As a result there were a total of **four faculty, 27 students** 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	6	4	0
Edoardo Serra	0	5	0
Elena Sherman	0	2	0
Dianxiang Xu	1	9	1
Total	**7**	**20**	**1**

Patents and Copyrights

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

Startups and Technology Licenses

CS faculty were directly involved in one new startup in 2016-2017.

- *Ronnow Personal Assistant*: A dialogue based system using natural language. *(Dr. Casey Kennington, Dan Kondratyuk (student), Dr Amit Jain and an investor)*

Students were directly involved in the following **four** new startups, supported by Co-PI Jim Conrad via the Senior Design course. Several of these startups are in conjunction with Boise State Venture College.

- PayDayly — new startup. Allow employees to draw wages before receiving their paychecks.
- JumpRope — new startup. Automated tracking of jump rope competitions.
- WeaverDesign — new startup. A life-like football blocking sled in virtual platform.
- LittleAuthors — new startup. Story-telling/creation app for children

Expenditure Report

Four faculty and six 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	$414,805.06	$123,873.78		$538,678,84
Graduate Assistants	$120,073.17	$20,906.70	$20,340.76	$161,321.16
Total	**$534,878,76**	**$144,780.48**	**$20,340.76**	**$700,0000.00**

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