



# Computer Science



**MONTANA**  
STATE UNIVERSITY

College of  
**ENGINEERING**



2015

## Software Engineering Program

2016

### About the Software Engineering Laboratory



MSU-SEL is a research lab composed of graduate and undergraduate students from the Montana State University Department of Computer Science. The lab is focused on exploring various areas of software engineering as well as interdisciplinary research with various collaborators from industry and academia. Currently the lab is working in the areas of Empirical Software Engineering, Technical Debt, and Software Testing.

The Empirical Software and Technical Debt group is more closely related to research in software engineering, its processes, and finding appropriate measures that can serve as surrogates for software quality. The notion of technical debt encompasses economics and software engineering theory and provides an opportunity to make the process of software engineering less error prone and more efficient by investigating ways to quantify it. This research allows students to take empirical, practical, and theoretical viewpoints and provides numerous potential areas of research.

Testing is the most widely used approach for quality assurance of software. Most software development projects spend about half of the development budget on software testing. As the complexity of software systems increases, especially with scientific software, the challenges in testing becomes more and more complex. These emerging challenges present many research opportunities. The software testing group focuses on developing techniques for test automation, automated test oracle creation, and developing techniques for testing scientific software. We further explore the effectiveness of using machine learning approaches to tackle software testing challenges.

### Marketability

The market for US based computing careers is expected to thrive, with the US Bureau of Labor Statistics (BLS) projecting that computing will be one of the fastest growing US job markets in science, technology, engineering, and mathematics (STEM) for the foreseeable future. Almost 75% of new US science or engineering jobs will be in computing, while only 16% will be in traditional engineering positions. The BLS predicts that 27% of the new STEM positions will be in software engineering.

### Software Engineering Laboratory Members

#### Faculty:

Dr. Clemente Izurieta

Dr. Upulee Kanewala

#### Graduate Students:

Melissa Dale (Ph.D)

Isaac Griffith (Ph.D.)

Nathan Woods (Ph.D)

Derek Reimanis (Ph.D.)

Nathan Fromelt (M.S.)

Kathryn Manning (M.S.)

#### Undergraduate Students:

Mackenzie O'Brien (B.S.)

Mike Trenk (B.S.)

*The Engineering and Physical Sciences Building is home to the Computer Science Department.*



For additional  
information, contact:

Dept. of Computer Science  
Montana State University  
357 EPS Building  
Bozeman, MT 59717-3880  
406-994-4780  
csinfo@cs.montana.edu  
www.cs.montana.edu



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## About Montana State University

Founded in 1893 as Montana's land grant college, Montana State University is a comprehensive, multipurpose university, integrating programs of instruction, research, and public service.

MSU is located in Bozeman, Montana, an extended community of 70,000 nestled in the Rocky Mountains about 90 miles north of Yellowstone National Park. In addition to providing access to extraordinary teaching and research programs, Bozeman is renowned for year-round recreational and cultural opportunities that include access to world class ski areas, multiple blue ribbon trout streams and the Gallatin National Forest. The local airport is served by four national airlines and is the second busiest airport in the state.



Named an All American City, Bozeman boasts high-quality medical facilities, a very low crime rate, many fine restaurants, acclaimed public and private schools, a symphony orchestra and choir, an annual opera, and nationally known events such as the Sweet Pea Festival of the Arts held in early August.

## Financial Support

There are many different possibilities for graduate students to obtain financial help. Outstanding graduate students can receive financial support (as TAs or RAs) for the program duration subject to satisfactory progress. Ph.D. students in good standing and making appropriate progress towards the degree typically receive RA support from ongoing grants. All graduate students are welcome to apply to be a TA at any point during their graduate careers. Scholarships are available to qualified undergraduate students. Scholarship applications are typically due in early February. Scholarships are funded through the generosity of individuals and organizations.

## International Students

International students are permitted to work on campus for up to 20 hours per week. For additional information, please visit the web pages of the Office of International Programs at <http://www.montana.edu/international/>

## CS Degree Programs

The Computer Science Department provides degrees at the B.S., M.S., and Ph.D. levels.

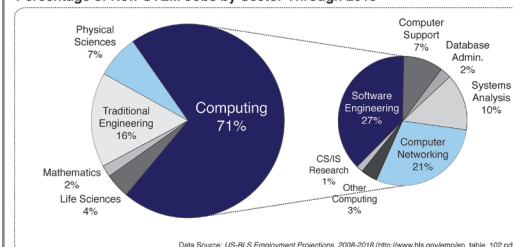
### Software Engineering Courses

- Software Engineering (ESOF322)
- Advanced Software Engineering (ESOF422)
- Empirical Software Engineering (ESOF522)

### General Courses Include

- Artificial Intelligence
- Compilers
- Computational Biology
- Computer Architecture
- Computer Networks
- Data Mining
- Data Structures and Algorithms
- Database Systems
- Discrete Math
- Ethics
- Machine Learning
- Operating Systems
- Programming Paradigms
- Robot Vision
- Robotics
- Software Engineering
- Systems Administration

Percentage of New STEM Jobs by Sector Through 2018



Data Source: US-BLS Employment Projections, 2008-2018 ([http://www.bls.gov/emp/tables\\_table\\_102.pdf](http://www.bls.gov/emp/tables_table_102.pdf))

*The Bridger Mountains provide a dramatic background for the MSU-Bozeman campus.*



"All parts should go together without forcing. You must remember that the parts you are reassembling were disassembled by you. Therefore, if you can't get them together again, there must be a reason. By all means, do not use a hammer."

— IBM Manual, 1925