Computer Science
MONTANA TECH OF THE UNIVERSITY OF MONTANA

Computer Science Industry Advisory Board Meeting Minutes
September 7, 2016

Industry Members Present:

- Terry Brandt, IAB Member representing Zoot Enterprises, Inc.
- Tyler Dusek, IAB Member representing Schweitzer Engineering Laboratories, Inc.
- May Huang, IAB Member representing Serial Entrepreneur
- Haythem Memmi, IAB Member representing Microsoft
- Christopher Tenda, IAB Member representing EchoStar
- Craig Spannring, IAB Member representing TeeJet Technologies
- David Thompson, IAB Member representing SoFi

Montana Tech Representatives Present:

- Michele Van Dyne, C.S. Dept. Chair
- Frank Ackerman, C.S. Faculty
- Jeff Braun, C.S. Faculty
- Phillip Curtiss, C.S. Faculty
- Brian Koontz, C.S. Faculty
- Tami Windham, C.S. Administrative Associate
- Kyleigh Chelini, S.E. Student
- Zachary Burke, S.E. Student
- Greg Marlow, S.E. Student
- Andrew Young, C.S. Student

Welcome (Doug Coe, Dean of the College of Letters, Sciences and Professional Studies)

Doug Coe, Dean of the College of Letters, Sciences and Professional Studies welcomed the board members to Montana Tech and thanked the members for their time and support they give to the Computer Science program. Dr. Coe informed members that the CS Department is doing well; informing them the department has added an additional tenure track position. With the addition of another faculty member it will allow the department extra resources to pursue other things. He expressed his appreciation to the board members for their input and feedback to the Computer Science program.

Welcome and Introductions (Michele Van Dyne)

Introduction of all attending the meeting were made. Michele Van Dyne, Department Head welcomed the board members to Montana Tech and thanked the members for taking the time to attend the meeting and for their input to the department.

Computer Science Department Updates (Michele Van Dyne)

- **Montana Tech Updates**
- **Enrollment is down somewhat this year**
- **Buildings**
    - Natural Resources Laboratory Building
        - Construction is on schedule, should be completed this winter
    - Still planning a new dormitory
- **National Recognition/Rankings**

- U/.S. News and World Report
    - Ranked 1st for Top Public Regional Colleges in the West
    - Tied for 5th in Top Regional Colleges in the West
    - Ranked 49th for best online graduate engineering programs
- Ranked Highest in Edsmart's Top 40 Colleges Advancing America's Economic Progress
- Best Value in MT and 18th in the Nation by New York financial company SmartAsset
    - Also ranked top in MT for starting salaries and 25th in the country

- **Faculty**
- Jeff Braun
    - Back from sabbatical
- Celia Schahczenski
    - On sabbatical
- Phil Curtiss
    - Successfully applied for and got the Assistant Professor position replacing Keith Vertanen
- Brian Koontz
    - Successfully applied for and got the additional Assistant Professor position we were granted
- Currently searching for a new Outreach Coordinator
    - Have made a recommendation to hire, and are waiting on approval
- **Curriculum**
- **Software Verification and Validation course**
    - First Offering last spring (2016)
- **Data Science B.S.**
    - Made it through the campus approval and the first round at the Board of Regents
    - Awaiting final BOR approval
- **Computational Science**
    - Graduate certificate approved
    - Minor was approved
- **ABET Accreditation – Site Visit this Year!**
- **ABET Accreditation – 6 year cycle**
    - Both CS and SE Programs accredited to 2017
    - Prepared Program Self-Study Reports this past summer
        - CS Program - Computing Accreditation Committee (CAC)
        - SE Program - Engineering Accreditation Committee (EAC)
    - ABET visit is scheduled for October 9th - 11th
    - We will be assembling materials for the visit this next month
        - Assembling notebooks with example student work and course information
- **Recruiting Efforts**
- **CodeMontana started Fall 2013**
    - Publicity for need of more CS graduates
    - Introduce high school students to coding
    - $4000 scholarships offered from Tech
    - CSCI 191 CodeMontana: Intro to CS course
- **Gianforte Family Foundation Grant**
    - 2 ½ years funding for Outreach Coordination
    - The department is hosting and managing the CodeMontana site
    - Brian will tell you about his outreach efforts later today
- **Scholarships**
- **20 CodeMontana Scholarships $4000 over 2 years**

- Complete 4 modules OR AP score of 4-5
- ACT Math Score of 24 or higher (SAT Math score of 590 or higher)
    - 12 students received the scholarship
        - 6 last year, 6 this year

- **R.E.A.L. Scholarship Program - Year 7**
    - Earn up to $600 by completing 4 online modules + Competitive Programming Challenges
    - 4 new recipients this year
    - Currently helps support 14 students ($1193.75 this year)
- **Montana Minds Scholarship ($6500)**
    - An additional CS student received this for one year this fall
- **Enrollment Trends**

Year	Total SE Students	Total CS Students	Total Students
2001	16	100	116
2002	18	86	104
2003	28	69	97
2004	26	45	71
2005	20	45	65
2006	21	36	57
2007	25	26	51
2008	21	26	47
2009	26	27	53
2010*	20	28	48
2011	22	26	48
2012	24	34	58
2013	27	31	58
2014**	32	40	72
2015	24	48	72
2016***	25***	41***	66

* FESP began
** FESP ended
*** Unofficial

- **Retention to Graduation**

Year	Total Freshmen	Total Graduates	Graduation Percent
2001	41		
2002	34		
2003	40	13	
2004	22	7	14%
2005	21	7	17%
2006	17	10	29%
2007	24	11	28%
2008	23	5	23%
2009	24	4	19%
2010*	19	4	24%
2011	18	2	8%
2012	16	4	17%
2013	18	6	25%
2014**	34	8	42%
2015	28	7	39%
2016***	15***	13	81%

* FESP began
** FESP ended
*** Unofficial

- **Other Activities**
- **3D Data Visualization and Collaboration Workspace MUS 108**
    - Initial discussion on making this space available
    - Currently have close to $100K for renovation
    - Submitting grant to Keck Foundation $300K
- **Montana Tech Robotic Mining Club Placed in Top 10**
    - 2016 NASA Robotic Mining Competition, Kennedy Space Center
    - Placed 1st in depth of mining, 7th in total material removed, 20th overall (out of 40 teams)
    - Three of these students were CS/SE
        - Josh Lee, Mack Sutherland, Tyler Fricks
        - (Other helped but didn't travel)
- **Grace Hopper Conference**
    - Fall 2015 - Brought 6 woman students to the conference
    - Fall 2016 - Brian is working on setting this up for this year
- **First Robotics Competition**
    - Hosting qualifier since Nov. 2013
    - Brian Koontz and Bryce Hill (EE) organized it in 2015

Faculty/IAB Members/Students (Comments/Suggestions/Questions):

- What are some of the grants and research projects the department is working on?
    - Hoplite Storage Engine (Behavior DB) for Mongo DB that Optimizes the Retrieval of Context Trigged Piecewise Hashes and Similarity Indexing
    - CS 10k Grant (The total funding is $1 million split between all 4 schools. Part of the $191,000 coming to Tech is to put on the workshop in 2018 and a couple weekend sessions, which includes stipends and travel expenses for the high school teachers. Faculty from all 4 institutions will assist in the workshops. Professional development workshops will be offered at the UM 2017, MT Tech 2018, SKC 2019).
- How many students do you employ for research projects*?*
    - At the present time there are more positions than students
- Have any faculty published any publications?
    - US Air Force Publication (Phil Curtiss)

Computer Science and Software Engineering Program Assessment (Jeff Braun)

- **CS Assessment Results: Fall 2015 - Spring 2016**
    - ABET Accreditation uses assessment of educational objectives and student outcomes as part of their process of evaluating computing programs
    - We gather assessment data on objectives and outcomes and report this to the assessment committee annually.
    - The assessment committee is comprised of members of industry (our IAB), a recent alumnus, a student, and the faculty
    - This annual meeting is the platform for presenting those assessment results and gathering input on any changes we might make based on results
- **Student Outcomes Assessment**
    - Student outcomes are those criteria we expect students to meet immediately after completing coursework within the CS and SE programs
    - Each course has course outcomes, and these are mapped to more general student outcomes

    - These more general student outcomes are one part of how our programs are evaluated by the ABET accreditation teams
  - Outcomes between the two programs are similar but do not have differences

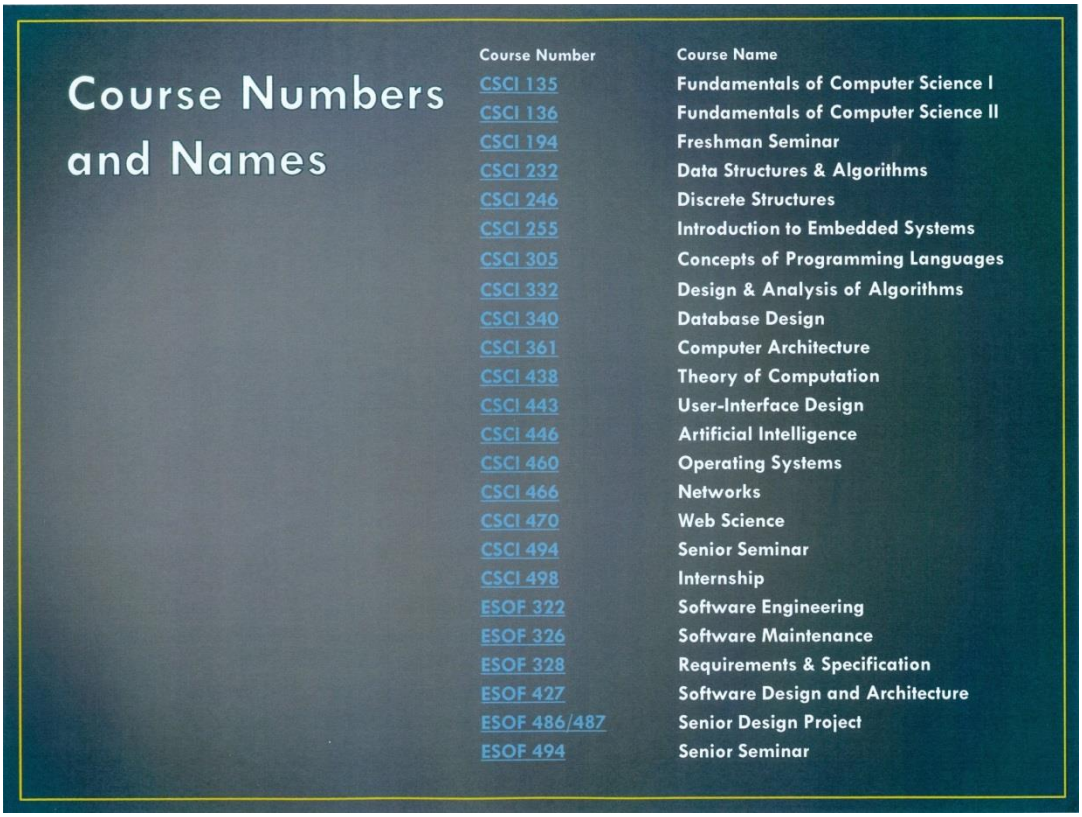
- **Student Outcomes: CAC**

  (a) *An ability to apply knowledge of computing and mathematics appropriate to the discipline*
  (b) *An ability to analyze a problem, and identify and define the computing requirements appropriate to its solutions*
  (c) *An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs*
  (d) *An ability to function effectively on teams to accomplish a common goal*
  (e) *An understanding of professional, ethical, legal, security and social issues and responsibilities*
  (f) *An ability to communicate effectively with a range of audiences*
  (g) *An ability to analyze the local and global impact of computing on individuals, organizations and society*
  (h) *Recognition of the need for and an ability to engage in continuing professional development*
  (i) *An ability to use current techniques, skills and tools necessary for computing practices*
  (j) *An ability to apply mathematical foundations, algorithmic principles and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices*
  (k) *An ability to apply design and development principles in the construction of software systems of varying complexity*

- **Software Engineering (EAC) Outcomes**

  (a) *An ability to apply knowledge of mathematics, science and engineering*
  (b) *An ability to design and conduct experiments, as well as to analyze and interpret data*
  (c) *An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability*
  (d) *An ability to function on multidisciplinary teams*
  (e) *An ability to identify, formulate and solve engineering problems*
  (f) *An understanding of professional and ethical responsibility*
  (g) *An ability to communicate effectively*
  (h) *The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context*
  (i) *A recognition of the need for and an ability to engage in life-long learning*
  (j) *A knowledge of contemporary issues*
  (k) *An ability to use the techniques, skills and modern engineering tools necessary for engineering practice*
  The program must demonstrate that graduates have: (SEC-1) the ability to analyze, design, verify, validate, implement, apply and maintain software systems; (SEC-2) the ability to appropriately apply discrete mathematics, probability and statistics, and relevant topics in computer science and supporting disciplines to complex software systems; (SEC-3) the ability to work in one or more significant application domains; and (SEC-4) the ability to manage the development of software systems.

- **Course Numbers and Names:**



- **Fall 2015 - Spring 2016 Outcome Assessment Results**
  - Our expectation is that 75% of students will meet each outcome at a level of 70% or above
  - The percentages in this table are the percent of students meeting that outcome
  - Two of our outcomes fell below the threshold: EAC-d and EAC-h

Outcome	Fall 2015	Spring 2016	Row Average
CAC a	86%	78%	82%
CAC b	75%	90%	82%
CAC c	83%	87%	85%
CAC d	100%	85%	92%
CAC e	86%	100%	93%
CAC f	83%	92%	88%
CAC g	86%	100%	93%
CAC h	96%	94%	95%
CAC i	83%	87%	85%
CAC j	87%	86%	87%
CAC k	82%	88%	85%
EAC 1	85%	84%	85%
EAC 2	72%	85%	79%
EAC 3	88%	89%	88%
EAC 4	100%	67%	83%
EAC a	84%	70%	77%
EAC b	76%	96%	86%
EAC c	81%	91%	86%
EAC d	0%	69%	69%
EAC e	85%	86%	85%
EAC f	86%	75%	80%
EAC g	87%	92%	89%
EAC h	71%	0%	71%
EAC i	94%	96%	95%
EAC j	0%	100%	100%
EAC k	83%	89%	86%
Column Average	78%	84%	

- **Fall 2015 - Spring 2016 CS Outcome Assessment Results Details**

	CAC a	CAC b	CAC c	CAC d	CAC e	CAC f	CAC g	CAC h	CAC i	CAC j	CAC k	Row Average
CSCI 135		80%	80%						84%	84%	80%	81%
CSCI 136		84%	94%						94%	94%	89%	91%
CSCI 194						83%		88%				86%
CSCI 232	76%	76%	76%						76%	76%	76%	76%
CSCI 246	84%											84%
CSCI 255	93%		100%						100%		100%	98%
CSCI 305	100%								80%	100%		93%
CSCI 332	57%	64%	78%						85%	71%	85%	73%
CSCI 340			92%	69%	100%	84%	100%	84%	92%		92%	89%
CSCI 361	28%		71%						57%	71%	57%	57%
CSCI 438	85%	100%							85%	85%		89%
CSCI 446	100%	100%	100%		100%		100%	100%		100%		100%
CSCI 460	84%		69%			84%		84%	76%	69%		78%
CSCI 466	76%					92%			84%	76%	76%	81%
CSCI 470	91%		91%						91%	91%	91%	91%
CSCI 486	100%	100%	100%					100%	100%	100%	100%	100%
CSCI 494						100%		100%				100%
CSCI 498	100%			100%		100%		100%	100%		100%	100%
ESOF 322	57%	42%	57%		71%	57%	71%		57%		57%	58%
ESOF 326	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Column Average	82%	83%	85%	89%	92%	87%	92%	94%	85%	86%	85%	

- **Fall 2015 - Spring 2016 SE Outcome Assessment Results Details**

	EAC 1	EAC 2	EAC 3	EAC 4	EAC a	EAC b	EAC c	EAC d	EAC e	EAC f	EAC g	EAC h	EAC i	EAC j	EAC k	Row Average
CSCI 135							72%								80%	76%
CSCI 136							84%								94%	89%
CSCI 194											83%		88%			86%
CSCI 232	76%				76%	76%			76%						76%	76%
CSCI 246		69%			84%											76%
CSCI 255	100%		100%		93%		93%		100%						100%	97%
CSCI 305															80%	80%
CSCI 332	71%				57%				71%						85%	71%
CSCI 340	92%							69%		100%	84%		84%	100%	92%	89%
CSCI 361	71%				28%		71%		71%							60%
CSCI 443																
CSCI 460	46%				69%						92%		92%		69%	73%
CSCI 466	76%	76%			76%				76%		92%				69%	78%
CSCI 470	91%	91%			91%	91%	91%		91%						91%	91%
CSCI 494											100%		100%	100%		100%
ESOF 322	57%	42%			71%		57%		57%	71%	57%	71%			57%	60%
ESOF 326	100%	100%	100%	100%	100%		100%		100%	100%	100%		100%		100%	100%
ESOF 328	100%	100%			50%				100%		100%				100%	91%
	66%	33%	66%	33%	66%	100%	100%		66%		66%		100%		66%	69%
ESOF 427	100%	100%			100%		100%		100%		100%				100%	100%
ESOF 486	100%		75%	100%					100%	100%	100%		100%		100%	96%
ESOF 487	100%	100%	100%		100%		100%		100%	25%	100%		100%		100%	92%
Column Average	83%	79%	88%	77%	76%	89%	87%	69%	85%	79%	89%	71%	95%	100%	86%	

- **Additional Independent/External Assessments**
  - Educational Testing Service (ETS) Proficiency Profile Exam
  - ETS Computer Science Major Field Test

- **Results of the Educational Testing Service (ETS) Proficiency Profile Exam**

-2016 Department Summaries of Proficiency

Doctoral/Research I & II,

Master's Comprehensive I & II,

and Liberal Arts I & II Institutions

(132,422 Seniors at 294 four year Institutions)

		Reading Level 1	Reading Level 2	Critical Thinking Level 3	Writing Level 1	Writing Level 2	Writing Level 3	Math Level 1	Math Level 2	Math Level 3
Montana Tech (N = 302)	Proficient	87%	68%	13%	76%	29%	8%	89%	73%	36%
	Marginal	8%	15%	41%	17%	45%	38%	9%	15%	31%
	Not Proficient	5%	18%	46%	7%	26%	54%	2%	12%	32%
Computer Science & Software Engineering (N = 5)	Proficient	100%	80%	40%	100%	40%	20%	100%	100%	80%
	Marginal	0%	20%	60%	0%	60%	60%	0%	0%	20%
	Not Proficient	0%	0%	0%	0%	0%	20%	0%	0%	0%
Marginal (N-schools = 294, N-students = 132,422)		69%	41%	7%	66%	22%	10%	60%	33%	9%
Proficient (N-schools = 294, N-students = 132,422)		17%	21%	22%	25%	38%	26%	23%	25%	18%
Not Proficient (N-schools = 294, N-students = 132,422)		14%	39%	72%	9%	40%	63%	18%	41%	72%

- **Results of the ETS Computer Science Major Field Test**

Computer Science Major Field Test

Test 4CMF (given 2006-11)	Mean*	2008		2009		2010		2011	
		Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile
Total Score	148	160	85%	167	95%	164	95%	163	90%
Programming Fundamentals	55%	74%	95%	71%	90%	75%	95%	76%	95%
Discrete Structures and Algorithms	35%	47%	90%	55%	95%	46%	85%	48%	90%
Systems (Architecture, OS, DB, Networking	42%	45%	55%	62%	95%	60%	95%	48%	70%
#students	9095	7		3		4		3	

*Mean is based on 232 institutions

Test 4HMF (given 2012-15)	Mean*	2012		2013		2014		2015	
		Score	Percentile	Score	Percentile	Score	Percentile	Score	Percentile
Total Score	147.2	164	95%	169	99%	164	95%	169	99%
Programming & SE	47%	61%	89%	65%	95%	64%	93%	63%	92%
Discrete Structures and Algorithms	39%	54%	94%	60%	98%	58%	98%	55%	95%
Systems (Architecture, OS, DB, Networking	38%	57%	98%	60%	99%	49%	90%	72%	99%
#students	7530	7		5		10		6	

*Mean is based on 214 institutions

Faculty/IAB Members/Students (Comments/Suggestions/Questions):

- More data is needed to assess EAC-d and EAC-h, how do we assess this?
    - We need to create more multidisciplinary team projects
    - The Chancellor needs to appoint a person outside of the interdisciplinary project to drive it.
    - The focus on the project should be on the project manager.
    - Work with an individual in the Business dept. to be the project manager, it would be great for them to have to work with a software engineer.
    - Project management is the responsibility of the project manager, planning and execution of the project. This person looks at the final project.
    - A student could be the project manager

Welcome

Chancellor Don Blackketter welcomed the board members to Montana Tech and emphasized the importance of their advice to the department. Dr. Blackketter informed members that enrollment is down but overall Tech is financially solid. He continued with an overview of projects that are going on around the campus, e.g., the new research building and the Living and Learning Center. He informed members that in May the Board of Regents approved Montana Tech offering Civil and Mechanical Engineering degrees, instead of offering them as options within the General Engineering department. Both degrees will begin this fall. Don also informed members that Montana Tech is one of only two publicly funded nursing programs in Montana to offer a Bachelor of Science in Nursing. He touched base on the scholarships that have been paid out by the foundation, and stressed that the structure should be changed to work towards incoming freshman. At the present 85% of scholarship support was paid to non-freshman. Once again Chancellor Blackketter conveyed his appreciation to the board members for their time, support and feedback to the Computer Science program.

Faculty/IAB Members/Students (Comments/Suggestions/Questions):

- Are you recruiting students overseas?
    - We have sent a team to China for recruitment, it is important when recruiting international students to find the right students to attend MT Tech.
    - Tuition is a factor for some international students and out of state students
    - Students should look into scholarships. There are no restrictions for the CodeMontana scholarship.
    - International students could work within the department to help cover expenses
- Multi-disciplinary Projects (Person outside of the discipline to drive it)
    - I have not found someone to step forward and take this on.

Outreach Coordination (Brian Koontz)

- **Outreach Activities**
    - Visited 21 schools (including middle school programs)
    - Attended Girls for a Change Conference
    - Attended Ronda Coguill's GEMS (Girls Excelling in Math and Science) Conference
    - Reached approximately 500 students (including those enrolled in CodeMontana)
    - Working with Butte School district to train middle-school teachers for a CodeMontana module
- **Work in Progress**
    - In process of hiring new Outreach Coordinator
    - We recognize the need for more efficient outreach. (Noted: Hunter at MSU is no longer visiting schools). Will brainstorm with new Outreach Coordinator and the MSU outreach coordinator on new more efficient ideas to interact and reach students.
- **Funding (Grace Hopper Convention)**
    - Requested IAB members for contact information regarding possible funding opportunities to send some of our students to the convention in Houston.

Faculty/IAB Members/Students (Comments/Suggestions/Questions):

- There are volunteer programs at the conference that would be a funding opportunity for students
- Companies may agree to sponsor a student for the conference
- Redesign website to attract students
- How much does the environment affect a student's decision to come to MT Tech?
    - First impressions are very important for women and somewhat for men
    - It wasn't bad enough to scare me away
    - Girls look for comfort
    - A nice environment for the CS program is important
    - First impressions are important for parents
    - I paid more attention to the professor and what the students did. I was more concerned there were good faculty members.
    - A few students would get physically depressed living in Butte but liked the faculty.

Industry Update (IAB Members)

Craig Spannring, TeeJet Technologies

- **What toolset are you using for development and collaboration?**
    - Many different tools related to embedded systems using assembly language
    - On linux platforms - Eclipse, Emacs - Cross compilation to target embedded systems
    - Gcc compilers with a shift toward Clang compilers
    - C++ language development environment
- **Have there been any changes in your software engineering process?**
    - Struggle with getting a uniform process in place across the company
    - Development has been driven by sales of the organization
    - Use MediWiki for initial development documentation (such as software requires specifications, requirements, etc.), works well across the organization.
- **Do you see movement toward mobile app development?**
    - Not big into mobile platforms at all
- **Are our graduates meeting your company's needs? If not, what's missing?**
    - Have not hired MT Tech graduates.

May Huang, Serial Entrepreneur

- **What toolset are you using for development and collaboration?**
    - Web App Development includes: Bootstrap.js, React.ja
    - Seeking a robust Natural Language Processing Platform
    - Backend Software Stack built on Node.js, Mongo DB, Postgres DB
    - Development tools include:
        - Subline Text Editor (MacDevelopment Platform) with Web development plugin
        - Some Visual Studio IDE
        - No Unit Testing framework
        - Selenium Testing for Web Site/Apps, moving toward automated testing within Selenium
        - Jira for trouble ticketing and bug tracking
        - Draw.io for UML and Schema and Diagramming
        - Balsamic for Conceptual Modeling

        - Zeppelin for UI Mockups and also Sketch for UI mockup
    - Jenkins for automated builds and continuous integration testing
- **Have there been any changes in your software engineering process?**
    - Mostly using Scrum with Russian Developers
    - Virtual machines for:
        - Compose.io for database system
        - Digital Ocean for VM infrastructure, will eventually move to web service (AWS) for data objects
- **Do you see movement toward mobile app development?**
    - Mobile App is presently a blend of web app and native app built on React.js
- **Are our graduates meeting your company's needs? If not, what's missing?**
    - Have not hired MT Tech graduates.

Christopher Tenda, EchoStar

- **What toolset are you using for development and collaboration?**
    - Version control system is moving into Github
    - Bug Tracking:
        - Jira is used for tracking bugs and trouble reporting, requires a human mediator to do problem escalation and assignment - this introduces challenges.
        - Bugzilla is used by the developer side because it is more automated and allows for input from end-users in an automated manner.
- **Have there been any changes in your software engineering process?**
    - Adding agile to Bugzilla, being developed by interns
    - There is still a lot of manual process from manages who produce tasks to teams manually
    - Moving more and more to an Agile process
    - Every two weeks reconsider what processes are working and which are not.
    - Self-testing code has not been great with intern projects, incomplete testing models; this has implications to V&V and Unit Testing within the program.
- **Do you see movement toward mobile app development?**
    - Beginning to adopt mobile platforms, but it is a slow process
- **Are our graduates meeting your company's needs? If not, what's missing?**
    - New hires have mostly been able to work almost immediately on projects.

David Thompson, SoFi

- **What toolset are you using for development and collaboration?**
    - Slack for collaboration among developers
    - Bamboo for automated builds and integration
    - IDES include Eclipse, Intellij, Sublime
    - Node.js is the backend, java is the language for everything, but they are slowly adopting C# for some desktop applications
    - Mac Shop - don't do windows
- **Have there been any changes in your software engineering process?**
    - Developers are required to make the case to management for new features - manager, features that get approved are then allocated to teams

- Selenium is used for automated testing including unit testing and front-end web testing
- Expanding QA engineering to incorporate developers for testing
- Moving more and more to an Agile process
- Every two weeks reconsider what processes are working and which are not.
- Self-testing code has not been great with intern projects, incomplete testing models; this has implications to V&V and Unit Testing within the program.

- **Do you see movement toward mobile app development?**
  - Mobile development has begun to exploded, can't find developers in Montana, have had to marshal mobile development resources from Salt Lake City - possible case for a "Mobile Application Development" additional courses for SE program.
- **Are our graduates meeting your company's needs? If not, what's missing?**
  - MT Tech graduates have done well generally, but have had mixed results at times.

Tyler Dusek, Schweitzer Engineering Laboratories

- **What toolset are you using for development and collaboration?**
  - For Firmware Development
    - C++g++ - Wary of 3rd party libraries due to lack of control of code base
    - Motorola controllers is the legacy hardware in use, moving to ARM based controllers
    - Use QNX for real-time embedded runtime and toolsets for development
- **Have there been any changes in your software engineering process?**
  - Moving to agile development process
  - Not much automated testing
  - QA costs are quite high and looking for ways to reduce these costs
  - Unified development environment for bugs, version control, bug tracking, etc.
  - Moving to Stash and Git which has greatly increased productivity for collaboration - driving better development
  - Distributed teams have been driving higher code reviews to keep QA higher
  - Bamboo for continuous integration builds - manual testing continues
  - Testing includes unit testing, integration testing
  - Software tool sets and languages :
    - C#, Data Service Oriented Architecture - allows customers to develop in other languages by leveraging SOA model
    - Lots of software stack and libraries
    - Web friendly client side - not mobile, but site can be used on mobile devices
- **Do you see movement toward mobile app development?**
  - Not targeting mobile at all
- **Are our graduates meeting your company's needs? If not, what's missing?**
  - The last hire of MT Tech graduate was in 2012. Graduates have done well - have great work ethics.

Terry Brandt, Zoot Enterprises, INC.

- **What toolset are you using for development and collaboration?**
  - Eclipse IDE

    - SVN for version control
    - Jira for bug and trouble tracking
    - C, C#, JavaScript, CSS, html, XMLXSLT
    - Oracle DB for database
    - Selenium for testing and UI portal
- **Have there been any changes in your software engineering process?**
    - Scrum in an enterprise model
    - Moving to Agile development
    - Change management requires testing and QA is moved through "regions" prior to release
    - Testing has moved back into Software Development
    - Unit and Functional Testing
    - All of this shortens QA Cycles
- **Do you see movement toward mobile app development?**
    - Have done some native mobile application development
    - Mostly have been waiting on a new framework development from the company
- **Are our graduates meeting your company's needs? If not, what's missing?**
    - The graduate from day one has been effective, had great enthusiasm and contributed well.

Haythem Memmi, Microsoft

- **What toolset are you using for development and collaboration?**
    - C#, Visual Studio IDE with various plugins
    - Auto-Pilot Virtual Machines - used for service development and deployment
    - Moto: Cloud-First, Mobile-First - based on Azure infrastructure
    - Testing including unit testing, integration testing, pipeline includes code review
    - Sandbox is created in which code is tested in an automated method via AP VM
    - Version control is via Git
    - One-Note is used for Development Documentation
- **Have there been any changes in your software engineering process?**
    - Change control process within Microsoft - required to test code against lots of inter-dependencies between different projects
    - Ensures code base modifications don't break other projects and dependencies
    - All of this shortens QA Cycles
- **Do you see movement toward mobile app development?**
    - Engage in a large way - very important for search
- **Are our graduates meeting your company's needs? If not, what's missing?**
    - Have not yet had experience with them

Marketing CS/SE (Jeff Braun)

Jeff informed members that the department received OTO (One-Time-Only) money in the amount of $40,000.00 for marketing purposes. Promotional materials purchased: folders, posters, USB drives and "End of the Year Postcard" which is sent out to the new applicants thanking them for applying at Montana Tech. The department has purchased a new server, which will host the department's new website. The CS website will follow MT Tech's website template. He also informed members that Doug Coe has received $15,000.00 to promote the college. Doug plans to develop a TV ad featuring Dan Cleary a former CS student who is now a neurosurgeon. Jeff asked IAB members if the department should spend more money on other marketing projects and what should those projects be.

Faculty/IAB Members/Students (Comments/Suggestions/Questions):

- Film IAB Members
- Videos of CS/SE Students
- Use Social Media for advertising - Facebook, Snap Chat

Plea for Industry Partners - V&V and Testing (Frank Ackerman)

- **Software V & V (Software Verification and Validation)**
  - A software V&V person is basically just an inspector from the BSB (Better Software Bureau)
- **What do software V&V people do?**
  - Software V&V People
    - Research and suggest tools the software development organization can use to make better software faster and cheaper
    - Observe processes for ways they can be improved to meet the above goals
    - Examine artifacts for ways they can be improved to meet the above goals
  - Research Tools
    - Some possibilities here – we used some of the unit testing tools last term
    - But most of these tools appear to me to be pretty week
    - Static analyzers
    - Automatic radon test set generators
  - Observe Process - Not practical for our class:
    - No significant software development organizations within a hours
    - The largest software project on campus is pretty hopeless when it comes to software processes
    - In our own department all the other class doing SE have the same instructor.
  - Observe Process
    - Might be possible with Tech's IT department, but scheduling a major problem - will look into this.
  - Examine artifacts:
    - Documents
    - Code
    - Test scripts
    - Testing - active examination of application
  - Can you help?
  - Do you have any mothballed projects?
    - With some documentation?
    - That could be made to run in our environment?

- **Faculty/IAB Members/Students (Comments/Suggestions/Questions):**
    - Available over winter break to work on projects (Frank Ackerman)
    - Find projects on open source on the web
    - Input from IAB members on V & V projects would be helpful.

Hoplite Research: Link with Security - (Phil Curtiss)

- **Research Proposal:**
    - Develop a Hoplite Storage Engine (Behavior DB) for Mongo DB that Optimizes the Retrieval of Context Triggered Piecewise Hashes and Similarity Indexing
        - The development of a Hoplite Storage Engine will be the focus of the research performed under this research effort. The overall goal is to develop a highly scalable, extensible, reliable, and distributed high-performance database storage engine for the storage and retrieval of context triggered piecewise hashes (CTPH). The performance of the retrieval will be based on the development of a similarity indexing method. The development of an efficient index method for the CTPWh will be based on exploring different acyclic-graph models, using Cypher query language to extract properties in piecewise-B-Tree approach (e.g. B-Tree sharding).

          In addition, optimization strategies will be explored including matching secondary storage architecture to the CRUD operations of database storage elements to make sure there is no loss of efficiency in an architecture mismatch. Similarly, if needed, novel processing methods of CRUD and indexing operations using add-in cards and/or co-processing will be explored.

Discussion and Wrap-Up

Faculty/IAB Members/Students (Comments/Suggestions/Questions):

- IAB members stressed the importance of testing
- Testing goes with development, needs to be included in courses.
- Testing needs to be introduced early in program
- Cover Unit Testing and Functional Testing
- Funding for Grace Hopper Conference - Microsoft will match volunteer time (Haythem)
- Assessment - Should we change the cut off?
    - Our expectation is that 75% of students will meet each outcome at a level of 70% or above
- Let's see what happens after we go through our courses; then meet as a department to make a decision.

Meeting adjourned.

Respectfully submitted,

Tami Windham