

## COMPUTING &amp; SOFTWARE SYSTEMS

## Bits &amp; Bytes


 W  
BOTHELL


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## CSS FOCUS

## Understanding Agile & Secure Software Development within the CSS Curriculum



Dr. Frank Cioch

The computer industry's landscape is continuously changing. With the constant advent of newer technologies and higher demand from consumers, programmers and software engineers are pushed every day to think and create bet-

ter, more secure, and more stable software to meet these demands.

In order to keep students ahead of the game and well prepared for the real-world, CSS faculty at UW Bothell are presented with the continuous task of modifying and adapting their curriculum to these changes.

One such faculty member is Dr. Frank Cioch, who has been in the field of software engineering since the early 1980s. Through his experience, Dr. Cioch discusses and explains his approach to teaching agile and secure software development in his curricula at UW Bothell.

### Can you briefly describe what agile and secure software development is?

Agile methods provide a way to deliver software that is developed in small increments, with customer feedback on each one before starting the next. Agilists do not plan the entire project in detail at the start. That

way, if the business or technical climate changes and the customer changes their mind about what they want, agile methods can accommodate the change more easily than carefully planned projects.

Secure software development builds security into the entire software development process; at the extreme it could be thought of as security-driven-development. Threat modeling is performed during requirements engineering and software design to identify potential security problems, secure coding practices are used during implementation, and special security-directed testing techniques are applied. The entire lifecycle is affected, not just coding.

### Are these concepts new to the industry?

Agile methods started to become well known in 2001 with the creation of the Agile Alliance and the writing of the Agile Manifesto.

Secure development practices have been gaining momentum since Microsoft's Trustworthy Computing Initiative, which started in 2002 after the disruption caused by the code red and nimda worms in 2001.

### How will these concepts improve the way we develop and use software today and how have they so far?

Agile methods are particularly well suited to the rapidly changing business environments that exist today. Hopefully, secure development methods will continue to become more

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# Letter from the Director

*Dear Alumni and Friends of CSS,*



**T**hese are exciting times for our Program. In the midst of an economic crisis and state budget cuts to the University, CSS is experiencing enormous growth and activity. Our undergraduate enrollment is up over 40 percent this year, our new Master of Science in CSS admitted its first cohort of approximately 30 students in fall, and our Masters Preparation Sequence admitted 25 students in winter. Bill Erdly is providing a sure and steady hand guiding the MS startup as our new Associate Director for Graduate Studies, and Megan Jewell is now our new Graduate Advisor. CSS faculty have been busily engaged in developing and teaching new courses for our MS degree.

The Program just hired Josh Larios as an Advanced Systems Engineer and is in the process of implementing a multi-year plan to upgrade all of our laboratories and expand our teaching and research capabilities with new hardware and software, including some exciting new collaboration facilities which we will unveil in the next few months. While other institutions of higher education have even resorted to laying off faculty, careful fiscal planning on the part of UW Bothell administration, coupled with our strong growth, has allowed CSS to search for new faculty for fall 2010.

Even with all of this frenetic new activity, faculty and staff continue their regular activities of updating and teaching courses, advising students, conducting research, publishing results, presenting their work to colleagues at conferences, placing students in internships, pointing students toward career opportunities, etc. If you're ever in the neighborhood, please stop by -- we'd love to show you how we're growing.

Cordially,

**Dr. Michael Stiber**  
*Professor and Director*

## EDITORS

Megan Jewell *Graduate Advisor*  
Michael Stiber *Director*  
Faraz Romani *Office Assitant*

## CSS STAFF

Megan Jewell *Graduate Advisor*  
Josh Larios *Advanced Systems Engineer*  
Janet McDanial *Program & Internship Coord.*  
Dina Meske *Undergraduate Advisor*  
Faraz Romani *Office Assistant*

## SPECIAL THANKS TO

Salman Aziz  
Dr. Frank Cioch  
Stephen Dame  
Juan Echevarria  
Kye Fehrenbach  
Iulius Filip  
Ardith Ketchum  
Tatyana Nikolova  
Mara Patton  
Elise Smith

## CSS WELCOMES NEW ASE STAFF MEMBER



**Josh Larios**

The CSS Program is proud to welcome Josh Larios to the CSS staff.

He has been with the University of Washington as an employee since 2001 and as a student between 1992

and 1996.

A professional UNIX systems administrator since 1994 (and hobbyist for longer), he has worked in a variety of environments, from a nonprofit arts organization to a dotcom-era search engine development company.

He currently serves as the Advanced Systems Engineer for the Computing & Software Systems Program at UW Bothell. Previously, he was a web developer at UW Bothell, and before that he was a desktop support specialist with UW Tech in Seattle (formerly C&C).

He collects Tarot and Loteria decks and photographs of manhole covers from around the world.

## RECORD ENROLLMENT INCREASE

The CSS Program is pleased to announce a record increase in enrollment in our undergraduate programs—up 40 percent over last year.

Approximately 20 percent of the new admits consist of native UW Bothell students, while the remaining 80 percent consist of transfer students from a variety of community colleges and universities throughout the region, such as Cascadia Community College, Bellevue College, Washington State University, and University of Washington.

Over our 14 year history, the CSS Program has strived for and achieved a reputation for quality education by providing students with a combination of state-of-the-art facilities, copious resources and networking opportunities, and a faculty consisting of highly qualified and greatly experienced individuals.

As a result of the record increase in enrollment, it might not come as a surprise that the CSS Program has become synonymous with excellence in computing education throughout the Pacific Northwest.



## FOLLOW & BEFRIEND US

Stay in touch and up-to-date with what's going on within the CSS Program. Visit our website ([www.uwb.edu/css](http://www.uwb.edu/css)) for links to our Twitter and Facebook pages.

## CLARK OLSON

### PUBLICATIONS

#### Robust Registration of Aerial Image Sequences

**Abstract:** We describe techniques for registering images from sequences of aerial images captured of the same terrain on different days. The techniques are robust to changes in weather, including variable lighting conditions, shadows, and sparse intervening clouds. The primary underlying technique is robust feature matching between images, which are performed using both robust template matching and SIFT-like feature matching. Outlier rejection is performed in multiple stages to remove incorrect matches. With the remaining matches, we can compute homographies between images or use non-linear optimization to update the external camera parameters. We give results on real aerial image sequences.

Clark F. Olson, Adnan I. Ansar, and Curtis W. Padgett in *Advances in Visual Computing, Lecture Notes in Computer Science*, Vol. 5876 (*Fifth International Symposium on Visual Computing*), Part II, pages 325-334, Nov. 2009.

## KELVIN SUNG

### PUBLICATIONS

#### Game-Themed Programming Assignments for Faculty: A Case Study

C. Hillyard, R. Angotti, M. Panitz, K. Sung, J. Nordlinger, D. Goldstein, "Game-Themed Programming Assignments for Faculty: A Case Study," to appear in *SIGCSE'10*, March 2010.

#### Computer Games and Traditional Computer Science Courses

K. Sung, "Computer Games and Traditional Computer Science Courses," *Communications of the ACM*, Vol. 52, No. 12, PP. 74-78, December 2009 (*invited paper, peer reviewed*).

## PEER REVIEWED WORKSHOP/POSTERS

#### Develop Game-Themed Examples for CS1/2 without Background in Graphics or Games

M. Panitz, K. Sung, J. Nordlinger, "Develop Game-Themed Examples for CS1/2 without background in Graphics or Games," *workshop to appear in ACM SIGCSE'10 Conference*, March 2010.

#### Sammy goes to UWB – A Game for UWB Admissions Office

A. Amlag, S. Krolkowski, B. McMahon, S. McPherson, K. Phillips, and K. Sung, "Sammy goes to UWB – A Game for UWB Admissions Office," *Poster, Serious Games Winter School 2010, Puerto Vallarta, Mexico, February 12-14, 2010*.

## INVITED WORKSHOP/PRESENTATIONS/PANELS

#### Developing Game-Themed Applications With XNA

"Developing Game-Themed Applications With XNA," *Invited 3-day workshop, Serious Games Winter School 2010, Puerto Vallarta, Mexico, February 12-14, 2010 [Sponsored by Information Systems Department, University of Guadalajara]*.

#### Breaking into the Game Industry the Educated Way

"Breaking into the Game Industry the Educated Way," *Invited Panelist, PAX | The Penny Arcade Expo!, Seattle, Washington, September 4th 2009*.

#### Developing Game-Themed Applications for Teaching Introductory Programming Courses

"Developing Game-Themed Applications for Teaching Introductory Programming Courses," *Invited 2-day Workshop, Beijing University of Technology, Beijing, China, July 2009*.

## CAROL ZANDER

### PUBLICATIONS

#### Student Transformations: Are They Computer Scientists Yet?

**Abstract:** Changes in the ways computing students view their field as they learn, as reported by the students themselves in short written biographies, are examined. In many ways, these changes result in students thinking and acting more like computer scientists and identifying more with the computing community.

"Student Transformations: Are They Computer Scientists Yet?," Zander, C., Boustedt, J., McCartney, R., Moströf, E., Sanders, K., and Thomas, L., *In Proceedings of the Fifth international Workshop on Computing Education Research Workshop (Berkeley, CA, USA, August 10 - 11, 2009)*. ICER '09. ACM, New York, NY, 129-140.

#### For Me, Programming Is...

**Abstract:** Students' initial attitudinal experiences with programming at the end of a first programming course are explored. Fun, interesting, hard, rewarding, and challenging: these are the most frequent responses of 697 students from five institutions at the end of a first programming course. Based on content-analysis of students' responses, nearly 50 percent of responses were positive in nature, there was a significant difference in the responses of majors and non-majors, and positive responses correlated to earned grade in the course.

"For Me, Programming Is..." , Simon, B., Hanks, B., McCauley, R., Morrison, B., Murphy, L., and Zander, C., *In Proceedings of the Fifth international Workshop on Computing Education Research Workshop (Berkeley, CA, USA, August 10 - 11, 2009)*. ICER '09. ACM, New York, NY, 105-116.

# A FUSION OF TWO WORLDS

**A** bright young student at UW Bothell has taken it upon himself to bring together two very different worlds.

Juan Echevarria provides insight into his ongoing research project with his native Tulalip Tribe and UW Bothell.

## Tell me a little about yourself and your project.

As a Tulalip Native American, I pride myself in the opportunity to be a part of the “Tulalip Project”.

I first started the project as a Computer Science major at Seattle University; I transferred to UW Bothell shortly after.

Through this project, I’ve had the opportunity to experience project management environments coupled with agile methodologies throughout various positions within a software engineering team.

I am currently the manager of the marketing and design team that implements new creative initiatives that impact user experiences across multiple platforms of both public and private [government and business] sectors.

My next educational milestone will be the Executive MBA program at UW Foster in which I will enroll Fall 2010.

## What is your research about?

It’s about the marketing role that computer science plays in future generations of Web 2.0.

Currently, I am deploying a strategy to help establish the Tulalip Resort with this notion of “social equity”. This basically entails a variety of social networking sites that are leveraged to create an established SEO (Search Engine Optimization) and SEM

(Search Engine Marketing) approach. With the current trend and psychographic results moving more and more towards digital media and “micro content”, [it] creates a huge content need.

The most recent deployment is the Tulalip Resort Night Club ‘MPULSE’ where I have used psychological principles taught in class as a direct application. This has been deployed since August of 2009 and to date the venue has received a 60 percent increase in a current declining market. This strategy is currently being assessed for property wide deployment.

## What interested you in computer science?

I always looked at computer science as an insight [into] the future, where technology seems to make the unimaginable imaginable.

Computer science is world of opportunities where your imagination and creativity is translated into a logical solution for a user.

## You mentioned ‘new creative initiatives’ earlier, can you give examples?

The most recent major deliverable was last year when we deployed the new user experience for the Tulalip Resort website (recently awarded the AAA 4 Diamond Award).

It consisted of usability principles and aesthetic changes to promote online booking. I had the opportunity to take full creative control, from directing the photography to the video experience.

## What are you most proud of?

One of the projects that I am most proud of is our recent deployment of the [www.tulaliptribes-nsn.gov](http://www.tulaliptribes-nsn.gov) site. I had the opportunity to collaborate in depth with the software engineering team on a content management system. We took an agile approach to this, we ran two sprint teams (marketing and design and software engineering) in parallel and at every sprint cycle we interweaved both teams. This allowed our designers to integrate a rigorous iterative design approach with the developers’ dynamic features in alleviating common impediments that occur within software engineering multi-disciplinary teams.

This approach complemented both

teams with the ability to avoid conflicting time estimates that would set the other team back. The best thing about this project was that we were able to implement the agile methodology within two of the hardest multi-disciplinary teams (designer and developers) working together effectively and efficiently. This created a team synergy, as well as motivated every individual that was part of both teams because everyone had the opportunity to showcase their domain knowledge as well as playing an integral role in alleviating impediments.

## What classes have had the strongest impact in helping you with this project?

**CSS 490: Game Design** with Professor Erdly: You really learn how design elements (the lenses) effect user interaction and promote resonance. This will help you establish psychographic trends that will allow you to make objective decisions in your future applications.

**BUS 402: Managing Work Teams** with Professor Boss: You will not be disappointed as to the exposure you will have to

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Juan Echevarria in his Marketing & Design office.

# “How’s it Going?”

*Students share their experience within the new Master of Science degree program.*

BY FARAZ ROMANI

**O**n the eve of its 20<sup>th</sup> Anniversary, it is sometimes hard to believe that the UW Bothell campus is so young. With a sizeable and diverse student body, along with numerous departments and degrees, the campus has a feeling of a much more senior institute. What’s more surprising is that the Computing and Software Systems (CSS) Program is even younger—only 14 years old.

What started with just one degree for the CSS Program has grown to encompass three; the latest being the Master of Science in CSS (MSCSS)—a nine quarter graduate degree offering evening classes tailored towards working professionals.

The road to establishing the MSCSS degree has not been easy. After many years of delays and setbacks, the degree was finally introduced to students in autumn 2009.

It was no surprise to CSS Director, Dr. Michael Stiber, that the new degree received higher than expected applicants for autumn and winter quarters.

“We feel gratified by the incredible response we’ve had from the community for this degree,” says Stiber. “Clearly, it fills a vital need for both continuing education

for computing professionals and for people living in this area who are looking to switch careers.”

Due to the nature of the MSCSS degree being a career transitioning one, it invites a diverse group of students with backgrounds ranging from medical and aerospace to the more traditional computer science and software engineering.

“Some have very recent bachelor degrees [while others] have been working in the industry for a couple decades,” continues Stiber. “Some are established computing professionals looking to move their career track up to the ‘next level’; some have humanities degrees and are looking to break into what really is the profession of the future—where most of the employment growth will be in this region.”

I followed up with two such students who are currently enrolled in the Masters Preparation Sequence (MPS), a set of courses designed to serve as prerequisites for the MSCSS for those without an undergraduate education in computer science, and the MSCSS program, to find out what they think about the new degree.

Elise Smith, who received her Bachelor of Science in Mathematics degree from

Western Washington University and has worked in the biotechnology field researching Alzheimer’s and aging, is enrolled in the CSS 501 course.

“It is fast paced,” she explains, “but is being taught in a clear [and] concise manner.”

The CSS 501 course explores basic and advanced data structures, their uses, and implementations.

It is being taught by Prof. Clark Olson, whose background includes two years of research at Cornell University along with five years at NASA’s Jet Propulsion Laboratory (JPL) working on computer vision techniques for Mars rovers and other applications.

“At some point,” Smith continues, “I would like to tie my biology background into my programming experience.”

Due to UW Bothell’s strategic location near Bellevue, Redmond, and Seattle, which have proven to be great hubs for medical and software businesses such as Fred Hutchinson Cancer Research Center and Microsoft, along with the CSS department’s strong relationship with these and other businesses within the region, Smith will have many opportunities upon graduation.

In fact, many undergraduate CSS students have received internships for their senior projects and have been hired by companies such as Boeing, Amazon, Siemens Medical Systems, and Honeywell to name just a few.

Stephen Dame, who’s currently enrolled in the CSS 565 course, received his Master of Science in Electrical Engineering

## CSS FOCUS CONT.

widespread, for we are all aware of the potential problems caused by malware and the disclosure of personally identifiable information.

Both have improved software development because of the new practices, tools, and techniques they employ. For example, agile methods introduced pair programming, test-driven development, refactoring, daily stand-up meetings, user stories, and burndown charts, to name a few. Secure development methods include threat models, coding practices for buffer overruns, integer overflow and other known coding-related problems, fuzz testing and penetration testing.

### **What sorts of activities/projects do you do with your students to help with this?**

Agile methods have been incorporated into CSS 360 and CSS 461 in a compare and contrast way. I emphasize that all methods/tools are part of the practitioner’s tool kit, and knowing which method/tool to use in a particular situation is a key to success. I thus cover both traditional (capability maturity model inspired) and agile (Scrum

and extreme programming in particular) approaches, as well as the unified process hybrids such as Open UP and Agile UP.

In my 490 special topics course on agile methods, I run the course in an agile way, rather than a traditional planned way, in an effort to illustrate the cultural differences that distinguish agile from traditional methods. For example, self-organizing teams replace the traditional project manager in an agile project so my 490 students take an active role in administering the course.

### **The secure software development course will soon be offered in the Masters program; how will the curriculum change to adapt to the different, more experienced, student body?**

One of the interesting things about secure development is that it appears to be better suited to the traditional completely planned, fully specified, big-design-up-front approach to development. For example, threat models need to be written and maintained. Agile’s highly iterative approach works best with minimal documentation

and frequent re-design via refactoring. It is unclear what can be done to address both needs: responsiveness to change with security built-in rather than added-on. This is an active area of research and though we analyzed the sources of this problem in the secure development class at the undergraduate level, at the Master’s level we will examine the literature for solutions to the problem.

*“One of the goals of the software engineering courses in the CSS curriculum is to update them in response to the new methods and tools that are developed. Two primary thrusts that Mark Kochanski and I have tried to incorporate into the curriculum are agile methods and secure development methods.”*

~ Dr. Frank Cioch

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# COOPERATIVE EDUCATION HIGHLIGHTS

A capstone project required for all Bachelor of Science students, the Cooperative Education senior project is structured in a way that allows the student to choose the option that best fits his/her educational goals. The following are short synopses of what just a few recent and upcoming graduates have done for their cooperative education experience.



**Salman Aziz**  
Siemens Medical Solutions

## Code Refactoring and Test Automation

Salman worked on refactoring error-handling components of a diagnostic ultrasound system to reduce dependency on software libraries that were not compatible with a newer compiler. In addition, he wrote nightly scripts to automate the process of running ultrasound imaging module tests and developed a web reporting interface to access the test results.



**Iulius Filip**  
Adaptis Inc.

## Clear Choice - Fulfillment Materials Implementation on QNXT Platform

Iulius developed a modernized health insurance processing system using QNXT. He customized the QNXT software platform to optimize the workflow and bridge gaps not covered by the initial implementation. His project focused on the automation rendering of Fulfillment Materials and Health Insurance ID cards. His efforts impacted roughly 60,000 members insured by Clear One Health Plans of Bend, Oregon.



**Kye Fehrenbach**  
Sultan School District

## Digital Signage

Kye developed the management software and user interface for a digital signage system, sending out school-related notifications to several locations near the targeted school. The system provides a very effective way to help students become aware of upcoming events, who then pass on the information to their parents.



**Mara Patton**  
Microsoft

## Debugging Tools for the Internet Explorer Team

Mara's project focused on debugging improvements for the Internet Explorer team. During the project she created debugger extensions and stand alone debugging applications. In addition, by analyzing human driven debugging sessions she cataloged useful techniques and produced debugging extensions.



**Tatyana Nikolova**  
UW Seattle Computer Software Engineering

## Binary Trace File Format for Daikon

Tatyana worked on Daikon, which is an open source software tool for automated learning of program specifications. It analyzes a program and outputs invariants ('a>b' or 'list is sorted'). The project goal is to modify Daikon's front end to produce binary files instead of ASCII and modify the central system module to read and process binary files.



**Ardith Ketchum**  
Renewable Energy Technology Gp.

## Agile Development in a Start-Up Company

Ardith created MVC pages and Silverlight 3.0 charts for a website showcasing the development of a consumer-sized renewable generation system that combines the use of a wind turbine and solar panels coupled with an intelligent grid-tied inverter with IP networking to a web server.

degree from California State University, Sacramento where he also worked as a medical ultrasound engineer for various companies after graduation.

Although Dame's career began in the medical engineering field, he says his interest in new software languages, databases, wireless networking and embedded systems grew over the past 10 years. He adds, "I have been pursuing the need to refresh my knowledge more formally."

Dame currently works as an embedded software lead engineer at Boeing on the 787 Dreamliner where he performs supplier oversight for Level A DO-178B software. DO-178B are stringent guidelines provided by the FAA for all new aviation software.

The CSS 565 course that Dame is enrolled in covers a variety of research methods used in software development.

It is being taught by Associate Director of Graduate Studies William Erdly. A fellow Husky, he received his Master of Science and Ph.D. from the University of Washington in social and organizational psychology.

Erdly has been active in the computing field since the mid-1970s and has experience in software development and research

within the aerospace and healthcare industries.

"The classes are fresh, inspiring, and captivating," explains Dame. "The opportunity to participate in the broader level of networks and resources afforded me as a UW graduate student is a benefit that goes well beyond the actual class content and assignments."

For Dame, the benefit of applying what he's learned in class isn't waiting until after graduation. He explains that what he learned in his CSS class on multithreaded distributed computing last quarter gave him the opportunity to improve and expand on a recent project he completed: a "web based system for managing the extraction of many terabytes of data to serve over 60 user analysts."

In fact, "I was just recently assigned the opportunity to lead this new development as a special assignment," continues Dame. "None of [which] would have occurred without the excellent learning opportunities extended by the UW and the talented teaching professionals that have inspired such directions."

As a career transition degree, the MSC-

SS offers students a more diverse group of colleagues to work alongside and network with versus the more traditional MS degrees offered by other institutions. This not only enables cross-sharing of ideas, concepts, and broader perspectives but also encourages it, creating a somewhat 'open source' environment for learning and self-enrichment.

The CSS department has a highly qualified and well-experienced pool of faculty, giving students the opportunity to take full advantage of years of knowledge and know-how. This only enhances the learning experience by presenting them with instructors who exemplify the curriculum and provide a real-world link to in-class assignments and projects.

Lastly, the Program's strong ties with local businesses, in addition to UW Bothell's strategic location, provide great opportunities for students to excel after graduation.

Smith and Dame help champion the fact that the new MSCSS degree is a well-rounded and promising addition to the CSS Program's growing degree offerings. It will give them the edge to further their career and establish a stronger foundation for their professional lives.



## CSS EVENT NEWS

### STATE OF COMPUTING SUMMIT

Advisors and faculty members from nearby community colleges met at the second annual State of Computing Summit hosted by the CSS Program. Attendees discussed their approaches to zero-level programming courses taught at their campuses. Zero-level programming courses are beginner-level courses in which the fundamental concepts and ideas of programming are introduced to students.

In addition, attendees brainstormed ways to interest a more diverse group of students in computer science.

Two approaches to teaching and learning were discussed for introductory programming courses: experiential and unplugged. In experiential learning, instructors teach students about the fundamental concepts of programming by having them take part in it, such as by actively solving problems, understanding program logic, elements, and syntax, and

creating basic programs. The unplugged approach adds a step prior to experiential, in which students are first introduced to the concept by lecture or discussion and then implement what they learned.

The aim of this summit was to both share ideas and concepts amongst colleges and colleagues and to also broaden the scope of teaching by incorporating different and new ideas. In doing so, community colleges, along with the CSS Program, will be able to provide a better learning and educational experience to current and future students.

### 'WOMEN IN COMPUTING' DINNER

It is no secret that in an industry dominated by men, it can be a difficult choice to pursue a career in computing for women. The CSS Program is proud to have a strong cadre of female students working towards their undergraduate and graduate

degree, and recently spent an evening acknowledging the challenges they face.

In winter quarter, the department reinitiated and hosted the 'Women in Computing' dinner to bring awareness and strengthen the bond between female students and alumni within the Program and throughout the professional computing community.

This women-only informal dinner created a no-stress environment in which attendees had an opportunity to get to know one another and network with current students and alumni. In addition, it gave them the opportunity to share their ideas, experiences, and issues as women within the computing world.

Due to the large turnout and overall success of this dinner, plans to have another event are underway for spring quarter. Future event announcements will be sent to current and alumni students via the CSS email list.

# HELP SUPPORT OUR MISSION

Whether you donate \$5 or \$500, every gift helps keep the CSS program a unique and rewarding experience for students and an important resource for computing education in this region.

Support from people like you enables us to grow our activities even in the face of state budget cuts. Become part of our mission by donating whatever you can.

You can direct your giving to CSS by visiting [www.uwb.edu/css](http://www.uwb.edu/css) and clicking on the "Make a Gift" link.

Thank you for your generous support.

## STUDENT SPOTLIGHT CONT.

"power" and learning how to diagnose a team problem and prescribe a solution.

**CSS 370: Analysis & Design** with Profs. Kochanski and Cioch: This [course] will help you tremendously create flow for your thought-process and troubleshooting problematic areas.

### What is the overall goal of your project?

For my project, I want to show how computer science methodologies and principles are applied towards marketing concepts. Specifically, how this notion of "parasocial interactions" can create relationships with its users, like Facebook, [and] be leveraged within marketing 2.0 initiatives. Throughout my independent studies along with the CSS curriculum I have been able to apply similar/hybrid methodologies that have lead to qualitative and quantitative results.

