HELLO AND WELCOME!

Hard to believe that another academic year is coming to a close, but we’re happy to be able to use this spring newsletter to give you a sense of this year’s happenings in our program. While the following paragraphs will give a high-level overview of some important issues, the rest of this newsletter is packed with extensive highlights from our faculty on various educational, research, diversity, and internationalization initiatives.

An important highlight this year was the establishment of the VMware Fellow Martin Casado Computer Science Scholarship, an $800K endowment that will provide full-tuition scholarships for promising Flagstaff-area students in our program. Martin Casado is one of our alumni from the graduating class of 2000, and went on to complete his graduate studies at Stanford University before co-founding Nicira. In 2012, Nicira was sold to VMware for $1.26B, with Martin now serving as the leader of VMware’s Networking and Security Business Unit. It’s a point of pride for us that Martin recognizes the quality of our program and our students, saying “To this day, some of the most impressive students I have ever interacted with I met during my years as an undergraduate at NAU. In fact, even with the depth of talent in Silicon Valley, three of the first 10 employees at Nicira were NAU alumni.”

We’re all very happy to report that our program continues to be accredited by the Accreditation Board for Engineering and Technology (ABET) after undergoing a full review during the last academic year. ABET accreditation provides an important outside perspective on the quality and completeness of our curriculum. This is a particularly important mark of distinction for us, as it validates the extensive curricular improvements we’ve put in place over the last few years, such as the use of pair programming and the adoption of blended learning techniques.

Enrollment continues to be robust with no break in the trend over the last few years of an average of 18% annual growth—the fastest growing program in Northern Arizona University. This academic year, we had about 400 majors in our Computer Science and Applied Computer Science degree programs. To give you a better sense of the magnitude of our growth, we had 141 majors in 2008—we’ve almost tripled our student body over the last six years! While it is a challenge to continue providing an exceptional learning experience to our students in the face of such numbers, we’re excited to be at the forefront of the Science, Technology, Engineering and Math (STEM) disciplines.

Ongoing hires will certainly be helpful in the context of dramatic and sustained growth in our program: We’re currently hiring for one additional tenure-track professor to begin in the fall, and we’ll also be beginning a search for an additional lecturer next academic year. While our need for additional faculty will remain even after these hires, academia is notoriously slow to respond to the kinds of aggressive growth rates we’re experiencing and we expect to continue staffing the program in the years to come.

We hope you find the updates in this newsletter as interesting as we do, and please never hesitate to reconnect with us during a visit to the area. We’re always delighted to spend time with our friends and alumni.

All the Best,

Dr. John C. Georgas, Associate Chair, NAU Computer Science program and Associate Director of the Informatics and Computing program
By Dr. Maggie Vanderberg

This past October the CS department and CEFNS sent ten students (seven females and three males) and myself to the annual Grace Hopper Conference (GHC), which took place in Phoenix, AZ. Additionally, two of our top females students won scholarships from the Anita Borg Institute to attend the conference. The conference events spanned three days and included everything from keynote speakers, research talks on cyber security, open source development, data science, and cloud computing - to career development and mentoring. There were also evening dance parties sponsored by major companies.

It’s been 15 years since I chose computer science as an undergraduate major, and thus, was introduced to the vast gender gap that exists in the discipline. Throughout this time, I’ve commonly been the only female, or one of very few females in the classroom, on the development team, or in meetings. Then on October 8th 2014, I walked into GHC and realized that I was one of 7,400 women attending. I was introduced to the vast gender gap that exists in the discipline. Throughout this time, I’ve commonly been the only female, or one of very few females in the classroom, on the development team, or in meetings. Then on October 8th 2014, I walked into GHC and realized that I was one of 7,400 women attending.

The students felt the experience was extremely beneficial. Upper class(wo)men were particularly impressed with the career fair and the opportunity to interview with major companies, including Google, Intel, CISCO, Palantir, ThoughtWorks, General Electronics, Allstate, Verizon, and Nationwide, among others. In some cases, these interviews led to job offers – “[This conference] led me ultimately landing an incredible job with Intel in my dream location of Portland” (Sarah Kehoe, senior). Younger class(wo)men were inspired by hearing about the vast array of careers related to the computer science discipline, as well as the success stories they heard from various women of different ages and backgrounds. “The entire Grace Hopper experience left me with a feeling of camaraderie towards other women in technological fields. I love the encouragement and support that everyone offered each other,” (Erin Bailey, senior).

“NAU Computer Science continues to attract women and minorities into our program while there continues to be an industry shortage.”
BlueTooth technology helps NAU CS students build a device to monitor hand washing in hospitals.

Could the key to preventing deaths from hospital infections be in the palm of your hands? A group of Northern Arizona University students think so. New technology developed by computer science and engineering students pairs a smart phone with hand sanitizing dispensers to collect data on hospital staff.

"Hospitals have a problem, there are infections that take place inside the hospital that cost money and can put the life of patients at risk," said Omar Badreddin, assistant professor [in CS] at NAU. Badreddin, who worked inside a neonatal intensive-care unit, observed the procedures used to ensure every staff member and visitor thoroughly washed their hands. Sometimes a nurse was stationed at the entrance at all times. He said it seemed very costly, which got him thinking about ways to find a solution that could also save lives.

"There is strong evidence showing the hands are the main medium of transferring infectious diseases," he said.

He challenged a group of students to apply their studies to help create a low-cost and hands-free device for hospitals to use to track how often staff are cleaning their hands. Other devices do exist that can collect this data, but none can do it without assistance from the user, a flaw that Badreddin said could potentially re-contaminate clean hands.

The project began back in October and by November, Raspberry Pie, as the students’ system is called, arrived.

Duke Ayers, a senior computer science student, explained Raspberry Pie is like a small computer that sits inside hand-sanitizer dispensers and is programmed to transmit collected data to a computer. It has a USB-like plug-in that is configured to pair with a BlueTooth connection on a smart phone. "(Raspberry Pie) will send out a frequency to look for a phone and the phone finds it and then sends out all the information we need," he said. When hospital staff activate hand-sanitizer dispensers, Raspberry Pie will connect with a smart phone in a pocket or purse and then transmit the data collection and analysis. The device costs about $55 and is not limited to hand sanitizer, but can also monitor sinks and soap dispensers.

"I'm hopeful to see it expand," said Michael Albanese, a senior computer science major. "It's in its infant stages right now. It's a rough prototype."

Flagstaff Medical Center will install a second prototype currently being built that will supply real-time data to students that can help improve their invention.

The above article is modified from: http://www.azcentral.com/story/news/12news-nau-hand-sanitizer-device-flagstaff/22190501/

Also please listen to this KNAU interview: http://knau.org/post/brain-food-monitoring-hand-sanitizer-use-hospitals
GSEP has been growing rapidly, with nearly 200 participants across all STEM disciplines this year. Computer Science has been well-represented in the GSEP program from the start, and we currently have 17 CS participants spread fairly evenly across French, German, Spanish, and Japanese language variants... plus one going to China: CS major Andrew Stebenne is headed off to Chongqing (China) this fall, where he will work with one or two Chinese research professors in their large and active CS department. At the same time, CS student Lane Fujikado (who was profiled in the last issue) is finishing up his B.S. Computer Science and B.A. in Modern Languages (Spanish) degrees, having just accepted a job offer with GM following his return from his GSEP year abroad in Alicante, Spain. According to Lane, his GSEP experience was a major factor in receiving the job offer from GM. With strong global preparation, you can bet that NAU-CS grads will be leading global entrepreneurial forays in years to come!

For more information about GSEP, visit the GSEP website (nau.edu/GSEP)…or just shoot me a mail!

BILL GATES WISHES HE’D DONE GSEP

By Dr. Eck Doerry

It’s hard to think of a more global discipline than Computer Science. Not only is computer technology driving globalization of most modern business sectors, but software itself is one of the most global products on the market, often created by commercial or open-source teams distributed across the globe. Several recent articles in the popular press have emphasized the value of language and cultural exposure for global entrepreneurs (http://www.entrepreneur.com/article/244233), with no less than Bill Gates himself commenting on how handicapped he’s felt as a monolingual CS entrepreneur on the world stage (http://money.cnn.com/2015/01/28/technology/bill-gates-regret/). This mirrors a fundamental shift in America’s attitude towards global preparation. Bill Gates, of course, has an excuse: who knew when he was young that the world would become such a global marketplace? Our job is to make sure that current generations of students are better prepared.

As most of you know, the internationalization of Science and Engineering (aka. STEM internationalization) has been a pet project of mine for a long time and, in recent years, has been the focus of my current administrative assignment as the Director of the Global Science and Engineering Program (GSEP). Just to give a brief refresher, GSEP is an ambitious, five-year dual-degree curricular track that comprehensively internationalizes participants’ undergraduate studies: they prepare for three years on campus, integrate their regular STEM studies with intensive language and cultural preparation, then spend their fourth year abroad, including a language-immersed six-month professional internship. After finishing up in the fifth year, students graduate with their STEM B.S., a second B.A. in the language, and of course, a killer resume emphasizing their global training.

GSEP has been growing rapidly, with nearly 200 participants across all STEM disciplines this year. Computer Science has been well-represented in the GSEP program from the start, and we currently have 17 CS participants spread fairly evenly across French, German, Spanish, and Japanese language variants... plus one going to China: CS major Andrew Stebenne is headed off to Chongqing (China) this fall, where he will work with one or two Chinese research professors in their large and active CS department. At the same time, CS student Lane Fujikado (who was profiled in the last issue) is finishing up his B.S. Computer Science and B.A. in Modern Languages (Spanish) degrees, having just accepted a job offer with GM following his return from his GSEP year abroad in Alicante, Spain. According to Lane, his GSEP experience was a major factor in receiving the job offer from GM. With strong global preparation, you can bet that NAU-CS grads will be leading global entrepreneurial forays in years to come!

For more information about GSEP, visit the GSEP website (nau.edu/GSEP)…or just shoot me a mail!

GLOBAL SCIENCE AND ENGINEERING PROGRAM (GSEP)

The Global Science and Engineering Program is an ambitious, innovative dual-degree curricular track that internationalizes your studies in any science or engineering discipline by adding intensive language study, immersion in our community of international scholars, and a variety of other international curricula and activities. Studies in language and culture are integrated with students’ regular studies in their engineering and science majors, following a set of carefully crafted degree progress plans.

After preparing on-campus for three years, GSEP students spend a year abroad, consolidating their language and professional skills with a semester of study at one of our international partner institutions, followed by a professional internship at with one of our corporate or research partners in Europe, Latin America, China, or Japan. With their language studies completed, GSEP students then spend their final year back on-campus, finishing off the Capstone year of their engineering or science degrees.

For more information, contact Dr. Eck Doerry or please visit: https://nau.edu/CIE/Global-Science-Engineering/
NAU sponsors a student chapter of the Association for Computing Machinery, the CS professional society. They have a projects room where research is conducted and informal tutoring takes place.

Visit the NAU ACM web site at: http://acm.cefns.nau.edu/

ACM OF NAU AT “HACK ARIZONA” PROGRAMMING COMPETITION

By David Miller, NAU Student ACM Chapter President

Thank you to all the student workers, faculty, and staff who showed unwavering support in sending us students to Hack Arizona in Tucson March 6-8, 2015! Our group of ACM Members included NAU students in Computer Science, Chemistry, Mechanical Engineering, and also some alumni of NAU who are ACM Members. The NAU CS program sponsored the group.

We encountered many obstacles on our way that tested our patience and persistence. Again and again, we overcame these obstacles with your help. I would like to take a few moments to point of some of the major success your efforts helped achieve.

Students had the opportunity to connect with other programmers and designers and learn about internship and employment opportunities with companies like Raytheon, Amazon, Wolfram, USA, State Farm, and numerous startups. By sending these students to Hack Arizona, you helped them expand their understanding and awareness of internship opportunities and post-graduation job markets which they will soon be entering.

Hacking non-stop from Friday evening to Sunday morning, the students you helped send to Hack Arizona grew closer together in friendship, loyalty, and trust. Pictured in Figure 1 (left to right), Alec and Lisa hack together late one night in the UA Science Engineering Library.

In addition to the invaluable experience to collaborate, connect, and learn, three of our NAU teams received recognition for their projects.

Pictured in Figure 2 (left to right), NAU Junior CS Students Brandon, Dylan, and Conner won 3rd place in Raytheon’s drone hack competition. These students programmed a drone hovercraft to seek and track a human face, maintaining distance and altitude. If the drone loses sight of the target, it enters a search pattern to find new faces to track. For this accomplishment, they each received their own Parrot AR Drones!

Pictured in Figure 3 (left to right), NAU CS Students Tyler, Josh, and Lisa (all enrolled in CS 136) won “Best Beginner Hack” for their project called Easy Speak. They used an SMS service called Twilio to send and receive text messages from cellphone users, who get quizzed on vocabulary in another language. Their application checks for translation accuracy using the Wolfram Alpha knowledge base to score the users of the application. For this accomplishment, they each received their own Raspberry Pi computers!

Pictured in Figure 4 (left to right), UA Student Pierce (EE), NAU Students Brandon (ME), Amanda (CIS), and Keevan (CS) used an Arduino controller, accelerometer, and servo motors to make a robot. They programmed the robot to learn how to walk all by itself by making random movements and mutating the ones which performed best - a genetic algorithm! The prize they won is “Close But No Cigar,” a runner-up prize for a category which already has a prize winner, in this case, “Best Hardware Hack.” For this accomplishment, they each won their own Raspberry Pi computers!

This incredible experience has left us excited for the future of computing and of our educations. We are very grateful for the support we received.

Figure 1

Figure 2

Figure 3

Figure 4
**MOVING BACK TO TEACHING**

By Dr. Dieter Otte

After five years of being the chair of the CS programs, I stepped down from this position last summer. As a consequence, I have what we call a "higher teaching load". This sounds almost like an oxymoron to me, as the truth is, I really love teaching! I get to more and more realize that I have an incredibly beautiful job. For me teaching is much more than just getting the facts across about some area of computer science. I get to touch the lives of many young people! This is both an honor and a great responsibility!

Every now and then I receive a note or an email from a student that, in turn, touches me: "Dr. Otte, you have been so kind and such a pleasure to get to know. Thank you for all your help with ACM and my personal problems." Sometimes, I would receive an email from a student who graduated years ago: "... I don't think I would be where I am today if you hadn't been there for me. For that, I can't thank you enough, and I will be always grateful!"

Many of our students already have internships in reputable companies, which is also a reflection of the quality of the education that we deliver to our students. Here are a few examples that I received from my students. Justin P. told me: "I am currently a junior at NAU and recently accepted an offer for IBM's Extreme Blue internship program this upcoming summer. The process involved a series of four one hour interviews over a period of three months. I felt prepared for each of the interviews and I think... all of my classwork contributed in one way or another to my success during the interview process. ... I am very excited about this tremendous opportunity and feel well prepared to meet the challenge!"

Josh F. wrote: "I am a third year student of computer science at NAU. I recently accepted an internship offer at DirecTV in Los Angeles as a Software Engineer in their Interactive Department. NAU has been very helpful in achieving this. ... I was well prepared to answer the technical interview questions that I was asked. Since there is such a large problem solving influence in our curriculum, I was easily able to answer their questions."

Emily B. told me: "Majoring in computer science has not been easy. It is a challenging discipline, but among the most rewarding opportunities one can take at Northern Arizona University. As a computer science major, taking into account my eclectic academic experience, I have had access to the best faculty on campus... When I graduate I will already have three years of contracted programming experience, and a job offer as a full-time web developer at the USGS, thanks to the skills I have acquired at NAU/CS."

I do love teaching!

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"Education in its general sense is a form of learning in which the knowledge, skills, values, beliefs and habits of a group of people are transferred from one generation to the next through storytelling." (Wikipedia)

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**CONNECT WITH US**

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If you want to support design and research projects, find out how you can sponsor a capstone project.

**Donate**

Whether you are an alumnus, a parent or an employer and support our efforts to prepare computer science professionals to make a difference, donate to our scholarship fund or to the department.

**Alumni: Network with us**

Share your story

What have you been up to since graduation? Inspire us by sharing your success stories. Contact dieter.otte@nau.edu

**Employers and Alumni**

Connect and partner with us through our upcoming NAU and College Career Fairs, scholarships, capstone projects, donations, internships, special speakers or membership on our advisory council.

If you would like to hire some students before they graduate, contribute to our Job Opportunities page.

For more information, please visit:

http://nau.edu/CEFNS/Engineering/Computer-Science/Connect/
OUTSTANDING FACULTY WHO CARE

The Computer Science faculty has varying professional specialties, but all are united by a strong commitment to teaching. Among the special interests of the faculty are Groupware Systems and Intelligent Interfaces (Doerry), Graphics and Computational Geometry (Palmer), Distributed Systems and Web Technologies (Otto), Software Engineering and Robotics (Georgas), UML modeling, programming languages and code generation (Badreldin), Software Assurance and databases (Vanderberg), and introduction to software development and user interfaces (Jacobs).

This academic year, we have also invited some additional instructors to help out --- we appreciate their contributions to our successes: Patrick Kelley, Dr. Ronald McFarland, and Dr. Michael Vanderberg.

Please come see us anytime, make an appointment, ask questions, try our interesting classes, sponsor a project, make a donation, join NAU ACM, tell a friend. There are many ways to get involved. See more about our program at:

http://www.nau.edu/cs

EXPLORING EXPONENTIAL PERSPECTIVE

By Dr. James D. Palmer

Each year graduate students engage in research experiences within the NAU Computer Science program, which often result in exciting papers and research artifacts. One of our graduate students, Michael McCormick, has engaged in a number of studies related to software architecture visualization and core rendering techniques. One of the topics I worked on with Michael was developing a rendering technique I call exponential rendering.

This particular technique owes its origins to computer games I played in the mid 80s and early 90s. At this time three dimensional games as we know them simply didn’t exist. Home computers were often not powerful enough to do the three dimensional geometry manipulations required to flatten three dimensional geometry into two dimensional screen space. One technique used by games of this era was to have artists draw three dimensional objects in two dimensional bitmaps. Dungeon crawlers of the time would often use bitmap images of walls, floors, and ceilings, which artists would resize at different scales to make up the geometry of a dungeon. In the figure above these elements have been repeated three times and scaled by 50% each time to give the illusion of a dungeon hallway disappearing into the darkness.

But any art student can tell you this isn’t how you draw scenes in perspective. Where size in true perspective is inversely proportional to the z axis (moving away from the view plane), this perspective is characterized by an inverse exponential relationship proportional to z.

But where artists in the 80’s and 90’s defined this relationship informally, we have mathematically defined this relationship. By finding a mathematical representation, we can apply this transformation to three dimensional scenes and compare the result to traditionally rendered work. In this first example, we render a jade Buddha in the foreground first in perspective and then in exponential perspective:

But what makes this technique different is moving the Buddha along the z-axis in exponential perspective does not change the projected geometry of the model, while in linear perspective it does. Potential applications include faster rendering, and an expansion of how we understand non-photorealistic rendering.