NC STATE Engineering

CSC NEWS

LETTER FROM THE DEPARTMENT HEAD
GREGG ROTHERMEL

Gregg Rothermel

Dear Alumni and Friends,

Welcome to the Department of Computer Science's 2023 newsletter. There are a number of exciting things happening in our department that we want to share with you.

A major expansion of the department is under way as part of the Engineering North Carolina's Future initiative. Thanks to funding from the North Carolina General Assembly, NC State's College of Engineering will grow its enrollment by 40 percent over the next few years and hire more than 100 new faculty members. So, it's no surprise that we've set a new department record: 2,672 students (including first-year students who intend to major in computer science) are now studying computer science at NC State. Of that student population, 25 percent are women, also a new high for the department.

Much of this growth will take place in our department as the state looks to provide support to North Carolina's booming tech economy. After hiring a record 14 new faculty members during the 2022-23 academic year, we have added 11 more in 2023-24. Meet our newest hires on page 8.

Our College of Engineering is marking its 100th anniversary in 2023 and we are also welcoming a new dean. **Jim Pfaendtner** joined NC State as the Louis Martin-Vega Dean of Engineering on August 1st. He had served most recently as chair of the Department of Chemical Engineering at the University of Washington. Learn more about the new dean on page 16.

You'll read in this issue about a number of new developments within the department on artificial intelligence research, as well as growth in our cybersecurity program. Laura Rodgers is our new director of cybersecurity practice. Her role is to facilitate outreach with government and industry partners to advance cybersecurity education and research initiatives.

Some other departmental achievements that I'd like to highlight (and that you will learn more about in this issue).

- **Thomas Price**, assistant professor, is part of a team called the Adaptive Experimentation Accelerator that won the $500,000 grand prize in the **XPRIZE Digital Learning Challenge**.
- We had another great Day of Giving on March 22, with more than $3.8 million raised for the department, a single-day fundraising record. That total included a $1 million gift from alumnus and departmental hall of fame inductee **Tony Brown** and the **Brown family**.
- **James Lester** has been named as the inaugural **Goodnight Distinguished University Professor in Artificial Intelligence and Machine Learning**. Lester is also director of the National Science Foundation AI Institute for Engaged Learning led by NC State and our Center for Educational Informatics.
- **Munindar P. Singh** has been named as the **SAS Institute Distinguished Professor of Computer Science**.
- Finally, I'm excited to announce that I have been appointed to a second five-year as department chair. I have thoroughly enjoyed my time at NC State and I am looking forward to helping our department reach new heights.

In closing, I'd like to offer my sincere thanks for all that our alumni and corporate partner community do to support NC State Computer Science. Your help helps take us from being a good department of computer science to being a great one, and we couldn't do it without you.

I hope that you will stay in touch with the department and please visit us on Centennial Campus when you are able.

Sincerely,

Gregg Rothermel

Gregg Rothermel
Department Head

Department is part of AI Institute focused on **climate-smart agriculture and forestry**

NC State is one of six universities nationwide to become part of a five-year $20 million grant from the National Science Foundation (NSF) and the U.S. Department of Agriculture's (USDA) National Institute of Food and Agriculture (NIFA) to lead a new National Artificial Intelligence Research Institute. NC State's portion of the grant is $500,000, and lead researcher on the project is computer science Professor Raju Ranga Vatsavai.

Led by the University of Minnesota Twin Cities, researchers at the AI Institute for Climate-Land Interactions, Mitigation, Adaptation, Tradeoffs and Economy (AI-CLIMATE) aim to leverage artificial intelligence (AI) to create more climate-smart practices that will absorb and store carbon while simultaneously boosting the economy in the agriculture and forestry industries.

Using new AI techniques like deep learning and knowledge-guided machine learning, researchers at the AI-CLIMATE institute are improving accuracy and lowering the cost of accounting for carbon and greenhouse gases in farms and forests, ultimately making the process more accessible for more people. The institute will also expand and diversify rural and urban AI workforces.

The goals of AI-CLIMATE directly intersect with what other federal programs are doing to further develop climate-smart agriculture. In 2022, USDA announced that it would be investing $3.1 billion to support farmers, ranchers and private forest landowners through its Partnerships for Climate-Smart Commodities project.

AI-CLIMATE is a collaborative effort bringing together scientists and engineers from across the country, including national experts on artificial intelligence and climate-smart ag and forestry from the University of Minnesota Twin Cities, Cornell University, Colorado State University, Delaware State University, Purdue University and NC State. In addition, the researchers will collaborate with the American Indian Higher Education Consortium and the tribal nations it represents.

The new institute is one of seven new NSF- and NIFA-funded AI Institutes announced recently and is part of a larger federal initiative — totaling nearly half a billion dollars — to bolster collaborative artificial intelligence research across the country. ■

Pop quiz: AI matches human performance at developing good test questions

Researchers have developed an artificial intelligence (AI) model that can generate online course assessment questions that instructors found indistinguishable from questions written by humans.

The new AI is called QUADL, and it does two things: it identifies key terms and ideas in instructional texts, and then crafts questions that focus on those terms and ideas.

"We provide QUADL with the courseware contents and the learning objectives for the curriculum, and QUADL can then develop questions that help students achieve those learning objectives," said Noboru Matsuda, associate professor in the department and co-author of a paper on the work.

"Humans are good at developing courses, but in interviews with instructors and courseware developers, we found that they often struggle to develop questions that are effective at assessing student progress on the learning objectives for those courses," said Machi Shimmei, a computer science Ph.D. student at NC State University and first author of the paper. "Our study suggests QUADL can be a useful tool for instructors and course developers."

To test QUADL's performance, the researchers used existing online courseware called the Open Learning Initiative. The researchers recruited five instructors who use the OLI for their classes and asked them to evaluate a lengthy list of questions. Some of the questions were generated by QUADL; some were generated by the current state-of-the-art question-generating AI model (called Info-HCVAE); and some of the questions were already in use in the OLI courses. Study participants were not told where the questions came from and were asked to assess the pedagogical value of each question.

"The pedagogical value scores given to questions generated by QUADL were essentially identical to the value scores that instructors gave to questions written by people for use in the OLI," Shimmei said. "The questions generated by Info-HCVAE received lower scores from the instructors."

The researchers are now planning undergraduate classroom studies that will ask instructors to use questions generated by QUADL in order to see how, if at all, questions generated by QUADL affect student learning.

"This forthcoming work should close the loop for this technology," Matsuda said. "Hypothetically, QUADL will work. Now we have to see if it actually will work in practice."

QUADL is part of a larger suite of AI technologies that Matsuda and his collaborators are developing called PASTEL. All of the PASTEL technologies are designed to facilitate the development of educational courseware.

"These technologies deal with everything from generating questions — which is QUADL's role — to quality assurance functions used to assess how effective each element of the courseware is at helping students learn," Matsuda said. "We are looking for both research partners to help us develop these generative AI technologies, and for partners who are educators interested in using these AI tools in their courses."

This research was done with support from the National Science Foundation. ■

New AI boosts teamwork training

Researchers have developed a new artificial intelligence (AI) framework that is better than previous technologies at analyzing and categorizing dialogue between individuals, with the goal of improving team training technologies. The framework will enable training technologies to better understand how well individuals are coordinating with one another and working as part of a team.

"There is a great deal of interest in developing AI-powered training technologies that can understand teamwork dynamics and modify their training to foster improved collaboration among team members," said Wookhee Min, co-author of a paper on the work and a research scientist in the department. "However, previous AI architectures have struggled to accurately assess the content of what team members are sharing with each other when they communicate."

"We've developed a new framework that significantly improves the ability of AI to analyze communication between team members," said Jay Pande, first author of the paper and a Ph.D. student in computer science at NC State. "This is a significant step forward for the development of adaptive training technologies that aim to facilitate effective team communication and collaboration."

The new AI framework builds on a powerful deep learning model that was trained on a large, text-based language dataset. This model, called the Text-to-Text Transfer Transformer (T5), was then customized using data collected during squad-level training exercises conducted by the U.S. Army.

"We modified the T5 model to use contextual features of the team — such as the speaker's role — to more accurately analyze team communication," Min said. "That context can be important. For example, something a team leader says may need to be viewed differently than something another team member says."

To test the performance of the new framework, the researchers compared it to two previous AI technologies. Specifically, the researchers tested the ability of all three AI technologies to understand the dialogue within a squad of six soldiers during a training exercise.

The AI framework was tasked with two things: classify what sort of dialogue was taking place, and follow the flow of information within the squad. Classifying the dialogue refers to determining the purpose of what was being said. For example, was someone requesting information, providing information, or issuing a command? Following the flow of information refers to how information was being shared within the team. For example, was information being passed up or down the chain of command?

"We found that the new framework performed substantially better than the previous AI technologies," Pande said.

"One of the things that was particularly promising was that we trained our framework using data from one training mission, but tested the model's performance using data from a different training mission," Min said. "And the boost in performance over the previous AI models was notable — even though we were testing the model in a new set of circumstances."

The researchers also note that they were able to achieve these results using a relatively small version of the T5 model. That's important, because it means that they can get analysis in fractions of a second without a supercomputer.

"One next step for this work includes exploring the extent to which the new framework can be applied to a variety of other training scenarios," Pande said.

"We tested the new framework with training data that was transcribed from audio files into text by humans," Min said. "Another next step will involve integrating the framework with an AI model that transcribes audio data into text, so that we can assess the ability of this technology to analyze team communication data in real time. This will likely involve improving the framework's ability to deal with noises and errors as the AI transcribes audio data."

The paper was co-authored by Jason Saville, a former graduate student at NC State; James Lester, the Goodnight Distinguished University Professor in Artificial Intelligence and Machine Learning at NC State; and Randall Spain of the U.S. Army Combat Capabilities Development Command (DEVCOM) Soldier Center.

This research was sponsored by the U.S. Army DEVCOM, Soldier Center. ■

Department launches undergraduate concentration in artificial intelligence

In fall 2022, the Department of Computer Science (CSC) launched a new artificial intelligence (AI) concentration for undergraduate students majoring in computer science. Sarah Heckman, Alumni Distinguished Undergraduate Professor and director of Undergraduate Programs in CSC, said this concentration will equip students with an understanding of theoretical, conceptual and professional AI practices and enable them to use AI models to solve real-world problems.

"The AI concentration in particular allows us to support the overall goals of the National Artificial Intelligence Initiative," Heckman said. "It also is really cool because the AI concentration allows us to support some of the engineering Grand Challenges, especially in areas of advancing personalized learning, enhancing virtual reality, reverse engineering the brain and engineering the tools of scientific discovery."

Heckman said CSC currently offers three undergraduate concentrations — game development, cybersecurity and artificial intelligence — which enable students to utilize their elective coursework to explore a subject matter of interest.

"For all of our concentrations, students will take 21 hours of focused coursework in those particular areas," Heckman said. "If you look at the base computer science degree, there's 24 hours of elective coursework. The concentrations allow students to take those hours and focus them in an area at depth."

Students in the AI concentration will develop an understanding of how to address real-world problems through AI practices and use data-informed decision making and problem solving. Heckman said this knowledge will provide students with essential skills that are in high demand.

"Apple recently just opened offices in Raleigh specifically for AI, and other corporations are very interested in AI as well," Heckman said. "We're finding that being able to use artificial intelligence models with appropriate curated data sets can provide a lot of value across disciplines."

In recent years, CSC has expanded opportunities for students to pursue areas of interest by creating new concentrations and tracks. While concentrations are intended for students who want to understand a subject extensively, CSC also offers two undergraduate degree tracks, which provide some depth in a subject matter while allowing students to pursue other electives.

The undergraduate track in security, which was established in 2019, comprises nine hours of coursework in computer and network security. The undergraduate track in entrepreneurship empowers students interested in entrepreneurial innovation to pursue 13 hours of coursework related to their focus.

"Concentrations and tracks provide the opportunity for students to focus their advanced coursework at various levels of depth," Heckman said. "The other piece of having these is that they become a really great advising tool as well. We can really carefully understand what it means to have depth at particular levels, and we know the courses that students need to take to complete this, so if a student knows they want to focus, they can really identify the courses they want to do. If you look at our elective list, we have lots of electives, and sometimes it's difficult to choose, because there are so many great ones. This helps people find an area of interest."

Heckman said CSC will continue to establish new undergraduate concentration and track options to provide students with the means to master disciplines of their liking within computer science.

Students do not need to apply for an undergraduate track, but they must apply for an undergraduate concentration on the CSC advising website and must meet the admission requirements. To learn more about the admission requirements for the AI concentration, visit **www.csc.ncsu.edu/academics/undergrad/bs-csc-ai.php**. ■

Adaptive Experimentation Accelerator team wins **XPRIZE Digital Learning Challenge grand prize**

Thomas Price, assistant professor in computer science and director of the HINTS lab at NC State, is part of a team called the Adaptive Experimentation Accelerator that won the $500,000 grand prize in the XPRIZE Digital Learning Challenge.

Launched in 2021, the Digital Learning Challenge is a global competition that incentivized teams to modernize, accelerate and improve technology and processes for evaluating and measuring effective learning and education.

Adaptive Experimentation Accelerator is a collaborative effort between Price from NC State; Joseph Jay Williams, assistant professor in the Computer Science Department at University of Toronto; Norman Bier, director of the Open Learning Initiative (OLI) and executive director of the Simon Initiative at Carnegie Mellon University; and John Stamper, associate professor at the Human-Computer Interaction Institute at Carnegie Mellon University.

Price and the team developed a tool that allows educators to conduct experiments in the classroom to determine which teaching methods are most effective. The team addressed the disadvantages of utilizing a traditional experiment to test the effectiveness of an instructional practice. In a traditional experiment, researchers would apply the teaching strategy to one group, and the other group — the control group — would not experience this strategy throughout the experiment. However, Price said, this experimental structure isn't always ideal in a classroom setting because the control group hasn't received the potential benefits of the instructional method if it proves to be favorable, and his team uses adaptive experimentation to enhance and personalize learning for students.

"What we want to do is get the help to as many students as possible while still learning from the experiment," Price said.

"An adaptive experiment uses various methods, often based on machine learning, to actually move students to different conditions depending on how the experimental study is playing out."

An adaptive experiment is advantageous because it tailors the educational experience of students throughout the duration of the experiment based on evidence, Price said.

"One example is self-explaining — trying to formulate an explanation of why something worked," Price said. "If you're really confident in the subject matter, then an explanation might help you reflect more deeply on what you already know. But if you aren't really sure you've mastered the material in the first place, trying to create that explanation might actually make you feel worse; it might make you feel nervous that you're not able to articulate it, it might make you feel frustrated because you don't actually have an answer.

"In an adaptive experiment, the machine learning model that's assigning students to conditions can also be aware of those contextual factors, and it might pick up on that, especially with larger experiments where we have more data. So, it might start to assign students who don't have as much experience not to self-explain, and students who have more experience to self-explain."

The team employed a software architecture called MOOClet, which supports adaptive experimentation on educational platforms and uses machine learning to develop data-driven solutions for personalized learning. Price said this idea has the long-term potential to help build a learning experience for students that best suits their needs.

"One vision of this is the idea of a continually improving classroom: The course that you are taking today is collecting data that will inform what that course looks like, not just for the next semester, but even in the next lesson," he said. "So if we have tools that allow instructors to adapt their course as the semester progresses based on what they're learning from their students, to gain insights about what is working and what is not, for teachers to feel some freedom to try different things and choose the one that's working best or even assign the one that's working best to different groups depending on their needs, I think that's a vision that is really powerful; it's a vision of personalization that people have been talking about for many years."

The Digital Learning Challenge incentivizes the use of AI methods, big data and machine learning to better understand practices that support educators, parents, policymakers, researchers and the tens of millions of Americans enrolled in formal education every year. Competitors are in pursuit of a deeper understanding of which educational processes are working well and which should be improved to achieve better outcomes. The competition is sponsored by the Institute of Education Sciences, the independent and nonpartisan statistics, research and evaluation arm of the U.S. Department of Education. ∎

Class takes software ideas from development to pitch

Graduate students in the Department of Computer Science are working together to devise innovative software in a project created by **Timothy Menzies**, a professor of computer science.

According to Menzies, the products are a collaborative effort of 250 students in his CSC510: Software Engineering class. Menzies gave students six weeks to produce a software project, and on Oct. 17, students gathered for a "software swap," where they presented 45 group projects that address real-world problems.

Students were challenged to "sell" their software to their peers, and students earned a bonus grade if another student declares they want to "buy" the project. The second half of the project presented a new challenge — after students share their work, they must swap projects with another group and maintain their code.

Menzies said the parameters of the project aligned with core software engineering principles, but were broad enough to allow students to be creative and gain experience in software development.

"Software engineering is creating things someone else is willing to maintain," Menzies said. "That was my principle: 'Can you write software that someone else cares enough about to pick it up and maintain it?' So, I didn't tell the students what technology to use. They're using everything. They're developing in all sorts of ways."

Some students generated solutions to improve the campus experience; one web application, titled FindMyRoomie, aims to connect NC State students with potential roommates based on their preferences. Another group of students presented a trained model capable of detecting floods through social media metadata to improve response time for natural disasters. The extensive array of projects at the software swap generated an inspiring atmosphere, Menzies said.

"There were times when a poster was surrounded by 12 adoring onlookers all saying, 'That's really cool.' I loved it," he said.

The project not only challenged students to create effective software applications but also tested other important career skills. The assignment is shaped around consensus-driven development, which is vital for successful teamwork, and open-source principles such as zero internal boundaries, Menzies said. The presentation aspect required students to share their work in a manner that attracts interest.

"There's an entrepreneurial component," he said. "We all have to be able to condense our ideas into a tiny pitch to communicate the essence of it to other people."

Ultimately, Menzies said, students constructed a product that can demonstrate their knowledge to potential employers.

"At the end of it, they all get something they can put into a repo and show employers," Menzies said. "In 2022, your repo is your resume. What you can show is running code." ∎

11 NEW FACULTY MEMBERS JOIN CSC

The Department of Computer Science (CSC) has welcomed 11 new faculty members this fall.

These new faculty members are part of Engineering North Carolina's Future, a state-funded initiative to expand the College of Engineering over the next few years. The College will hire more than 100 new faculty members and increase its student population by 4,000. Get to know the new faculty members and their research interests.

Top, left to right: Wesley K. G. Assunção, Caio Batista de Melo, Abida Haque, Chin Ho Lee, Sharath Raghvendra, Chandrika Satyavolu, Kimberly Titus, Wujie Wen, Dominik Wermke, Bowen Xu and Chenhan Xu.

Wesley K. G. Assunção
Associate Professor,
Ph.D. (2017),
Federal University of
Paraná

AI and machine learning for software engineering, model-driven software reuse and variability, software modernization, software quality, software testing and collaborative engineering.

Caio Batista de Melo
Assistant Teaching Professor,
Ph.D. (2023),
University of California,
Irvine

Reliable systems, emergent behaviors, computer science education.

Abida Haque
Assistant Teaching Professor,
Ph.D. (2023),
NC State

Cryptography, digital signatures, theory of algorithms.

Chin Ho Lee
Assistant Professor,
Ph.D. (2019),
Northeastern University

Theoretical computer science - computational complexity theory, randomness in computing, analysis of Boolean functions, statistical reconstruction.

Sharath Raghvendra
Starting January 2024
Associate Professor,
Ph.D. (2012),
Duke University

Algorithm design, geometric optimization, optimal transport theory and its applications to machine learning, online algorithms, and topological data analysis.

Chandrika Satyavolu
Associate Teaching Professor,
Ph.D. (2014),
University of Oklahoma,
Norman

Active learning techniques to improve student engagement, summer intervention programs to support student preparedness for college, wireless and mobile networks.

Kimberly Titus
Associate Teaching Professor,
Ph.D. (1994),
NC State

Computer science and data science education, developing tools and tutorials to improve programming instruction and undergraduate performance, data literacy, effective uses of chatbots in education.

Wujie Wen
Associate Professor,
Ph.D. (2015),
University of Pittsburgh

Software-hardware co-design for efficient domain-specific computing, design automation and hardware acceleration, trustworthy and privacy-preserving AI computing, machine learning, cyber-physical systems (autonomous driving and medical).

Dominik Wermke
Assistant Professor,
Ph.D. (2023),
Leibniz University
Hannover, Germany

Usable security, supporting software experts, the software supply chain, and the open source ecosystem. Designing secure and user-friendly systems, developing tools to assist software professionals, enhancing transparency and trust in the software supply chain, and improving collaboration and security in open source communities.

Bowen Xu
Assistant Professor,
Ph.D. (2012),
Singapore
Management
University

Large language model of code, AI security for SE, software text analytics, bug and vulnerability analysis.

Chenhan Xu
Assistant Professor,
Ph.D. (2023),
University at Buffalo,
the State University of
New York

Mobile computing/sensing system and machine learning for human-computer interaction and mobile health/cyber-physical system security. ■

Annual Day of Giving is **a day to remember**

NC State's 5th annual Day of Giving on March 22, 2023, is sure to go down in department lore as a "day to remember," as the Department of Computer Science (CSC) set an all-time single-day giving record with gifts and pledges totaling $3,825,805.

Thanks to a very generous challenge pledge by NC State engineering alumnus and former Strategic Advisory Board member David Whitley and his wife, Karen, $10,000 was unlocked around 5 p.m. when the department received its 50th individual gift. At the end of the day, the department had received 73 individual cash donations totaling $25,805.

In addition to the traditional online cash donations, two alumni decided to leverage the day to make major transformative gift announcements.

CSC alumnus and Hall of Fame inductee Tony McLean Brown and the Brown family have made a $1 million pledge to the department to create a named distinguished professorship, a named graduate fellowship and a named undergraduate scholarship. While more details about this gift will be released in the coming months, the funding is expected to be in place for all three new endowments sometime in 2024.

Finally, CSC alum and Hall of Fame inductee Keith Collins and his wife, Margie, have announced a $2.8 million increase of their estate gift plan that was already in place with the department. The additional funding will target the creation of a $2.5 million named endowed department chair and will increase the funding for a $1 million planned distinguished professorship already in place. More details will be released in the coming months.

The faculty and staff members and students would like to thank everyone who contributed during NC State's 2023 Day of Giving. And we especially want to thank the Collins and Brown families for making this a day we will never forget. ■

SAVE THE DATE

🐺 **NC STATE**
DAY OF GIVING
03.20.24
Thank you for supporting CSC

Top, David and Karen Whitley; Middle, Tony McLean Brown; Bottom, Keith and Margie Collins.

Researchers show how **network pruning** can skew deep learning models

Computer science researchers have demonstrated that a widely used technique called neural network pruning can adversely affect the performance of deep learning models, detailed what causes these performance problems and demonstrated a technique for addressing the challenge.

Deep learning is a type of artificial intelligence that can be used to classify things, such as images, text or sound. For example, it can be used to identify individuals based on facial images. However, deep learning models often require a lot of computing resources to operate. This poses challenges when a deep learning model is put into practice for some applications.

To address these challenges, some systems engage in "neural network pruning." This effectively makes the deep learning model more compact and, therefore, able to operate while using fewer computing resources.

"However, our research shows that this network pruning can impair the ability of deep learning models to identify some groups," said Jung-Eun Kim, co-author of a paper on the work and an assistant professor in the Department of Computer Science.

"For example, if a security system uses deep learning to scan people's faces in order to determine whether they have access to a building, the deep learning model would have to be made compact so that it can operate efficiently. This may work fine most of the time, but the network pruning could also affect the deep learning model's ability to identify some faces."

In their new paper, the researchers lay out why network pruning can adversely affect the performance of the model at identifying certain groups — which the literature calls "minority groups" — and demonstrate a new technique for addressing these challenges.

Two factors explain how network pruning can impair the performance of deep learning models.

In technical terms, these two factors are: disparity in gradient norms across groups; and disparity in Hessian norms associated with inaccuracies of a group's data. In practical terms, this means that deep learning models can become less accurate in recognizing specific categories of images, sounds or text. Specifically, the network pruning can amplify accuracy deficiencies that already existed in the model.

For example, if a deep learning model is trained to recognize faces using a data set that includes the faces of 100 white people and 60 Asian people, it might be more accurate at recognizing white faces, but could still achieve adequate performance for recognizing Asian faces. After network pruning, the model is more likely to be unable to recognize some Asian faces.

"The deficiency may not have been noticeable in the original model, but because it's amplified by the network pruning, the deficiency may become noticeable," Kim said.

"To mitigate this problem, we've demonstrated an approach that uses mathematical techniques to equalize the groups that the deep learning model is using to categorize data samples," Kim said. "In other words, we are using algorithms to address the gap in accuracy across groups."

In testing, the researchers demonstrated that using their mitigation technique improved the fairness of a deep learning model that had undergone network pruning, essentially returning it to pre-pruning levels of accuracy.

"I think the most important aspect of this work is that we now have a more thorough understanding of exactly how network pruning can influence the performance of deep learning models to identify minority groups, both theoretically and empirically," Kim said. "We're also open to working with partners to identify unknown or overlooked impacts of model reduction techniques, particularly in real-world applications for deep learning models."

First author of the paper is Cuong Tran of Syracuse University. The paper was co-authored by Ferdinando Fioretto of Syracuse, and by Rakshit Naidu of Carnegie Mellon University.

The work was done with support from the National Science Foundation, as well as a Google Research Scholar Award and an Amazon Research Award. ■
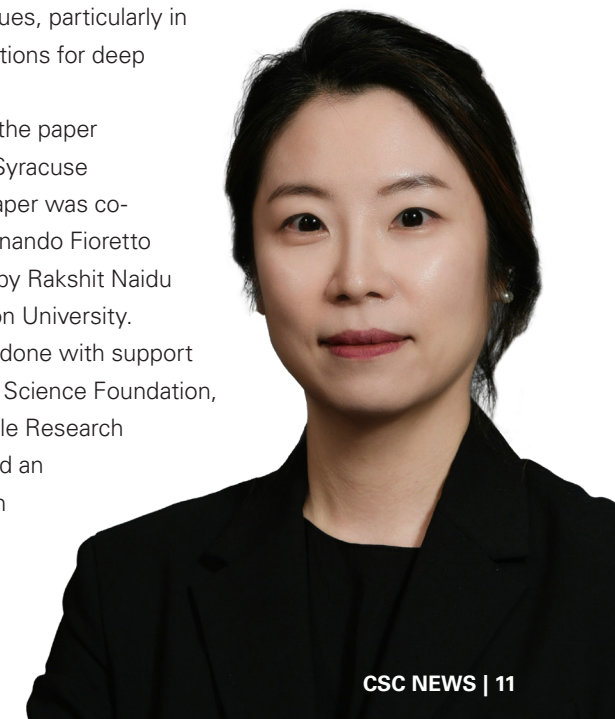
Researchers identify **fitness app loophole**

Despite attempts to anonymize user data, the fitness app Strava allows anyone to find personal information — including home addresses — about some users. The finding, which is detailed in a new study, raises significant privacy concerns.

"Strava users expect their personal information to be protected, and our work shows that this is not always the case," said Anupam Das, senior author of a paper on the work and an assistant professor of computer science. "This could be particularly problematic for users who are concerned about stalkers or have other reasons to desire that their location data be kept from the public."

Strava is a mobile fitness-tracking app that allows users to track their exercise activities, but also includes features designed to help users connect with each other. These features can be used to organize clubs around shared interests, such as hiking or cycling. For example, the app includes a "heatmap" feature that aggregates user data. While all of the user data is anonymized, the heatmap feature allows users to see how many other Strava users go hiking, running or cycling in a given area.

"Strava stresses that the heatmap feature uses only aggregate data, which should make it impossible for anyone to capture private information about any specific user," Das said. "However, we found a loophole."

Specifically, the researchers found it is possible for anyone to look up all of the Strava users in a given area. It is also possible for users to look at the aggregate data on a heatmap and see where each of the anonymous users' routes begin and end.

"In a densely populated area, with lots of routes and lots of users, there is so much data that it would be extremely difficult to track any specific person," Das said. "However, in areas where there are few users and/or few routes, it becomes a simple process of elimination — particularly if the person someone is looking for is a highly active Strava user. Even users who have marked their accounts as private show up when anyone searches for a list of all the users in a given municipality, so marking an account private doesn't necessarily provide additional protection against this tracking technique."

"We did reach out to Strava about this, and the company has said that it does not share heatmap data unless several users are active in a given area," said Kevin Childs, first author of the paper and a former undergraduate at NC State. "However, we were still able to identify the home addresses of some users in certain areas using the heatmap, and confirmed those identifications using voter registration data."

However, there is something that users can do to protect their privacy.

"Users can go into their Strava account settings and opt out of contributing data to the 'aggregated data usage' feature, which would remove their routes from the heatmap altogether," Das said.

The paper was co-authored by Daniel Nolting, an undergraduate student at NC State. ∎

Black student **group** partners with Google
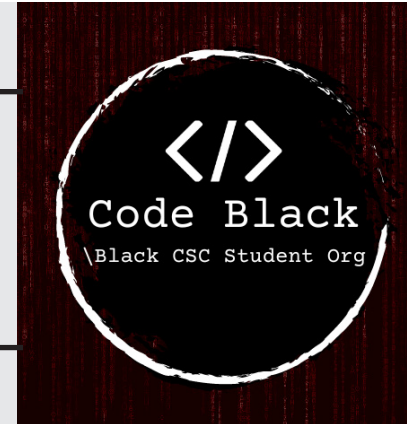
Code Black, a student organization for Black students in the department, partnered with the Black Googlers Network at Google to hold Code Black-a-thon, a hack-a-thon in honor of Black History Month. Students in attendance had the opportunity to network with Google employees and hear from speakers about subjects such as user interface (UI) and user experience (UX).

Students were tasked with creating a program focused on serving the community. The first-place team, composed of Sharonda Daniels, David Ezeude, Ifeoluwa Aderemi, Alphonzo Dixon III and Jaela Simms, created an app called BallotBox, which aims to simplify the process of researching political candidates. The first-place team was rewarded with a $500 prize.

Code Black was established at the end of the fall 2022 semester and Tim MacNeil, the staff sponsor for the group and an undergraduate lab coordinator in CSC, said Code Black-a-thon allowed Code Black to facilitate connections to help the organization grow.

"We actually had some people come up from NC Central and from Chapel Hill and they participated, which was cool," MacNeil said. "What was really cool is that one of the people from Chapel Hill actually got us in contact with their equivalent group from Chapel Hill, which is a group called Black in Technology, and we're hoping in the future to collaborate with them for more events. So, it's the start of a really good relationship between colleges."

Joshua Samuel-Ojo, a software engineer at Google, said Google employees enjoyed talking with students in attendance.

"The volunteers had a good time," Samuel-Ojo said. "I know the individuals who presented about UI/UX were able to connect with some of the students afterwards, so that's a win in our book. We're excited for more campus outreach-related activities."

Samuel-Ojo said events that promote networking between students and individuals in computer science can provide guidance for students when developing their career.

"I think a lot of times with computer science, there's a lot of different paths to get to where you need to go or where you want to go, and you might not be aware of that," Samuel-Ojo said. "So, at different opportunities to network like this hack-a-thon, we're able to interact with students and talk about our experiences, talk about our day-to-day, in hopes that somebody finds the answer that they're looking for, or at least becomes aware of a potential opportunity that they could then use."

Alexandra Jones, a sophomore in computer science and president of Code Black, said she is excited about the great potential for Code Black.

"We're really passionate about the longevity of this club," Jones said. "I'm only a sophomore now, but I really hope that once I've graduated and gone, this is something that can still be here, and it'll have an even bigger audience than it does now. I'm really excited to help bring this community together."

MacNeil said he was encouraged by the success of Code Black-a-thon and hopes to organize more events with Code Black in the future.

"One thing I'm happy about is the amount of engagement we had from Code Black and from the students who were there, which was really exciting," MacNeil said. "I think even though this was our first time and the first time is always rough, it's only going to get better. And it's going to be a yearly part of NC State computer science moving forward, which I think is awesome." ∎

DIRECTOR OF CYBERSECURITY PRACTICE joins department

Laura Rodgers has joined NC State as the director of cybersecurity practice in the Department of Computer Science (CSC), where she will facilitate outreach with government and industry partners to advance cybersecurity education and research initiatives.

This position is housed within the Secure Computing Institute (SCI), which was created in 2019 to position NC State University as a national leader in cybersecurity research and education. The SCI is a crucial player in the fight to address cyber-attacks that pose a threat to national security, Rodgers said.

The SCI is also home to the North Carolina Partnership for Cybersecurity Excellence (NC-PaCE), a coalition of eight of North Carolina's universities and community colleges, government organizations, and businesses dedicated to promoting economic growth in North Carolina through cybersecurity research and building a strong workforce of cybersecurity expertise in the state. In 2021, NC-PaCE received a $2 million grant from the National Centers of Academic Excellence in Cybersecurity within the National Security Agency.

"The overarching goal for everyone should be to keep our sensitive data out of the hands of our adversaries," Rodgers said. "But that is very complex and difficult to do, because we're dealing with humans, and we all make mistakes. We don't all understand our adversaries, we don't understand the threats and we don't understand our vulnerabilities. In order to solve those problems, we all have to work together."

Rodgers aims to build an ecosystem of outreach, research and education; she will work closely with government organizations and industry stakeholders to ascertain pressing cybersecurity challenges, which will guide research strategy within the SCI. Additionally, Rodgers said, this understanding will drive education within CSC to equip students with advanced cybersecurity knowledge and produce exceptional computer scientists for the workforce.

Laura Rodgers

As director of cybersecurity practice, Rodgers will also work to enhance cybersecurity opportunities for students. Rodgers said she is excited to help prepare CSC students to excel in the workforce and fill the cybersecurity job gap. According to CyberSeek, a project sponsored by the National Institute of Standards and Technology, currently there are over 700,000 cybersecurity job openings in the United States, and cybersecurity job demand in North Carolina is above the national average.

Rodgers holds a bachelor's degree and a master's degree from Oklahoma State University. She has more than 20 years of experience in the defense industry, where she was responsible for compliance and quality management systems. As a defense contractor, Rodgers said she witnessed a critical need for cybersecurity research and education to protect against a vast array of threats to national security.

"I'm very passionate about this because I am committed to national security, and I think that comes from my background being a defense contractor," Rodgers said. "I'm committed to us winning this cyber-war."

In recent years, CSC has expanded its endeavors to meet the growing demands of the cybersecurity industry and establish the department as a leader in cybersecurity research and education. The SCI plays a key role in this venture — led by Laurie Williams, Distinguished Professor, and William Enck, professor — the SCI performs essential cybersecurity research in several research labs, including the NC State's Science of Security Lablet, an initiative of the National Security Agency. This multidisciplinary lablet works to advance security and privacy research and has brought $19 million in research funding to NC State since it was established in 2012.

Throughout CSC, individuals are conducting valuable and impactful research that is recognized at a national level. In the 2021-2022 fiscal year, CSC received a record $19.5 million in new awards for research.

In addition to research, CSC is delivering a wealth of educational opportunities for students. In 2021, CSC began offering an undergraduate concentration in cybersecurity, and in fall 2022, the department launched an undergraduate concentration in artificial intelligence. In 2017, CSC created a master's track in security, and an undergraduate track in security in 2019. The department plans to offer more concentrations and tracks in the future to enrich the learning experience for CSC students.

Rodgers said she looks forward to contributing to NC State's outstanding research and education and working to prepare CSC students to defend cyberspace.

"I'm thrilled to be here and to be part of the solution," Rodgers said. ∎

CSC students BY THE NUMBERS

A record of **2,672** students (including FR CSC Intents) are currently studying computer science at NC State!

WOMEN IN COMPUTER SCIENCE

25 PERCENT (668) of the students studying computer science at NC State are women — **A NEW RECORD** for CSC.

DEGREES AWARDED 2022-23

292 B.S. DEGREES　　**384** M.S. DEGREES　　**30** Ph.D. DEGREES

ENROLLMENT DIVERSITY

CSC Undergrad Students

	White	Asian-Am	Hispanic	Black	Other
	829	484	120	95	257

CSC Graduate Students

	Intl	White	Asian-Am	Hispanic	Black	Other
	643	140	64	11	18	11
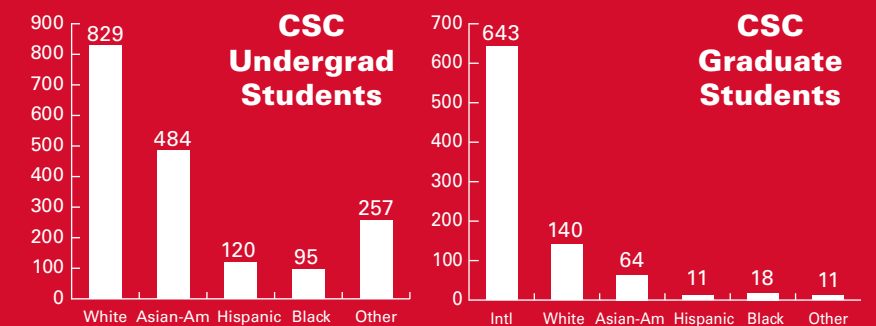
SALARY AND PLACEMENT DATA

B.S. CSC — **$87,500**　　　M.S. CSC — **$120,000**

59 PERCENT of bachelor's degree graduates reported having accepted a full-time position at the time of graduation.

23 PERCENT of bachelor's degree graduates reported plans to pursue a graduate degree.

Pfaendtner joins NC State as **dean of engineering**

Four inducted into the **2022 CSC ALUMNI HALL OF FAME**

Jim Pfaendtner joined NC State as the Louis Martin-Vega Dean of Engineering on Aug. 1, 2023.

Pfaendtner is the 10th permanent dean to lead the College of Engineering, which marks its 100th anniversary in 2023. He succeeds Martin-Vega, who stepped down from the dean's position after 17 years to return to the College of Engineering faculty.

Pfaendtner joined NC State from the University of Washington (UW), where he served as the Connie and Steve Rogel Endowed Professor and chair of the Department of Chemical Engineering.

As chair, he led departmental scholarly and educational activities, including the implementation of a broad strategic initiative in infusing research and teaching with machine learning, AI and data science; expanding and strengthening the visibility and role of the department's diversity, equity and inclusion committee; expanding the department's philanthropic work; raising more than $10 million in major gifts including five new graduate fellowships; and elevating the UW College of Engineering's efforts in faculty affairs and postdoctoral development.

He also held appointments at UW as professor of chemistry, associate vice provost for research computing and senior data science fellow at the university's eScience Institute, and at the Pacific Northwest National Laboratory as a senior scientist.

Pfaendtner serves on the Northwestern University Chemical and Biological Engineering External Advisory Board and is senior editor for the *Journal of Physical Chemistry*. In 2022, he became a member of the Washington State Academy of Sciences

and received the American Institute of Chemical Engineers Computational Molecular Science and Engineering Forum Impact Award. Other awards and honors he has received include the University of Washington College of Engineering Faculty Junior Innovator Award, the University of Washington Presidential Distinguished Teaching Award, the American Chemical Society OpenEye Outstanding Junior Faculty Award, a National Science Foundation Faculty Early Career Development Award, and he was named a U.S. National Academy of Science Kavli Fellow.

Pfaendtner's research has focused on using computer simulations to understand and control molecular scale driving forces for a wide range of applications spanning biotechnology to advanced materials. His lab at UW helped develop new methods to expand the capabilities of molecular simulation and use advanced research computing resources to solve challenging problems in the area of computational molecular science.

Pfaendtner holds a B.S. in chemical engineering from the Georgia Institute of Technology and a Ph.D. in chemical engineering from Northwestern University. He completed a National Science Foundation international postdoctoral fellowship with a focus on "multiscale modeling of conformational change in macromolecular assemblies."

"NC State's College of Engineering provides the nation's best undergraduate and graduate engineering experience," Pfaendtner said. "I am honored to lead the college as it continues to expand and set the bar for engineering in higher education, and I look forward to working with all the college's faculty, staff and students to keep the college's momentum going strong." ∎

Top, left to right: CJ Saretto, Kathy Markham and Tony Brown (not pictured Alagu Periyannan).

Bottom, left to right: Amir Bahmani and Anup Kalia.

The NC State Computer Science Alumni Hall of Fame officially inducted four new members during a special ceremony held at the Park Alumni Center on the evening of Thursday, November 10, 2022. More than 60 faculty and staff members, award winners, their families and special guests were in attendance.

A photo gallery with pictures from the special event can be found at **bit.ly/3NoXPUs**.

The CSC Alumni Hall of Fame was established in 2017 to celebrate and recognize the exemplary contributions our outstanding graduates have made to their profession, their community and to the world at large. With more than 11,000 CSC alumni, only a select number will be chosen for recognition in our Alumni Hall of Fame, making this a truly exceptional and noteworthy honor.

This class of inductees brings the total number of alumni honored in the Hall of Fame to 56.

Honorees are presented a specially designed award to take home and they will be featured on a permanent display wall on the third floor of Engineering Building II, near the department's main office. The Hall of Fame wall features an interactive component that is also accessible online (**ncsucsc.touchpros.com**).

The 2022 inductees into the NC State Computer Science Alumni Hall of Fame are:

- **Tony Brown** (B.S. '83)
  Principal partner and director of strategic investments at Public Consulting Group, Inc.
- **Kathy Markham** (B.S. '80)
  Retired healthcare IT executive
- **Alagu Periyannan** (M.S. '92)
  Co-founder and CTO of BlueJeans by Verizon
- **CJ Saretto** (B.S. '00, M.S. '01)
  Senior vice president of research and development at Axiom

In addition, the department recognized two Rising Stars, a special achievement award for outstanding computer science alumni within 10 years of their graduation:

- **Amir Bahmani** (M.S. '16, Ph.D. '17)
  Director of Stanford University's Deep Data Research Computing Center
- **Anup Kalia** (M.S. '13, Ph.D. '16)
  Senior research scientist at Dataminr

CSC Department Head **Gregg Rothermel** extended his congratulations to the group during the ceremony, saying, "To all of our inductees and honorees — congratulations are in order — you are indeed a very select group. Our Alumni Hall of Fame was established to celebrate and recognize the exemplary

> "These individuals not only care about the world, they have found a way to use their passion and their talents to make this a better world for all of us."
>
> **KEN TATE**

contributions our outstanding graduates have made to their profession, their community and to the world at large. As Hall of Fame honorees, we hope that you will serve as an inspiration for current and future students, while promoting the department's global impact for producing incredible talent that embodies the University's mantra to Think and Do the Extraordinary."

Ken Tate, director of engagement and external relations, said, "Collectively, this group has made its mark in the public and private sectors. They have launched start-ups creating jobs and economic prosperity, they've innovated and automated and they have dozens of patents to prove it, they've pioneered technologies we take for granted today, they've created iconic games, movies and books that entertain us, they've been recognized with countless awards and accolades including an Emmy, they've shared their wealth and wisdom to help others and they are working on advanced technologies that might literally save your life one day. These individuals not only care about the world, they have found a way to use their passion and their talents to make this a better world for all of us."

Tate added during the ceremony, "Over the years, I have come to know so many of our honorees, but one of the most pleasant surprises about the entire process has been the emergence of alums I had not previously met."

To nominate someone for future consideration, please visit **www.csc.ncsu.edu/alumni/hall-of-fame.php**. ∎

Ten new members named to **Strategic Advisory Board**

The department is pleased to welcome 10 new members to its Strategic Advisory Board (SAB):

- **Joe Aguayo**: Senior vice president, threat hunting and critical infrastructure protection at Truist
- **Matt Hambrick***: Senior director of ONTAP core software at NetApp
- **Chuck Kesler***: Chief information security officer at Pendo
- **Brian Onorio***: Serial entrepreneur, advisor at Yachtly
- **Michelle Peck***: Director, enterprise architecture at Blue Cross Blue Shield of NC
- **Alagu Periyannan***: Co-founder and chief technology officer of BlueJeans by Verizon
- **Andrew Phillips**: Senior director of engineering at Citrix
- **Andrew Porter**: Executive director, enterprise technology architecture at Merck
- **Jerry Tillman***: Vice president, IBM Cloud Platform Services at IBM
- **Erkang Zheng***: Founder and CEO of JupiterOne
* NC State alumni

The Strategic Advisory Board (SAB) is a distinguished group of leaders who collectively play a critical role in shaping the department's vision and strategic focus. The group provides real-world insight, direction and guidance, and as such is central to the department's strategic planning process. The role of the SAB is frequently cited as a significant departmental strength during accreditation reviews.

Launched more than two decades ago as the Industrial Advisory Council (IAC) by former department head **Alan Tharp**, the board has evolved over the years to include term limits and an expansion of focus beyond industry representation. In the early 2000s, the IAC was renamed the Strategic Advisory Board (SAB), reflecting a desire to expand representation to include industry, government and academic leaders.

Over the last two decades, the SAB has been instrumental in helping the department formulate strategies and plans to launch new academic tracks and concentrations, inject essential soft skills into the curriculum (leadership, communication and collaborative skills), and develop communication and marketing strategies to help shape external perspectives. The SAB has

also proactively supported the department's diversity initiatives, with individual members collectively launching the Diversity in Computer Science Endowment, which gives a substantial scholarship each year to one or more underrepresented students studying computer science at NC State. The endowment carries a current value of over $167,000 with a goal of growing to over $250,000.

The SAB meets annually on campus and acts as a virtual working team through member involvement on subcommittees, executive panels, search committees and other engagement opportunities. Each term with the SAB group is three years in length and membership may be renewed for a second term.

Gregg Rothermel, professor and computer science department head, expressed his gratitude to the new members. "With the support of the state's Engineering North Carolina's Future initiative, we are positioned to grow substantially over the next few years. We find ourselves facing strategic decisions that will impact the department for decades to come," he said. "We depend greatly on our SAB to provide us guidance and direction that will help us align our strategic plans with real-world needs and ensure that we can continue to play a significant role in providing the talent and research that fuels the economy of North Carolina and beyond."

Ken Tate, director of engagement and external relations, who helps coordinate the SAB's activities, said, "This is the largest group of new members we've ever had, and arguably one of the most seasoned and diverse, too. These new additions to the board bring with them tremendous experience and wisdom that will benefit us greatly as we shape the future of this department."

The SAB is currently chaired by **Kimberly Calhoun**, founder and CEO of Guardianator and senior executive producer of MoneyMasters.TV. ∎

Department mourns loss of graduate student **Naomi Rose Patrick**

Graduate student Naomi Rose Patrick passed away in October 2022 after a long and valiant battle with cancer, just weeks away from completing her M.S. degree in computer science at NC State.

On Friday, January 20, 2023, Patrick's family, friends, co-workers and instructors gathered on Centennial Campus for a special event celebrating the professional and academic accomplishments of this vibrant, energetic and spirited young woman. During the event, the Department of Computer Science posthumously awarded Patrick with the Master of Computer Science degree, and her colleagues highlighted her professional accomplishments and made special presentations to her family.

A highly honored computer scientist who had worked for the Federal Bureau of Investigation (FBI) for many years, Patrick is remembered as a dedicated and accomplished computer scientist. Throughout her professional career, she worked tirelessly to combat cyber-crime, while also focusing more recently on earning her graduate degree.

In her role at the FBI, Patrick was responsible for analyzing sophisticated malware created by international adversaries. She drafted malware analysis reports that were published by the FBI, Department of Homeland Security and other partners to ensure companies could defend against harmful malware. Not only did these efforts help protect the information and privacy of U.S. institutions, they also helped bring nation-state adversaries to justice for their harmful actions against the United States.

Patrick and her colleagues were invited to present at the Malware Technical Exchange Meeting (MTEM) at MIT, an annual event that attracts experts in government and academia, to discuss sophisticated foreign malware. Patrick and her partner's presentation was voted Best Presentation at MTEM by their peers.

In 2021, Patrick was an instrumental member of the FBI team that disrupted one of the most prolific pieces of malware ever observed. Due to her contributions to this operation, in July 2022, she was awarded the U.S. Department of Justice's highest award, the Attorney General's David Margolis Award. She was personally recognized by FBI Director Christopher Wray and Attorney General Merrick Garland.

Patrick was the first female member of the FBI's Computer Scientist Advisory Committee, and her leadership and guidance helped implement lasting, positive changes for computer scientists in FBI field offices nationwide.

FBI Supervisory Special Agent Jessica Nye recalled how Patrick skillfully hand-built a 3D printer for her FBI squad, and would consistently offer her help to others who wanted to use it. Special Agent Nye also spoke about Patrick's strength and character at the event, and how she remained driven throughout her battle with cancer.

"What always amazed us about Naomi was her sheer determination to continue working her caseload even while she was receiving treatments," Nye said. "She never asked for or wanted special treatment from us. Throughout all of her treatments, she somehow managed to power through and deliver absolutely incredible results. These results would not have been achieved without her excellent work and determination. We often wonder what our bad guys would say if they knew their evil plans were dismantled by a sweet, cheerful, and very colorful woman from the upper Midwest."

The Department of Computer Science is honored to recognize Naomi Rose Patrick as a shining example of the impact that a single individual can make when you pair a computer science degree with a passion to make a real difference in the world. Those within the department who had a chance to meet and nurture Patrick along her academic journey were indeed privileged for that experience, as she enriched and inspired us all. ∎

Wyatt honored as **a Distinguished Engineering Alumnus**

Mark D. Wyatt, an alumnus of the department, was one of three alumni honored by NC State's College of Engineering with the Distinguished Engineering Alumni (DEA) award for 2022. The three were honored during a dinner and ceremony on campus on Wednesday, Nov. 2, 2022, as part of Red and White Week.

The award was established by the faculty of the College in 1966 to honor engineering graduates who have been recognized for outstanding achievements in planning and direction of engineering work; fostering professional development of young engineers; contributing to knowledge in the field of engineering; or bringing, in other ways, distinction to the University through engineering achievement.

Wyatt received a B.S. degree in computer science from North Carolina State University in 1980. He retired from Duke Energy in 2013 with 34 years of senior management and utility experience. Prior to his retirement from Duke Energy, Wyatt served as vice president of grid modernization, where he was the lead executive for the company's grid modernization function, which was responsible for delivering enhanced operational efficiencies for the company's transmission and distribution system, as well as providing a platform for growing the company's revenue through leveraging grid modernization investments to provide value-added products and services to the company's retail customer base.

Wyatt started with Duke in 1980 in the information management department. He moved to the distribution department several years later, where he was responsible for the deployment of common business processes and supporting technology that enhanced the effectiveness of engineering, construction and operations functions within the department. Following this assignment, he experienced a series of promotions within the company through assignments in the retail customer services, transmission, distribution, generation, unregulated business operations and information technology areas.

Wyatt has been a member of numerous boards throughout his career. His NC State board service includes the Computer Science Strategic Advisory Board and the NC State Engineering Foundation Board of Directors.

Nominations for this prestigious award come from members of the engineering faculty, and a vote by faculty representatives determines the recipients of the award.

Quint M. Barefoot and Dan M. Pleasant were the other two DEA recipients for 2022. Barefoot received a B.S. in chemical engineering from NC State in 1985 and completed his MBA at the Fuqua School of Business at Duke University in 1996. His career is highlighted by leading successful entrepreneurial entities from the start-up phase to the ultimate sale and integration into publicly traded firms. Pleasant earned B.S. and M.S. degrees in civil engineering in 1973 and 1974, respectively, from NC State. Pleasant has spent more than 50 years in the consulting engineering profession. ∎

Mark D. Wyatt and Louis Martin-Vega

Whitehornes establish **entrepreneurship scholarship in computer science**

The department is proud to announce that CSC alumni **Ed** and **Deborah Whitehorne** have made lead gifts totaling over $75,000 to establish the Whitehorne Family Entrepreneurship Scholarship in Computer Science, along with a pledge to grow the endowment to $250,000, which will provide a "full-ride" tuition scholarship for an in state undergraduate student in the future. The couple has also donated $10,000 in cash, so that awards can be made to current students as the endowment matures.

This endowment will provide scholarships for students pursuing an undergraduate degree in computer science who are affiliated with the CSC Undergraduate Entrepreneurship Track. Preference will be given to students who have demonstrated a combined interest in entrepreneurship and the field of computer science and who are from the first generation in their family to attend college.

Ed and Deborah Whitehorne are proud of their deep connections to NC State. The couple met in the Department of Computer Science and graduated in 1972 as members of one of the University's earliest graduating classes in computer science. They married in June of 1972.

"Both of our kids went to NC State; my son Charles got his bachelor of mechanical engineering in 2004, and my daughter Elizabeth got her degree in business management in 2007," Ed Whitehorne said. "We have 12 immediate family members who have graduated from NC State, so I would say we are pretty much an NC State family and have been since 1968."

After graduation, Deborah worked as a computer programmer in Duke University Hospital's Obstetrics and Neurology departments and at the Research Triangle Institute. She retired in 1986 to run the family's Trakehner horse farm and have quality time with their children.

In 1973, Ed earned his master's degree in computer science at Duke University. He returned to NC State to pursue a Ph.D. in operations research.

Between 1979 and the early 1990s, Ed worked for what is now known as FHI 360, where he co-founded Clinical Research International, the first full-service multinational contract research organization (CRO). He later joined the boards of FHI 360 and the FHI Foundation, and he served as the vice chairman and chief of mergers and acquisitions at Novella Clinical. He led Novella's sale in 2013 and retired as chair of FHI 360 in 2018.

In acknowledgement of Ed's work with technology start-ups, he was recognized as an NC State Computer Science Alumni Achiever in 2002. In 2017, Ed was inducted into the inaugural class of NC State's Computer Science Alumni Hall of Fame.

The Whitehornes feel that much of their success is due to their education at NC State. Ed said he considers himself a serial entrepreneur, and he hopes to equip future computer science students to pursue entrepreneurship as well.

"I think the thing that I learned at NC State Computer Science was how to think," Ed Whitehorne said. "I think that has served me well. Most of what I've done has been in drug development, and I was able to get involved in that because I was able to understand the data and the programming side of what was necessary to run clinical trials. I got that in my undergraduate program at NC State."

With a long-range plan to grow the endowment to a level that will provide a full-ride scholarship award annually, the Whitehornes plan to provide supplemental support each year to allow partial scholarships to be awarded as the endowment grows.

The couple looks forward to making a difference for future computer science students.

"We're doing what we can with what we have, and we hope that this will encourage others that have graduated within the last 50 years in the Department of Computer Science to think about doing something similar," Ed Whitehorne said.

To learn more about how you can impact the Department of Computer Science and create a legacy for you and your family, please contact **Sara Seltzer**, **skseltze@ncsu.edu** or **919.515.3730**. ∎

Ed and Deborah Whitehorne are pictured here, flanked by their children Elizabeth and Charles

Brown family makes **transformational gift**

Tony Brown, right, is shown with Ken Tate, the Department of Computer Science's director of engagement and external relations.

Computer science alumnus and Hall of Fame inductee Tony McLean Brown and the Brown family recently made a $1M pledge to the department to create a named distinguished professorship, a named graduate fellowship and a named undergraduate scholarship. The transformational gift pledge announcement was made as part of NC State's 5th annual Day of Giving, helping the Department of Computer Science set an all-time single day giving record with total gifts and pledges exceeding $3.8 million.

Not only is this one of the largest gifts in department history, it is also quite unique in that Brown specifically directed that the donation was being made in the honor of Ken Tate, director of engagement and external relations, with whom he has worked closely for more than two decades in supporting various needs across the department and the University.

When fully funded, the transformational gift will help create:

- **Brown Family Distinguished Professorship in Computer Science** — once $667,000 is given, matching state funds in the amount of $334,000 will be sought from the Distinguished Professors Endowment Trust Fund to create a $1 million Distinguished Professorship endowment.
- **Brown Family Graduate Fellowship Enhancement for Computer Science** — $227,000 will be dedicated to the creation of this endowment, which will provide funds to be used to supplement stipends for newly admitted graduate students in the Department of Computer Science to strengthen recruiting efforts.
- **Ken Tate Scholarship for Student Success in Computer Science** — $60,000 will be appropriated to create a scholarship in Ken Tate's honor and annual funds will be used to provide merit- and need-based scholarships for CSC undergraduates with a preference toward students participating in the Computer Science Ambassadors program.

Tony McLean Brown is a principal partner and director of strategic investments with Public Consulting Group, Inc. (PCG). For almost four decades, he has helped build the technology solutions for PCG's healthcare, human services and education practice areas.

But Brown's legacy goes far beyond his professional accomplishments. His adventures include running with the bulls in Spain, as well as the Boston Marathon, Africa's Comrades Ultra-marathon and the Leadville Trail 100. Credentialed as a professional boxer, professional bull rider, jet pilot and NASCAR late model stock car driver, Brown authored *A Happy Guide to a Short Life: A Response to Ms. Quindlen's Fine Book*. At his core, he is fully aware that he has been blessed, and he focuses on leveraging his passion to advance multiple volunteer and philanthropic efforts to help people and make a positive difference in the world.

In 2022, Brown was inducted into the NC State Computer Science Alumni Hall of Fame.

"Ken and I have known each other for a long time, and our relationship is very special to me," said Brown. "He has been a fantastic ambassador for the Computer Science Department and has an incredible capacity to bring people together to do good for NC State students. Our family wanted to do something to honor all he has done for the Computer Science Department and the University before he retires. Ken is one of the finest individuals that I've met at NC State… and that goes all the way back to 1978."

When asked about the donation made in his honor, Ken Tate said he was humbled beyond words. "I've been blessed to be in this role for more than 22 years now, and even more blessed to be in a position to help incredible people like Tony use their passion and resources to help other people." When Tony told him of his plans, Tate said the news brought tears to his eyes. "Those of us who work in service roles like this do it for the love of the job, and the opportunity to make a difference in someone's life. Over the years, I've received some very nice 'thank you' notes, accolades and hugs, but I have to admit that this show of appreciation really tops the cake."

Gregg Rothermel, head of the department, highlighted the transformational nature of a gift like this in the department's quest to move from great to exceptional. "We are so thankful to the Brown family for their support, as this is really a 'Triple Crown' high-impact gift," said Rothermel. "Distinguished named professorships are essential to our efforts to attract and retain the very best talent, the graduate fellowship will help so many grad students who are feeling the pain of the high cost of living in Raleigh and the scholarship to honor Ken Tate is simply a heartwarming and fitting tribute to a man who has meant so much to the success of our department."

The initial installment of $250,000 arrived in June, allowing for the launch of both the scholarship and graduate fellowship endowments, and includes cash funds so that awards can be made to students starting in the 2023-24 academic year. ∎

Stricklands gift will grow
Student Leadership Endowment

Thanks to the generosity of alumnus Jay Strickland (B.S. CSC '97) and his wife, April, the **Carol Miller Student Leadership Endowment** is about to grow substantially, greatly increasing the funds that will be available to help NC State computer science students in the future.

The Stricklands have made a $50,000 multi-year pledge to help grow the endowment by almost 60 percent. The endowment was created to honor the late Carol Miller, a very popular and long-time lecturer in the department who retired in 2009. It was made possible by a lead gift from Jay Strickland as well as the generous donations of numerous other alumni, family and friends. It provides programmatic and/or scholarship support for student groups and student leaders. Once the pledge is completed, the value of the endowment will approach $140,000, generating cash awards of almost $6,000 annually.

During her 24 years of service as a lecturer for the department, Miller taught introductory and foundational courses to literally thousands of students, winning numerous teaching awards and establishing herself as a legendary department figure. But she was so much more than an outstanding instructor; she was an active faculty advisor to student organizations, she reviewed Park Scholarship candidates from Western North Carolina, and she loved projects and initiatives that helped the underserved across the state.

Jay Strickland was one of thousands of CSC students whose life was impacted by meeting Miller, and that impact was made on many levels.

Strickland recalls meeting Miller as a freshman. "She was my very first computer science teacher," said Strickland, who started his career at NC State as an electrical engineering major. "I was dead set on electrical engineering until I took her class, and I credit Carol with helping me see that I belonged in computer science."

They maintained a strong connection after that introductory class. For a period of time, Strickland was responsible for coordinating all the TAs for the department's introductory courses. It was during this period that he got to work closely with Miller and other faculty members. "For about three and a half years in college, I got to work directly with Carol and I saw how she poured herself into peoples' lives. She gave them a love for the degree and for programming in general."

As a student, Miller worked with Strickland on an independent study class that significantly impacted the trajectory of his professional career. "I got a chance to learn web development long before anybody else knew what it was," said Strickland, who co-developed the course along with Miller and another computer science graduate who was working at his start-up WingSwept. "I had the chance to work with her through several years of that class, and even had the chance to teach it once."

WingSwept began as a small computer-based consulting business with just one employee, but over the years has grown to a thriving computer IT firm employing nearly 90 individuals that spans five states. Strickland is highly regarded as a phenomenal leader and an example to those around him both professionally and personally. As a result of his leadership, WingSwept is consistently ranked among the best places to work in the Triangle and North Carolina. Later this fall, Strickland will be inducted into the NC State Computer Science Alumni Hall of Fame.

Recognizing the impact she made on Jay's life and career, the Stricklands say that their lead gift and this gift to grow the endowment is their way of honoring Carol Miller's legacy.

If you'd like to join the Stricklands and contribute to the Carol Miller Student Leadership Endowment, you can do so online by visiting **go.ncsu.edu/millerendowmentcsc**. To learn more about how you can impact the Department of Computer Science and create a legacy for you and your family, please contact **Sara Seltzer** at **skseltze@ncsu.edu** or **919.515.3730**. ∎

Carol Miller

Carol Miller,
NC State CSC icon, passes away

It is with heavy hearts that the department reports the passing of NC State Computer Science icon Carol Miller, who died on Jan. 26, 2023, in Brevard, NC, after a valiant battle with acute myeloid leukemia (AML).

A Kentucky native, Miller was valedictorian of the Raceland High School class of 1964, graduated Phi Beta Kappa with a degree in mathematics from the University of Kentucky in 1968 and earned a master's degree in computer science from Stevens Institute of Technology in 1971.

She began her professional career in computer science as a programmer at Bell Labs in Whippany, New Jersey, later transferring to the Naperville, Illinois, offices, where she met her husband, David Smith. She was a systems engineer for GE's Nuclear Fuels Division in Wilmington, North Carolina, prior to transitioning into academia, joining NC State University in 1985 to teach computer science classes.

During her 24 years of service as a lecturer for the department, she taught introductory and foundational courses to literally thousands of students, winning numerous teaching awards and establishing herself as a legendary department figure. But she was so much more than an outstanding instructor; she was an active faculty advisor to student organizations, she reviewed Park Scholarship candidates from Western North Carolina, and she loved projects and initiatives that helped the underserved across the state. She, along with a small group of students from the ACM/AITP student organizations, raised the funds and installed wiring at Waynesville Middle School, bringing the Internet to the school for the first time in 1997. She and her husband, David, also took a lead role in managing a Geek-a-thon in 2007 where CSC students and faculty and staff members refurbished hundreds of donated computers at Centennial Middle School and distributed them to local families that had no access to a computer.

Upon her retirement in 2009, grateful alumni (led by a generous pledge from alumnus Jay Strickland) crowd-sourced an endowment in her honor. The Carol Miller Student Leadership Endowment was created to pay tribute to Miller's legacy as a teacher, mentor, advisor, advocate and friend to thousands of students over her career. Proceeds from the endowment have primarily been used for student need-based scholarships and have been awarded to students in leadership roles within one of the CSC student organizations. She continued to stay involved in the life of the department even after her retirement, serving as a department historian and coordinating the documentation of the department history update for our 50th year celebration in 2017. She also served on the department's Alumni Hall of Fame Selection Committee since its launch in 2017. For more than a decade, the department has awarded two Carol Miller Outstanding Lecturer Awards annually (undergrad and graduate) to great instructors in her honor.

In retirement in Brevard, Miller was a committed volunteer tutor in the Rise & Shine after school program. She loved and was loved by her scholars in the program. She continued her involvement with Rise & Shine even when her illness made tutoring impossible.

She is survived by her husband of 43 years, David Howard Smith, of Brevard, and her two sons — Zachary Miller Smith of Raleigh and Peter Andrew (Andy) Miller Smith (Lisa Schimmer) of Durham. Her son Andy followed his mom's footsteps into academia, serving as a staff member in the Department of Computer Science's Center for Educational Informatics.

Memorial services for close family and friends were held in Brevard and Kentucky during spring 2023.

Memorials may be directed to the Carol Miller Student Leadership Endowment at the NC State Engineering Foundation, or Rise & Shine Afterschool Program in Brevard, North Carolina. ∎

James Lester III

LESTER NAMED GOODNIGHT DISTINGUISHED UNIVERSITY PROFESSOR

James Lester, professor in the department, has been named as the inaugural Goodnight Distinguished University Professor in Artificial Intelligence and Machine Learning.

Lester has spent his career leading efforts to transform the field of education using artificial intelligence and leads two NC State centers dedicated to this work. He is the founding director of NC State's Center for Educational Informatics. In 2021, the National Science Foundation (NSF) built on those efforts by awarding Lester and a team of faculty members from NC State and other partner institutions a five-year, $20 million grant that established the NSF AI Institute for Engaged Learning.

"I'm deeply honored and grateful to be named the Goodnight Distinguished University Professor in Artificial Intelligence and Machine Learning," said Lester. "The endowed professorship the Goodnights have created will enable us to expand our research program in AI and education and to innovate in AI-driven learning at a national scale."

Lester conducts research on AI-driven learning technologies such as intelligent narrative-centered learning environments and embodied conversational agents for education, and he leads teams to develop and disseminate them. Much of this work centers on AI-driven educational software for K-12 STEM education, but applications for these technologies are wide-ranging and include AI-driven training technologies for military personnel, first responders and others.

He has been recognized with an NSF CAREER Award, the NC State Alumni Association Outstanding Research Award, the NC State Outstanding Teacher Award and the Alexander Quarles Holladay Medal for Excellence, the highest honor awarded to faculty members by the University's Board of Trustees. His research is supported by NSF, the U.S. Department of Education's Institute of Education Sciences, the National Institutes of Health and the Army Futures Command. He is a Fellow of the Association for the Advancement of Artificial Intelligence (AAAI).

Lester received his B.A. in history from Baylor University and his B.A. (Highest Honors, Phi Beta Kappa), M.S.C.S., and Ph.D. in computer science from the University of Texas at Austin.

"This is a tremendous honor for James. He is truly a pioneer in this field and this professorship recognizes that and will help him expand on his work," said Louis Martin-Vega, former dean of the College of Engineering. "We are grateful to the Goodnights for their investment in these efforts to improve both how we teach and how we learn."

The professorship was made possible by a gift from NC State alumni James and Ann Goodnight. The Goodnights support more than 250 North Carolina students each year through the Goodnight Scholarships program, which they established in 2008 and expanded in 2017 to include transfer students from the state's community colleges. The Goodnights also have generously strengthened centers, programs and additional scholarship opportunities across NC State. Their commitment to faculty excellence has resulted in the creation of 28 named faculty positions, including a deanship, as well as a program to invest in early-career faculty and support for additional endowed professorship funds. In 2022, the Goodnights increased their support to include graduate students, creating the Goodnight Doctoral Fellows for Ph.D. candidates in STEM and education.

James Goodnight — the CEO and founder of SAS — earned his B.S. in applied mathematics in 1965, his M.S. and doctorate in statistics in 1968 and 1972, respectively, and the University conferred an honorary degree to him in 2002. Ann Goodnight earned her B.A. in political science in 1968 and works as the senior director of community relations at SAS.

SINGH NAMED SAS INSTITUTE DISTINGUISHED PROFESSOR OF COMPUTER SCIENCE

Munindar P. Singh has been named the SAS Institute Distinguished Professor of Computer Science at NC State.

Singh, who joined the NC State faculty in 1995, was previously named an Alumni Distinguished Graduate Professor in the Department of Computer Science. He conducts research into artificial intelligence (AI) and multiagent systems with the goal of advancing AI from individual agents to ensembles of socially intelligent agents, with the goals of realizing trustworthy AI-infused systems that reflect human needs. His recent research has involved models and techniques for flexible business processes, privacy and consent, social and legal norms and accountability, understanding social media and the ethics and safety of AI broadly. Over the last few years, he has been leading and co-organizing interdisciplinary efforts on campus on the ethics and safety of AI-infused sociotechnical systems.

Munindar Singh

"Everyone recognizes that we must develop AI technologies so they serve individual and societal needs. But these needs are reflected in users' goals, risk attitudes, and values and the norms that guide their interactions, which traditional approaches can't handle at runtime. My students and I develop computational methods by which AI agents can incorporate those factors into their behaviors," Singh said. "This research can enable new regulatory regimes to ensure that AI is used for good."

Singh is a Fellow of the Association for the Advancement of Artificial Intelligence, the American Association for the Advancement of Science, the Association for Computing Machinery and the Institute of Electrical and Electronics Engineers, and a foreign member of Academia Europaea. He has won the ACM/SIGAI Autonomous Agents Research Award, the IEEE TCSVC Research Innovation Award and the IFAAMAS Influential Paper Award. Within NC State, he has won the Outstanding Research Achievement Award and the Outstanding Graduate Faculty Mentor Award and is a member of the Research Leadership Academy.

To date, Singh has authored or co-authored more than 200 papers in peer-reviewed journals and conferences, he has secured more than $20 million in external support for research, he has been awarded 45 patents, and he has directed and graduated 30 Ph.D. dissertations and 30 M.S. theses.

Singh has served as the editor-in-chief of both the *ACM Transactions on Internet Technology* and *IEEE Internet Computing*, and on the editorial boards of other leading journals in his area. He has also chaired major academic conferences, including the *International Conference on Autonomous Agents* and *Multiagent Systems*.

Singh's research has been recognized with awards and sponsorship by (alphabetically) the Army Research Lab, the Army Research Office, Cisco Systems, the Consortium for Ocean Leadership, DARPA, the Department of Defense, Ericsson, Facebook, IBM, Intel, the National Science Foundation and Xerox.

The support of an endowed professorship — a position permanently paid for with the revenue from an endowment fund — is one of the best tools for recruiting and retaining great faculty members.

The funds in these professorships provide salary support, research flexibility, program development, graduate assistant funds, equipment and course development. The department is grateful to the SAS Institute for its foresight and generosity in endowing this position years ago.

Asked about the significance of this award to Singh, Gregg Rothermel, head of the Department of Computer Science, said: "Munindar's research has been among the most impactful in our department, and the many Ph.D. students he has mentored over the years have themselves made numerous contributions in academic and industrial settings. His leadership in the discipline, and within the department itself, has been deep and meaningful. I can think of no other faculty member in computer science who is more worthy of this professorship — and I can think of no other faculty member who can be so assuredly expected to leverage this professorship to advance science and computing, and along the way, to make NC State and SAS proud."

SAS Institute, Inc., located in Cary, North Carolina, established an endowment to fund the professorship in 2001. The company was founded in 1976 by NC State alumni James Goodnight and John Sall.

Goodnight and his wife, Ann, also an NC State graduate, support more than 250 North Carolina students each year through the Goodnight Scholarships program, which they established in 2008 and expanded in 2017 to include transfer students from the state's community colleges. The Goodnights

also have generously strengthened centers, programs and additional scholarship opportunities across NC State. Their commitment to faculty excellence has resulted in the creation of 28 named faculty positions, including a deanship, as well as a program to invest in early-career faculty members and support for additional endowed professorship funds.

Lina Battestilli

BATTESTILLI RECOGNIZED FOR EXCELLENCE IN TEACHING

Lina Battestilli, associate teaching professor in the department, has been selected as a recipient of the Outstanding Teacher Award from NC State's College of Engineering.

Battestilli completed her undergraduate education at Kettering University, where she received her B.S. in electrical engineering with a minor in applied mathematics in 1999. She completed her education at NC State, where she earned her master's degree in computer networking in 2002, and her Ph.D. in computer science in 2005. Shortly after receiving her Ph.D., she was selected by the NC State Graduate School as the winner of the 2006 Nancy G. Pollock Dissertation Award for her outstanding research in computer science, making her one of the first graduate students from computer science to receive this award.

She worked in industry before beginning her career at NC State as a teaching assistant professor in 2012. She has been involved at NC State in a variety of other roles including serving as faculty adviser of Women in Computer Science (WICS), member of the Academic Committee of the Grace Hopper Celebration, member of the Diversity in Admissions and Matriculation committee within the CSC department, panelist on Technology and Bias at Honors and Scholars Village, leader in College of Engineering (COE) high school summer camps, and a 2020 NC State Distance Education and Learning Technology Applications (DELTA) Faculty Fellow.

Battestilli has received many honors at NC State, including being nominated for the 2021 Equity for Women Award, and being recognized as the Computer Science Department's Carla Savage Award winner for being the "most awesome teaching

associate professor" in April 2021. She was also recognized as the 2020-21 recipient of the NC State Computer Science Department's Person of Exceptional Performance (PEP) Award for her dedication to her teaching and research, and her passion and commitment to establishing and maintaining a diverse computer science community at NC State.

"My goal is to create a welcoming and respectful learning environment for my students," Battestilli said. "Students may forget some of the things they learn in my courses, but they will remember how my course made them feel."

Her teaching philosophy is that the best way to learn is by doing. Battestilli's classes are full of hands-on projects and projects that have to do with larger societal impact.

"I also want my students to be able to relate to the topics and have fun while learning so I have also created projects around games such as Battleship, Mastermind, Connect Four, Adventure Games, etc.," she said. "I want my students to see the impact of computer science but also be able to personally relate to the topics and have fun while learning."

Junior Isaac Dunn met Battestilli early on in his college career, during his second semester of college in spring 2021, when he took Introduction to Computing.

"I can confidently say that Dr. Battestilli was the best professor I had during the pandemic because of the positive learning environment she created and maintained throughout the course," Dunn said. "She took great care in creating course webpages and using resources to be both organized and easily accessible.

"During lectures, she would encourage students to ask and answer questions," he continued. "Additionally, she would use Zoom breakout rooms for students to solve coding examples together in small groups. This was the most engagement I had in a learning environment during the pandemic, and it had a very positive impact on many students."

The Outstanding Teacher Award recognizes excellence in teaching at all levels. Upon being selected as an Outstanding Teacher, recipients become members of the Academy of Outstanding Teachers for as long as they are NC State faculty members.

Battestilli and other Outstanding Teacher Award recipients were honored at an awards luncheon and ceremony on April 21, 2023, at the Park Alumni Center. Recipients of the Board of Governors Award for Excellence in Teaching, the Alumni Distinguished Undergraduate Professor Award and the Gertrude Cox Award for Innovative Excellence in Teaching and Learning with Technology were also recognized.

Donald Bitzer

BITZER NAMED A COMPUTER HISTORY MUSEUM FELLOW

Donald Bitzer, Distinguished University Research Professor of Computer Science at NC State University, has been named a 2022 Fellow by the Computer History Museum (CHM) for his global influence and outstanding contributions in the field of computer science through pioneering online education and communities with PLATO and co-inventing the plasma display.

The CHM Fellow Awards Program recognizes remarkable innovators for their notable contributions to the advancement of computing. This prestigious program exhibits the groundbreaking achievements of each Fellow and denotes their historical significance.

Technology leaders, innovators and visionaries from around the world gathered in Silicon Valley on Saturday, October 15th, 2022, at a special ceremony to celebrate the remarkable contributions of Bitzer and his fellow honorees — Adele Goldberg, Dan Ingalls and Leonard Kleinrock.

Mladen Vouk, Distinguished Professor of Computer Science and Vice Chancellor for Research and Innovation at NC State, introduced Bitzer at the ceremony.

"Don's approachability, interest in discussing good ideas with everyone regardless of rank or age, his enjoyment in solving problems, and his leadership and vision in developing new products has been transformational for me, NC State's Computer Science Department and the University in general," Vouk said. "Don, you are a true Renaissance man, as well as a research and education wizard."

Bitzer is known as the "father of PLATO," or Programmed Logic for Automated Teaching Operations, the first generalized computer-assisted instructional program. Created in the early 1960s, PLATO was a revolutionary invention — Bitzer programmed the first online courses using the PLATO system, and many contemporary features in multi-user computing were developed for PLATO, including online forums, message boards, email, blogging and multiplayer games.

In 1964, Bitzer co-invented the flat-panel plasma display. Originally invented as an educational aid for the PLATO system, this influential innovation lay the foundation for flat-panel plasma screen televisions. In 2002, Bitzer received an Emmy Award from the National Academy of Television Arts and Sciences for his role in developing the plasma display.

Bitzer is a Fellow at the Institute of Electrical and Electronics Engineers and the National Academy of Inventors. He has been a member of the National Academy of Engineering since 1974, and in 2013, he was inducted into the National Inventors Hall of Fame. In 2019, he received the Alexander Quarles Holladay Medal for Excellence, the highest honor bestowed by NC State and the University's Board of Trustees.

Bitzer received his B.S. (1955), M.S. (1956), and Ph.D. (1960) in electrical engineering from the University of Illinois at Urbana-Champaign. He joined the faculty of NC State in 1989.

Rada Chirkova

CHIRKOVA NAMED DISTINGUISHED MEMBER OF THE ACM

Rada Chirkova, professor of computer science, was named a 2022 distinguished member of the Association for Computing Machinery (ACM) for her outstanding scientific contributions to computing.

The ACM has named 67 distinguished members for their outstanding contributions to the field of computing. All 2022 inductees are longstanding ACM members and were selected by their peers for a range of accomplishments that move the computing field forward.

The 2022 ACM Distinguished Members work at leading universities, corporations and research institutions in Australia, Canada, China, Finland, France, Germany, Greece, India, Italy, Japan, the Netherlands, New Zealand, Singapore, Taiwan, the United Kingdom and the United States. ACM distinguished members are selected for their contributions in three separate categories: educational, engineering and scientific. This year's class of distinguished members made advancements in areas including algorithms, computer science education, cybersecurity,

data management, energy efficient computer architecture, information retrieval, healthcare information technology, knowledge graph and semantic analysis, mobile computing, and software engineering, among many others.

The ACM Distinguished Member program recognizes up to 10 percent of ACM worldwide membership based on professional experience and significant achievements in the computing field. To be nominated, a candidate must have at least 15 years of professional experience in the computing field and five years of professional ACM membership in the last 10 years, and must have achieved a significant level of accomplishment or made a significant impact in the field of computing, computer science, or information technology. A Distinguished Member is expected to have served as a mentor and role model by guiding technical career development and contributing to the field beyond the norm.
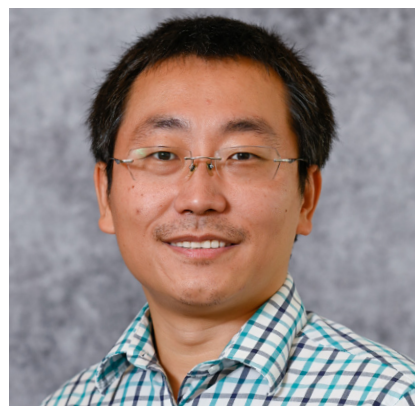
GUO RECEIVES ACM SIGBED EARLY CAREER AWARD

Zhishan Guo, associate professor in the NC State Department of Computer Science, has won a 2023 Association for Computing Machinery Special Interest Group

Zhishan Guo

on Embedded Systems (ACM SIGBED) Early Career Award.

"It is my great honor to receive the award. I really appreciate the support and recognition from ACM SIGBED," said Guo. "It is encouraging me to contribute more to the research community, both in technical research, and in service."

ACM SIGBED is a focal point for all aspects of embedded computing systems, including both software and hardware. Its Early Career Researcher Award recognizes "outstanding contributions by early career investigators in the area of embedded, real-time and cyber-physical systems." Recipients are chosen for their entire body of work, not just a particular project or two, based on their impact in the field.

Guo's research focuses on real-time scheduling and machine learning theory with applications to cyber-physical systems (CPS). CPS features seamless integration of computing with the physical world, and is one of the department's new research focus domains. CPS is the next generation of safety-critical embedded control systems, in domains spanning from autonomous vehicles, industrial automation and advanced manufacturing, to medical devices and systems, energy-efficient buildings and smart cities. Guo and his students are creating ways to build such systems more safely and efficiently with provable guarantees.

According to csrankings.org, Guo has been one of the most active researchers in the domain of real-time and embedded systems in the world for the past five years. He also actively publishes in other domains such as design automation and machine learning. He has received several recognitions and awards, including the National Science Foundation CRII Award in 2017, the UCF Reach for the Stars Award in 2022 (only five per year awarded among all 13 colleges at UCF), the Best Student Paper Award (with his Ph.D. student Ashik Ahmed Bhuiyan) and the Outstanding Paper Award at RTSS in 2019 — the top conference in the area of real-time systems, as well as the Best Paper Award at the EMSOFT conference in 2020 — the top conference in the area of embedded system software, which is organized and sponsored by ACM SIGBED.

ROTHERMEL REAPPOINTED AS HEAD OF DEPARTMENT

Gregg Rothermel has been reappointed as the head of NC State's Department of Computer Science (CSC), effective July 1, 2023, for a second five-year term.

Gregg Rothermel

With more than 2,500 students currently studying computer science, more than $19 million in new research awards and more than $13 million in annual research expenditures, CSC is regarded by many as the preeminent computer science program in the state of North Carolina. Rothermel's excellent leadership, dedication and integrity since 2018 have played a significant role in advancing the department's well-established academic and research excellence.

A recent assessment of the department leadership concluded that as department head, Rothermel has demonstrated tremendous success in shaping CSC's academic and research programs according to his strategic vision. He has led numerous initiatives to cultivate a successful department, including recruitment and outreach efforts, education research, and efforts to enhance diversity, equity and inclusion.

During his initial five-year term as department head, Rothermel has led the department through a period of significant growth and evolution, all while navigating the impact of a global pandemic. Under an improved, shared set of standards for faculty productivity and a transparent process for communicating expectations and evaluations of their accomplishments, faculty members reached record levels in research publications, research awards and research expenditures. Alumni donations and endowment growth also reached record levels. With significant corporate support, the department launched a major cybersecurity initiative, as well as new undergraduate concentrations in cybersecurity and artificial intelligence. Student enrollment and faculty growth have accelerated thanks to a major investment in STEM, engineering and computer science by the North Carolina General Assembly. In fact, the department hired a record 14 new faculty members last year and hired 11 more this year. Under Rothermel's direction, the department is well positioned to flourish in the future as the preeminent computer science program in the state and beyond.

Rothermel, who is considered one of the top software engineering researchers in the world, is an IEEE Fellow and is ACM Distinguished Scientist.

Before joining NC State, he was a professor and Jensen Chair of Software Engineering at the University of Nebraska-Lincoln, where he co-founded the ESQuaReD (Empirically Based Software Quality Research and Development) Laboratory.

Rothermel co-founded the EUSES (End-Users Shaping Effective Software) Consortium, a group — funded in part by the National Science Foundation — that has led end-user software engineering research.

Additionally, Rothermel co-founded and leads the development of Software-Artifact Infrastructure Repository (SIR), which is an infrastructure created to support controlled experimentation with program analysis and software testing techniques. SIR has been utilized by more than 700 institutions supporting more than 800 scientific publications around the world.

Rothermel's research interests include software engineering and program analysis with an emphasis on end-user software engineering, empirical studies and the application of program analysis techniques to problems in software maintenance and testing. His research has been supported by NSF, DARPA, AFOSR, Boeing Commercial Airplane Group, Microsoft and Lockheed Martin.

Louis Martin-Vega, former dean of engineering at NC State, said Rothermel enjoys strong support from the CSC faculty, students and staff.

"I appreciate his commitment and dedication to the progress and success of the CSC department for the last five years and look forward to his continued leadership of the department going forward," Martin-Vega said.

RICHARDS NAMED 2022-23 PERSON OF EXCEPTIONAL PERFORMANCE

The Department of Computer Science is pleased to present the 2022-23 Person of Exceptional Performance (PEP) Award to Donna Richards, assistant director of research administration.

The PEP Award, launched by the department in 2018, is intended to recognize faculty or staff members who have exhibited truly outstanding performance, contributing significantly to the department's success as role models for what it means to "Think and Do the Extraordinary." The recognition includes a custom acrylic plaque and a cash award. Richards becomes the department's sixth winner of the PEP Award, joining Thomas Price (2022), Lina Batestilli (2021), Leslie Rand-Pickett (2020), Sarah Heckman (2019) and Ken Tate (2018).

Since joining the department's contracts and grants (C&G) office in 2016, Richards has been an integral part of the team, always giving everything she has to the job. When Ann Hunt, the previous contracts and grants manager, retired at the end of 2021, Richards gave some thought to the manager position and decided that it was not for her, but agreed to fill the role temporarily until a replacement could be found. That temporary sacrifice went on far longer than anyone would have expected, ending only when the department was able to hire Petya Radey as the director of research administration — more than nine months later — in October 2022.

The intervening time was particularly stressful because the C&G office was understaffed, faculty members were submitting new grant proposals at record rates and research expenditures were at a record high. But Richards hung in there, even though it meant canceling vacations, working from home in the evenings and generally being on the front line handling all the stresses that the C&G group had to face. In fact, Richards' sacrifice did not end with the hiring of Radey, because she took on the role of helping Radey learn the processes and procedures associated with the manager's role — which has now been changed to director of research administration — and she continues to do that.

Richards was recognized for her efforts as an outstanding administrative staff member by being named one of the winners of the Carla Savage Award for Fall 2022.

Department Head Gregg Rothermel said, "I do not know how we could possibly have gotten through to today, in the shape we are in, without Donna's devotion to the department and to the contracts and grants group. Her insistence on giving everything she had to the job, at a time when it took absolutely everything a person could give to do the job, makes her truly a Person of Exceptional Performance. Donna, you have my thanks, the thanks of a grateful faculty and I'm sure the thanks of those in the C&G group, for all that you have done and all that you continue to do for the computer science department."

THREE WIN FALL CARLA SAVAGE AWARDS

Jessica Young Schmidt, associate teaching professor; William Enck, professor; and Donna Richards, an administrative staff member in the Research Administration Office, were named as the fall 2022 winners of the Carla Savage Awards.

Schmidt has served as the department's accreditation manager since 2017. Schmidt is a two-time graduate of the NC State Department of Computer Science. She earned her M.S. in 2009 and her Ph.D. in 2012.

This year, Schmidt earned a Carla Savage Award for her outstanding work on the department's ABET accreditation process. ABET is an external body that visits the department every six years and accredits college and university programs in applied and natural science, computing, engineering and engineering technology. Schmidt coordinates the extensive preparation effort for the accreditation visits, which includes working with faculty members for continuous improvement, producing a self-study report and answering questions of the ABET evaluation team.

Per her nomination: "Jessica did a fantastic job with accreditation and preparing for the ABET visit" and "Jessica has done an outstanding job on the ABET report and preparations. The level of detail is amazing."

Enck is co-director of the Secure Computing Institute (SCI) and director of the Wolfpack Security and Privacy Research (WSPR) laboratory. Enck earned his Ph.D. (2011), M.S. (2006), and B.S. (2004) from the Pennsylvania State University, and he studies the security of a wide range of systems, including mobile platforms; Internet of Things (IoT); networks, cloud and 5G infrastructure; and most recently the software supply chain.

Enck has earned a second Carla Savage Award for his outstanding, inspiring work as a teacher and researcher. In

Jessica Young Schmidt

William Enck

Donna Richards

2021, he won a Carla Savage Award for his part in the establishment of the highly successful SCI and the associated Cybersecurity Initiative at NC State. Per his nomination, "He oozes enthusiasm in class (CSC574) and is really passionate while explaining security concepts which automatically makes one pay more attention in class and develop interest in the subject."

Richards coordinates the pre-award and post-award services for the CSC Research Administration office, and she is a member of the Research Support Council. In the 2021-22 fiscal year, Richards said her group processed approximately $80 million in pre-award work, and CSC received $19.5 million in new awards for research.

Individuals who nominated Richards noted her adeptness at understanding the complicated pre-award and post-award process. Per her nomination, "She's always friendly, calm in a crisis, and often catches mistakes deep in the request for proposals that I might have missed."

Named after the incomparable department icon, the Carla Savage Awards are an intra-departmental initiative to recognize outstanding achievement and special people within the department.

SPRING 2023 CARLA SAVAGE AWARD WINNERS ANNOUNCED

Muhammad Shahzad, associate professor; Anupam Das, assistant professor; and Vaibhav Garg, Ph.D. student, were named as the spring 2023 winners of the Carla Savage Awards.

Shahzad leads the Wolfpack Interactive, Sensing and Networking Lab and is a member of the Networking Research Group. In their nomination text, his referees wrote that Shahzad is a compassionate and caring educator, an excellent mentor and teacher who genuinely cares about his students' well being and success. They added that he is continually available acting like a close friend to offer guidance and support and is an excellent mentor and teacher. Students praise his lectures and classes as being very informative, and his method of teaching helps students grasp the concepts easily.

Shahzad received his Ph.D. degree in computer science from Michigan State University in 2015. His research interests lie in the broad areas of mobile sensing and computing, Internet of Things, and computer networks and network measurement and modeling.

Das works in the Wolfpack Security and Privacy Research (WSPR) lab and is the director of the IoT Smarthome Lab. In their nomination text, his referees wrote that Das is a fantastic mentor and teacher to students, always helping students to find the crucial problem behind research questions with his professional knowledge and critical thinking. His referees say that through discussion with Das, they get not only valuable suggestions for the specific problem, but also learn how to think more deeply. Further, they write of Das' deep understanding and excellent skills in making students successful in academia (he not only teaches his grad students how to write research papers and proposals, but also introduces them to academic communities to serve on professional committees).

Das received his Ph.D. in computer science from the University of Illinois Urbana-Champaign in 2016. Prior to joining NC State, he was a postdoctoral fellow at Carnegie Mellon University. His research interests lie in the domain of security and privacy with a special focus toward designing secure and privacy-preserving technologies.

Garg, this spring's most awesome Ph.D. student, earned his master's degree from the Indraprastha Institute of Information Technology (IIIT, Delhi) in 2019 and his B.S. degree from the LNM Institute of Information Technology. Garg likes to work on

Muhammad Shahzad

Anupam Das

Vaibhav Garg

exciting projects that focus on building AI solutions for social good.

In their nomination text, his referees wrote that Garg brings a simple charm to all his interactions. "Overall, he is awesome not only for his passion for research and uplifting other students to do research, but also because of his humble character." Through the tough times when the pandemic was raging, he served as the glue between students and postdocs. He has been an amazing mentor for many students (some of whom have converted now to pursuing their Ph.D.). He has also collaborated with a high school student helping him with his research (and that work is now in the paper publication stage).

Garg says the secret to his success is simple — he tells students that playing badminton and meditating everyday provides relaxation and focus for his research. ∎

Mark Abdelshiheed

ABDELSHIHEED NAMED COE DOCTORAL SCHOLAR OF THE YEAR

Mark Abdelshiheed, a computer science Ph.D. student, won a 2022-23 College of Engineering Graduate Programs Award for Scholarly Achievement.

Abdelshiheed is a skilled researcher with novel and creative ideas and a 4.2 cumulative GPA. He was nominated by Min Chi, associate professor in computer science, who notes that Abdelshiheed "is very enthusiastic about research, has outstanding research skills, and is very passionate in learning (about) and exploring new domains."

Abdelshiheed's research interests are in the area of cognitive science and artificial intelligence in education, with a focus on applying reinforcement learning to prepare students for future learning with a metacognitive foundation, and time awareness for strategies. He has integrated two types of metacognitive skills into two intelligent tutoring systems, and more than 350 NC State students use his research each semester. Abdelshiheed has been first author on several papers accepted by prestigious conferences, as well as on a book chapter. He received the prestigious Diversity & Inclusion Award from the 44th Annual Conference of the Cognitive Science Society.

At NC State, Abdelshiheed is one of six outstanding engineering students to be recognized for their academic achievements, research, leadership and service through the Graduate Student Programs Awards.

To be eligible, graduate students had to submit a resume and receive a nomination from a faculty member. Twenty-five nominations were submitted in total.

Doctoral students and master's students are eligible to receive the Scholar of the Year Award in the following categories: citizenship and service, leadership, research and scholarly achievement.

FULBRIGHT SCHOLARS HEAD TO RWANDA

When Meriem Laroussi and Amy Isvik applied for Fulbright grants last year, they didn't know they would both end up in Rwanda.

In fact, Laroussi said, "I had no idea Amy was applying until we both won."

The Fulbright program provides approximately 8,000 scholarships annually for graduate study, to conduct research or to teach English abroad. This year, 11 NC State students were awarded 2023 Fulbright Scholarships, a new record. The other students will be traveling to Denmark, South Korea, Taiwan and more.

Laroussi is a 2023 master's graduate in industrial engineering and won the English Teaching Assistant Grant. Isvik is a Ph.D. student in computer science who received the Fulbright grant for study and research. Both have been to Rwanda on previous trips with NC State.

"That's why I chose Rwanda," Laroussi said. "I already have connections there which will allow me to enhance my impact on the community."

Because of the Accelerated Bachelor's/Master's program, Laroussi graduated with her master's degree this year. She taught as a teaching assistant both semesters and did other programs through the Women and Minority Engineering Programs (WMEP).

Ph.D. student Amy Isvik, left, is shown during a trip to Rwanda.

"We have a program on campus called the Alternative Service Break," she said. "Every year, they offer short-term service-based experiences in different locations. WMEP partners with Student Leadership and Engagement every year to do one in Rwanda centered around STEM outreach.

"I was one of the student leads this past year for that experience. In March 2023, we led a trip to Rwanda and we worked in four primary schools, mostly fifth and sixth grade in Musanze, a city in northwest Rwanda."

Laroussi plans to teach at the university and focus largely on teaching English fluency and cultural context to STEM students.

In Isvik's Ph.D. program, she does both research and teaching. At NC State, her research has focused on computing-infused lessons, in which teachers bring in a programming element or the ability to learn computing and computer science concepts into a core area class or elective.

"For example, we work a lot with Reedy Creek Middle School [in Cary, North Carolina] and we had a food web simulation where they coded a food web in block-based programming language, so they learned both about coding and the things they have to learn at the same time," said Isvik.

"That's nice because not all students get to take computing classes or camps. The biggest factor on if you'll take those classes in high school or college is if you've taken them previously, so putting it into a core class means that everyone gets to try it out."

In Rwanda, Isvik is training teachers to use computing-infused lessons in their math and science classes, providing support for those teachers and looking at what the difference is in support and new barriers that these teachers might face. Several schools in Rwanda do offer coding classes, but it tends to be specialized and not open to all students.

Isvik is partnering with University of Rwanda College of Education and the African Center for Excellence in Teaching and Learning Math and Science, but she hopes to do her research outside of university spaces as well.

"Based on the reality of where research happens, most of the schools where this has been tested out are school districts near universities, often a little more privileged than other school districts," she said.

Isvik arrived in Rwanda in September and will be there for nine months. Those with the English Teaching Assistant Grant like Laroussi will be in Rwanda from October until July.

"I want to come at it from a lens that's not imperialistic and

Jay Pande

more, 'What am I learning from them and what are they learning about the U.S.,'" Laroussi said. "For ETAs, we work very strongly with the U.S. embassy in the host countries."

She continued, "I couldn't have done it without the support of the faculty and staff at NC State, who really encouraged me to apply. I was not going to do it on my own. It's been a very supportive community overall."

PANDE RECEIVES PRESTIGIOUS NSF GRADUATE RESEARCH FELLOWSHIP

Ph.D. student Jay Pande has been chosen to receive a prestigious and highly competitive National Science Foundation (NSF) Graduate Research Fellowship.

Pande graduated from Duke University in 2020 and is currently a second-year Ph.D. student in computer science at NC State. His research interests focus on using artificial intelligence to support adaptive learning environments that embrace principles of universal design for learning. Specifically, his research involves the use of automatic speech recognition and natural language processing to analyze spoken communication and promote personalization and accessibility in learning environments. He is also passionate about increasing the participation of people with disabilities in computer science across all levels of academia and industry.

"My research will investigate the extent to which an AI-driven virtual agent within a learning environment that can participate in spoken language dialogue can equitably support students of all abilities by providing personalized feedback. This research will address foundational problems in how to computationally

understand, reason about, and generate spoken natural language, and, unlike most other research about these issues, will focus on adolescents (specifically, middle school students) rather than an adult population."

He is part of the IntelliMedia Group at NC State, a research group that is dedicated to bringing about dramatic improvements in human-computer interaction and communication. Additionally, Pande is an advisory committee member for the Working Group for Students and Professionals with Disabilities in STEM, which is sponsored by the American Association for the Advancement of Science and works to increase the participation of people with disabilities in STEM.

The purpose of the NSF Graduate Research Fellowship Program (GRFP) is to ensure the quality, vitality and diversity of the scientific and engineering workforce of the United States. GRFP seeks to broaden participation in science and engineering of underrepresented groups, including women, minorities, persons with disabilities and veterans. The five-year fellowship provides three years of financial support inclusive of an annual stipend of $37,000, and a cost-of-education allowance of $12,000 to the recipient's institution.

Since 1952, NSF has funded more than 60,000 Graduate Research Fellowships out of more than 500,000 applicants. Currently, 42 Fellows have gone on to become Nobel laureates, and more than 450 have become members of the National Academy of Sciences. In addition, the Graduate Research Fellowship Program has a high rate of doctorate degree completion, with more than 70 percent of students completing their doctorates within 11 years.

JERIN SMITH RECEIVES COLLEGE OF ENGINEERING SENIOR AWARD FOR HUMANITIES

Jerin Smith, a spring 2023 graduate of the Department of Computer Science, won the 2022-23 College of Engineering Senior Award for Humanities.

Smith is an exceptional student who double-majored in computer science and Japanese. He is passionate about both engineering and the humanities — and able to understand the human aspects of the Grand Challenges for Engineering that society is facing.

A Benjamin Franklin Scholar, Smith has taken a full range of language courses and has demonstrated a superior ability at cultural analysis and expression. His studies in Japanese have not only included studying the language, but also writing on and studying cultural phenomena.

Smith was also involved with NC State's Jazz Program. He has taken classes ranging from Digital Audio Workstations to Music Composition, and has performed with four ensembles on tenor

Jerin Smith

saxophone, guitar and flute since 2019. His dedication, exemplary leadership and musical growth has been an inspiration to those around him, and he handles the pressure of performing in the premier jazz ensemble with grace and professionalism. This past December, Smith traveled to Chicago with the Jazz Orchestra for a performance at one of the largest and most prestigious music education conventions in the world.

During his time at NC State, Smith was also a member of the Air Force ROTC program and was the region III director of operations of the Arnold Air Society.

Smith is one of four seniors in the College of Engineering to receive 2023 Outstanding Senior Awards for their exceptional contributions to NC State and beyond in Citizenship and Service, Humanities, Leadership and Scholarly Achievement.

Seniors are nominated by their respective academic departments in the College of Engineering, and winners are chosen by a selection committee made up of faculty and staff members in the College. Departmental nominees were honored during a ceremony held at the James B. Hunt Jr. Library on NC State's Centennial Campus where the four COE winners were also announced.

LOVE OF CRIME SHOWS LEADS STUDENT TO PURSUE CYBERSECURITY STUDIES

Growing up, Molly Sun traveled a lot. From her home province of Shandong, China, she ventured to new cities and other provinces. But traveling across the world to Raleigh, North Carolina, has been one of her biggest adventures yet.

After graduating with her B.S. in computer science and economics in May 2023, she stayed in North Carolina for her next adventure: moving to Charlotte to begin her new chapter as a software engineer at Bank of America.

She attributes much of her success to the resources, opportunities and mentorship that drew her to NC State four years ago.

Sun knew she wanted to go abroad for her undergraduate education, and her initial journey to North Carolina began when she and her family were deciding on candidate universities. She was ultimately drawn to NC State University because of its strong engineering program, suburban environment and variety of post-graduation opportunities in Research Triangle Park.

Her inspiration to pursue computer science came from two places: loved ones and crime drama series. She had years of experience solving technological issues brought to her by family and friends, and she liked watching web sleuths featured in crime series like The Blacklist and 24. She thought that could be her.

"It's just a show, but I thought that the character's ability to hack into a system in order to make something work or to avoid an attack was cool," she said. "I thought to myself 'Oh my gosh, I want to do this.'"

This led to Sun's interest in cybersecurity — more specifically, to better understand how hacking works, what malicious actors hacking into a system means and what happens if personal information is leaked.

Sun also has taken on a second major in economics. While seemingly unrelated, she saw many ways the two fields intersect and benefit from each other to improve her own work. For example, she has used programming to build models that forecast the likelihood of economic events. Through experiences such as this, she sees how this can make her more valuable within a competitive field.

"My economics degree has expanded my career possibilities beyond software engineering to include roles such as quantitative analyst and data analyst, which require a combination of economic knowledge and programming skills," Sun said.

This combination of coursework has provided her with a unique, interdisciplinary skill set, something she has been also leveraging during her senior project building a web streaming platform. Working with Diversity Movement, an organization providing training videos on diversity, equity and inclusion, Sun and her team are making a more manageable product for their client.

"It's a great team, with one person working on the algorithm and another connecting the API to make the algorithms work," she said. "It's not just one person needed to make this work, we all come together."

Sun has also worked as a Computer Science Student Ambassador and championed values of service and engagement as a University Scholar Program member. She was a member of

Molly Sun

Women in Computer Science and Rewriting the Code, and she felt her involvement helped promote a more gender-inclusive environment within computer science.

"Sometimes a class will only have a few girls and we're typically separated, so it's hard to build a community," she said. "That's part of why I want to get involved: to build a stronger community."

One place Sun has always felt at home is with the User Experience Department at NC State University Libraries. As a student web developer for three years, she grew within this role, going from solving simple issues on the library website interface to doing backend coding.

"Compared to a project for a class where we submit on a due date and we're done, it's satisfying working on something for a bigger organization as a part of a cycle," she said. "Someone will review it, push it and deploy it; it's something with bigger implications."

Outside of coding for the library and reimaging streaming services, Sun has made many cherished memories. Participating in Hack_NCState, where she and friends built a stock simulation web app and gathering with thousands of others to listen and dance to American Aquarium through the rain at Packapalooza '22 have been highlights.

She encourages new members of the Pack to get involved and to explore their interests early.

"Explore what you like or think you might like, that helped me figure out I liked working in software engineering and that I didn't want to do research as much," she said. "If you never try you won't know if it's meant for you or not." ∎

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