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RESEARCH

2021 – 2022

NC State is the lead institution on a \$9 million, multi-institution National Science Foundation (NSF) grant to research technical challenges in software supply chain security to help build a diverse workforce for the software industry.

As the lead institution, NC State was awarded \$6 million. This project establishes the **Secure Software Supply Chain Center (S3C2)**. It brings together researchers, industry partners and government agencies to develop scientific tools, metrics, data formats, and method to reduce risks with software.

The S3C2 Team is pictured - front row (l-r): **Laurie Williams** and **Yasemin Acar**. Back row (l-r): **Michel Cukier**, **Christian Kästner**, **William Enck**, and **Alexandros Kapravelos**.



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This fall we are celebrating our 55th anniversary - that's more than a half century of performing groundbreaking research along with educating technological leaders for the future.

Research is fundamental to what we do, and our faculty are leaders in their field conducting impactful and pertinent research. We have had 34 National Science Foundation (NSF) CAREER Award recipients, to date. We have ten Institute of Electrical and Electronics Engineers (IEEE) Fellows, and three IEEE Golden Core members. We have three Association for Computing Machinery (ACM) Fellows, and two American Association for Artificial Intelligence Fellows. Additionally, we have numerous recipients of NC State's top research and mentorship award – the Outstanding Research Award - who are also members of NC State's Research Leadership Academy. We even have a member of the National Inventor's Hall of Fame, and a recipient of an Emmy Award from the National Academy of Television Arts and Sciences!

There is exciting news going into the new academic year! Recognizing the significant growth of science, technology, engineering and mathematics (STEM) workforce-dependent industries in our state, the North Carolina legislature has announced a new \$20 million funding initiative titled **Engineering North Carolina's Future**. The initiative will help grow the enrollment of engineering and computer science students at NC State and other engineering programs in the University of North Carolina System.

What will this mean to NC State's CSC department? The goal is for CSC to add about 650 undergraduate and 300 graduate students. And, over the next few years, CSC will grow our tenure-track faculty by 23 (to 68) while adding an additional 10 teaching professors. With these new faculty and students, we will be able to increase the strength of our research and educational offerings. This expansion will further secure CSC's position as the preeminent computer science department in North Carolina, and one of the strongest departments in the nation.

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Research Highlights

Listed below are brief synopses of some of the most notable research projects currently underway in the NC State Computer Science Department. For more information on the department's research activities, please visit csc.ncsu.edu/research.

- NC State is the lead institution on a \$9 million, multi-institution National Science Foundation (NSF) grant to research technical challenges in software supply chain security and to help build a diverse workforce for the software industry.

Modern software is vulnerable to malicious activity, and software professionals must address software supply chain attacks. This project establishes the **Secure Software Supply Chain Center (S3C2)**, bringing together researchers, industry partners and government agencies to develop scientific tools, metrics, data formats and methods to reduce risks with software.

Through education, outreach and training, the project will also foster a diverse workforce of technical leaders and practitioners capable of problem-solving in software supply chain models. Summer programs and new course modules will prepare current and future technical leaders and practitioners to build more secure software.

Three NC State faculty members are on the S3C2 leadership team: **Laurie Williams**, Distinguished University Professor; **William Enck**, professor; and **Alexandros Kapravelos**, Assistant Professor. NC State was awarded \$6 million as the lead institution. Other university partners include Carnegie Mellon University, The George Washington University and the University of Maryland College Park.

- A new coalition that will enhance North Carolina's economy and keep its citizens safe through education, research and outreach work in cybersecurity will benefit from a \$2 million grant from the National Centers of Academic Excellence in Cybersecurity located within the National Security Agency.

The **North Carolina Partnership for Cybersecurity Excellence (NC-PaCE)** will bring eight of North Carolina's universities and community colleges together with public agencies and private-sector businesses to address a growing workforce gap and establish cybersecurity as an economic development tool for the state through education, research, services and outreach. In helping to protect the state's financial and intellectual property assets from cyber threats, the coalition will help drive the state's economy by giving North Carolina businesses the skilled workers, knowledge and support that they need to grow. **Laurie Williams**, Distinguished University Professor, is co-director of the coalition.

- Protecting information technology (IT) and operational technology (OT) networks is crucial to safeguard the manufacturing industry. As part of the SecureAmerica Institute's (SAI) nationwide initiative to empower the U.S. manufacturing enterprise, SAI and partners at NC State and Airgap Inc. are developing technology to resist attacks, detect attacks in progress and ensure an IT/OT system can automatically restore itself to a trusted state. **Munindar Singh**, Alumni Distinguished Graduate Professor, and his partners, Abhi Muthiyar, architect of

Airgap Inc., and Samudra Vijay, president and CEO of SAM Analytic Solutions, are collaborating on a two-fold automated approach for manufacturers to detect and resist cyberthreats.

- New research from NC State offers insight into why Facebook's targeted advertising can sometimes be more like a wild pitch. Facebook has been open about targeting advertising to individual users based on each user's interests. It has also made clear that it infers a user's interests based on that person's activities. However, it hasn't been clear exactly how that process works. PhD student **Aafaq Sabir**, along with assistant professor **Anupam Das** and recent CSC graduate **Evan Lafontaine**, has been studying how Facebook generates its interest profiles for users by performing controlled experiments like creating new accounts and systematically executing numerous planned activities. This enabled researchers to make causal inferences about activities that lead to generating specific interests, many of which were not representative of actual user preferences.

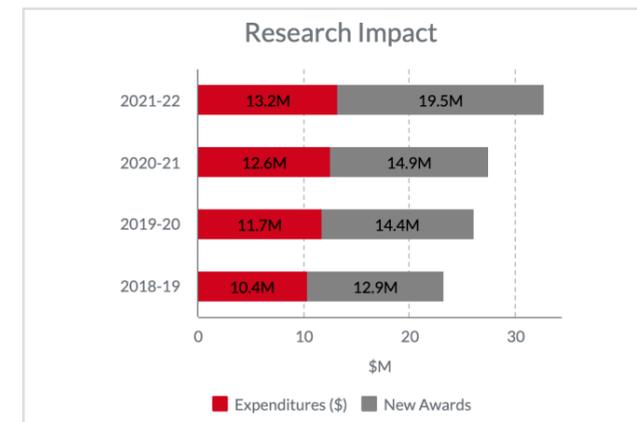
- Are autonomous vehicles (AVs) safe for the highways? **Dr. Munindar Singh**, Alumni Graduate Professor of Computer Science, is part of an interdisciplinary panel of experts that assessed the risks and potential benefits associated with deploying AVs on U.S. roads. Deploying AVs onto public roads is a complex social issue, which touches on everything from ethics to transportation engineering to artificial intelligence programming. Their research predicts that the benefits will substantially outweigh potential harms — but only if the AVs are well regulated.

- Researchers in NC State's Department of Computer Science (CSC) and Department of Electrical and Computer Engineering (ECE) are collaborating with colleagues at other mid-Atlantic universities to help develop quantum simulation devices that can understand, and thereby exploit, the rich behavior of complex quantum systems.

The **Quantum Leap Challenge Institute for Robust Quantum Simulation**, led by the University of Maryland (UMD), brings together computer scientists, engineers and physicists from five academic institutions and the federal government. Funded by a \$25 million award from the National Science Foundation (NSF), researchers in the institute will develop theoretical concepts, design innovative hardware and provide education and training for a suite of novel simulation devices that can predict and understand quantum phenomena. **Frank Mueller**, Professor in NC State's CSC, and **Greg Byrd** and **Huiyang Zhou**, Professors in ECE, will partner with the other awardees of the institute. NC State will receive \$1.125 million from NSF over five years to fund research on auto-generation of approximate quantum circuits and their simulation; verification of quantum simulations; domain-specific quantum software; co-design of simulation for quantum topologies of tomorrow; and education and workforce development in electrical and computer engineering and computer science.

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The department's research productivity continues to grow with more than **\$19.5 million** in new awards, and annual expenditures in the **\$13.2 million** range, both records for the department. Research expenditures for the 2021-22 academic year were up 5.6% over 2020-21 (\$12.6M), and up 7.7% over 2019-20 (\$11.7M). New research awards were up 31% over 2020-21 (\$14.9M), and up 35% over 2019-20 (\$14.4M).



Some of our 2021-2022 research highlights are listed on page two, and a sampling of some of our research projects appears on page four of this newsletter. Please visit our website (csc.ncsu.edu) to learn more about the department, our faculty and staff, and our cutting edge research.

One particular research highlight we are thrilled to announce is that NC State is the lead institution on a \$9 million, multi-institution National Science Foundation (NSF) grant to research technical challenges in software supply chain security to help build a diverse workforce for the software industry. As the lead institution, NC State was awarded \$6 million. This project establishes the **Secure Software Supply Chain Center (S3C2)**. It brings together researchers, industry partners and government agencies to develop scientific tools, metrics, data formats, and method to reduce risks with software. The S3C2 team is made up of **Drs. Laurie Williams, William Enck, and Alexandros Kapravelos** from NC State; Dr. Yasemin Acar from George Washington University, Dr. Michel Cukier from the University of Maryland, and Dr. Christian Kastner from Carnegie Mellon University.

Here are some other research highlights and prestigious honors, awards, and professional accomplishments by our faculty that deserve special recognition:

- The **North Carolina Partnership for Cybersecurity Excellence (NC-PaCE)**, a new coalition that will enhance North Carolina's economy and keep its citizens safe through education, research and outreach work in cybersecurity, is benefitting from a \$2M grant from the National Centers of Academic Excellence in Cybersecurity located within the National Security Agency. **Dr. Laurie Williams**, Distinguished University Professor of Computer Science, is the co-director of the coalition, which is headquartered in NC State's Secure Computing Institute (SCI).



- Dr. Bradley Reaves**, Assistant Professor of Computer Science, has received a **Faculty Early Career Development (CAREER) Award**, from the National Science Foundation to support his project, "Increasing Trust and Reducing Abuse in Telephone Networks." The CAREER Award is one of the highest honors given by NSF to young faculty members in science and engineering. The CSC Department has now had 34 faculty members receive CAREER Awards, to date.
- Dr. Munindar Singh**, Alumni Distinguished Professor of Computer Science, was named a **2021 Fellow of the Association for Computing Machinery (ACM)** for his contributions to artificial intelligence and multiagent systems and their applications in service-oriented and sociotechnical systems. He is the third ACM Fellow in the NC State Computer Science Department joining **Drs. Laurie Williams** (2020) and **Frank Mueller** (2018).
- Dr. James Lester**, Distinguished University Professor of Computer Science, was awarded the **Alexander Quarles Holladay Medal for Excellence**, the highest honor bestowed by NC State University. He was also recognized with NC State's top research and mentorship award, the **Outstanding Research Award** and was inducted into the university's **Research Leadership Academy**.
- The National Center for Women & Information Technology (NCWIT) has named **Dr. Tiffany Barnes**, Distinguished Professor of Computer Science, the recipient of the **2022 Harrold and Notkin Research and Graduate Mentoring Award**. The award recognizes faculty members who distinguish themselves through outstanding research and excellent graduate mentoring, as well as those who recruit, encourage and promote women and minorities in computing.

Finally, preparing well educated students for the workforce is also key to the mission of the department. Our enrollment continues to increase - in fall 2022 we enrolled over 2,500 students in the department - 1,690 undergraduates and 851 graduate students (234 PhD students). In 2021-2022 we awarded 294 undergraduate and 136 graduate degrees. Demand for our graduates continues to remain high with annual salaries for our undergraduates averaging over \$90,000/year, and MS graduates averaging over \$129,000. It's even higher for our PhD graduates. We are one of the top suppliers of new grad talent to companies like IBM, Cisco Systems, NetApp, SAS and other top financial and IT organizations, as well as other high-tech companies.

In conclusion, I'd like to thank you for your continued support of computer science at NC State. We hope you will stay connected with the department through our website, social media channels and our departmental publications.

Gregg Rothermel
Professor and Department Head

Selected Research Projects

AI Institute for Engaged Learning, **James Lester**. **\$19,996,290** by **National Science Foundation**.

Science and Technologies for Phosphorus Sustainability (STEPS) Center, **Jacob Jones, Rada Chirkova**. **\$4,999,334** by **National Science Foundation**.

National Center of Academic Excellence in Cybersecurity (NCSU), **Laurie Williams, William Enck**. **\$2,981,264** by **National Security Agency**.

A Cybersecurity Educational Partnership for the Government Workforce, **Douglas Reeves, Sarah Heckman**. **\$2,748,558** by **National Science Foundation**.

Tools for Natural Language-Based Team Communication Assessment and team Feedback in Collective Synthetic Training Environments, **James Lester, Bradford Mott, Jonathan Rowe, Randall Spain**. **\$2,018,810** by **US Army – Army Research Laboratory**.

Generalizing Data-Driven Technologies to Improve Individualized STEM Instruction by Intelligent Tutors, **Min Chi, Tiffany Barnes, Thomason Price**. **\$1,999,578** by **National Science Foundation**.

Improving Conceptual Knowledge in Upper Elementary Science with Scaffolded Sketch-Based Modeling, **James Lester, Bradford Mott**. **\$1,999,050** by **US Department of Education (DED)**.

Multimodal Visitor Analytics: Investigating Naturalistic Engagement with Interactive Tabletop Science Exhibits, **James Lester, Jonathan Rowe, James Minogue**. **\$1,951,956** by **National Science Foundation**.

Improving Student Learning with Explanation-based Classroom Response Systems, **James Lester, Wookhee Min**. **\$1,599,645** by **National Science Foundation**.

A Personalized Wearable Rehabilitation Sensing System for Stroke Survivors, **Yong Zhu, Xiaogang Hu, Alper Bozkurt, Xu Liu, Xipeng Shen**. **\$1,199,998** by **National Institutes of Health**.

Engaging Rural Students in Artificial Intelligence to Develop Pathways for Innovative Computing Careers, **Bradford Mott, Wookhee Min, Veronica Cateté**. **\$1,166,886** by **National Science Foundation**.

NSF Quantum Leap Challenge Institute for Robust Quantum Simulation, **Frank Mueller, Gregory Byrd, Huiyang Zhou**. **\$1,125,000** by **University of Maryland, College Park**.

Defining Security Policy in Distributed Environments Using Network Views, **William Enck, Bradley Reaves**. **\$1,033,306** by **US Navy – Office of Naval Research**.

Integrating Artificial Intelligence into Upper Elementary Science with Immersive Problem-Based Learning, **James Lester, Bradford Mott**. **\$985,585** by **National Science Foundation**.

Defending Against Emerging Stateless Web Tracking, **Alexandros Kapravelos, Anupam Das**. **\$799,081** by **National Science Foundation**.

Day-Ahead Probabilistic Forecasting of Net-Load and Demand Response Potentials with High Penetration of Behind-the-Meter Solar-plus-Storage, **Xipeng Shen, Wenyan Tang**. **\$750,000** by **US Department of Energy (DOE) – Energy Efficiency & Renewable Energy (EERE)**.

Catalyzing Action-Oriented Academic Communities for Broadening Participation in Computing, **Tiffany Barnes, Veronica Cateté**. **\$652,289** by **National Science Foundation**.

Agricultural Decision Intelligence Modeling System for Human-AI Collaborative Action Elicitation and Improvement (DECIDE-SMARTER), **David Roberts, Michael Kudenov, Cranos Williams, Daniela Jones, Sarah Barnhill**. **\$648,722** by **US Department of Agriculture - National Institute of Food and Agriculture**.

Software-Tailored Architecture for Quantum Co-Design, **Frank Mueller, Huiyang Zhou, Alexander Kemper**. **\$623,408** by **Duke University**.

CAREER: Increasing Trust and Reducing Abuse in Telephone Networks, **Bradley Reaves**. **\$606,848** by **National Science Foundation**.

Enabling Practically Secure Cellular Infrastructure, **William Enck**. **\$601,966** by **National Science Foundation**.

Socially Relevant Computing and Analytics, **Tiffany Barnes, Collin Lynch, Veronica Cateté**. **\$598,913** by **National Science Foundation**.

Elements: Can Empirical SE be Adapted to Computational Science?, **Timothy Menzies**. **\$592,129** by **National Science Foundation**.

CAREER: Web Evolution and Emerging Threats, **Alexandros Kapravelos**. **\$561,188** by **National Science Foundation**.

Engaging Female High School Students in New Frontiers of Computing, **Tiffany Barnes**. **\$555,000** by **National Science Foundation**.

CAREER: Improving Adaptive Decision Making in Interactive Learning Environments, **Min Chi**. **\$547,810** by **National Science Foundation**.

A Framework Managing Data and AI Models for Analyzing and Optimizing Scientific Applications, **Xipeng Shen**. **\$508,977** by **US Department of Energy (DOE)**.

CAREER: WolfPack: An Application-Network Co-Design Framework for Performance-Guaranteed Real-time Applications at the Network Edge, **Ruozhou Yu**. **\$505,702** by **National Science Foundation**.

Foundations of Ethics for Multiagent Systems, **Munindar Singh**. **\$500,000** by **National Science Foundation**.

CAREER: On the Foundations of Semantic Code Search, **Kathryn Stolee**. **\$500,000** by **National Science Foundation**.

Supporting Position Independence and Reusability of Data on Byte-Addressable Non-Volatile Memory, **Xipeng Shen**. **\$499,998** by **National Science Foundation**.

Detecting the 1%: Growing the Science of Vulnerability Detection, **Laurie Williams, Timothy Menzies**. **\$499,998** by **National Science Foundation**.

Formative Feedback for Writing, **Collin Lynch**. **\$499,973** by **Education Testing Service**.

Detecting Vulnerabilities and Remediations in Software Dependencies, **William Enck, Bradley Reaves**. **\$499,928** by **National Science Foundation**.

Towards the Development of a Customizable Fleet of Autonomous Co-Robots for Advancing Aquaculture Production, **Sierra Young, Steven Hall, John-Paul Ore, Celso Castro Bolinaga, Natalie Nelson**. **\$499,245** by **US Department of Agriculture - National Institute of Food and Agriculture**.

New Faculty Profiles



Dr. Alexander Card has joined the department as an Assistant Teaching Professor. His research interests are in computer science and game design education, especially in project-based courses featuring design work, as well as procedural content generation. He received his Ph.D. in 2022 from NC State University.



Dr. Marcelo D'Amorim has joined the department as an Associate Professor. His research interests are in software testing and debugging, runtime verification, artificial intelligence (AI) for software engineering (SE), SE for AI and code repair. He received his Ph.D. in 2007 from the University of Illinois at Urbana-Champaign.



Dr. Adam Gaweda has joined the department as an Assistant Teaching Professor. His research interests are in activity sequences, educational data mining, novel exercise types, training regimens, student modeling, personalized student feedback, and general student attitudes toward computer science. He received his Ph.D. in 2022 from NC State University.



Dr. Zhishan Guo has joined the department as an Associate Professor. His research interests are in real-time scheduling, machine learning (time series prediction and sparse discriminant learning), and cyber-physical systems (autonomous driving and medical). He received his Ph.D. in 2016 from the University of North Carolina at Chapel Hill.



Dr. Jung-Eun Kim has joined the department as an Assistant Professor. Her research interests are in resource/time-dependent machine learning, AI/machine learning for cyber-physical and embedded systems, safety-time-critical systems and real-time multicore systems. She received her Ph.D. in 2017 from the University of Illinois at Urbana-Champaign.



Dr. Sandeep Kuttal has joined the department as an Associate Professor. Her research interests are in human-computer interaction, software engineering, AI, with a focus on the human aspects of software engineering by studying programmer behavior and designing mixed-initiative programmer-computer systems. She received her Ph.D. in 2014 from the University of Nebraska-Lincoln.



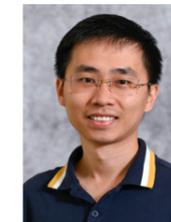
Dr. Jiajia Li has joined the department as an Assistant Professor. Her research interests are in high-performance computing, tensor algorithms, and auto tuning. She received her Ph.D. in 2022 from the Georgia Institute of Technology.



Dr. Xiaorui Liu has joined the department as an Assistant Professor. His research interests are in large-scale machine learning, distributed optimization, trustworthy AI, security and fairness in AI, deep learning on graphs, and graph neural networks. He received his Ph.D. in 2022 from Michigan State University.



Dr. Yuchen Liu has joined the department as an Assistant Professor. His research interests are in networking and wireless systems, mobile computing, machine learning for networking, new communication paradigms, optimization and resilience, software and simulator development for computer networks. He received his Ph.D. in 2022 from the Georgia Institute of Technology.



Dr. Jianqing Liu has joined the department as an Assistant Professor. His research interests are in computer communications and networking with emphasis on MAC- and network-layer design and evaluation, network security, data privacy, low-power Internet-of-Things, and quantum networks. He received his Ph.D. in 2018 from the University of Florida.



Dr. Sterling McLeod has joined the department as an Assistant Teaching Professor. His research interests are in robot motion planning, software testing for robotics, and computer science education. He received his Ph.D. in 2019 from the University of North Carolina at Charlotte.



Dr. Sharma Valliyil Thankachan has joined the department as an Associate Professor. His research interests are in string algorithms, compressed data structures and bioinformatics. He received his Ph.D. in 2014 from Louisiana State University.



Dr. Dongkuan (DK) Xu has joined the department as an Assistant Professor. His research interests are in parameter efficiency (network pruning), data efficiency (few-shot learning), and computation efficiency (weight-sharing learning); domains (natural language understanding), and applications. He received his Ph.D. in 2019 from the Pennsylvania State University.



Dr. Man-Ki Yoon has joined the department as an Assistant Professor. His research interests are in security of safety-critical cyber-physical systems, real-time embedded computing, and accountable computing for autonomous systems. He received his Ph.D. in 2017 from the University of Illinois at Urbana-Champaign.

Researchers*

Tiffany Barnes, Distinguished Professor
PhD, NC State University, 2003

Educational data mining, serious games for education, health and energy, broadening computing participation

Donald Bitzer, Distinguished University Research Professor
PhD, University of Illinois, 1960

Convolutional codes, signal processing for biological systems, computer-based education

Franc Brglez, Visiting Research Professor
PhD, University of Colorado, 1970

Distributed and collaborative workflows, databases, and groupware for the Internet

Veronica Catete, Assistant Professor
PhD, NC State University, 2018

Advance learning technologies, computer and video games, graphics, human computer interaction, and user experience, software engineering and programming languages

Min Chi, Associate Professor
PhD, University of Pittsburgh, 2009

Machine learning, artificial intelligence, cognitive science and learning science

Rada Y. Chirkova, Professor
PhD, Stanford University, 2002

Database performance, query-processing efficiency, data sciences

Marcelo D'Amorim, Associate Professor
PhD, University of Illinois at Urbana-Champaign, 2007

Software testing and debugging, runtime verification, artificial intelligence (AI) for software engineering (SE), SE for AI, code repair

Anupam Das, Assistant Professor
PhD, University of Illinois, 2016

Data science

Rudra Dutta, Professor and Associate Department Head
PhD, NC State University, 2001

Network design: optical, wireless sensor and mesh networks; future Internet design

William Enck, Professor
PhD, The Pennsylvania State University, 2011

Systems security, mobile operating systems security

Edward Gehringer, Professor
PhD, Purdue University, 1979

Memory management, object-oriented software systems, computer-aided education

Xiaohui (Helen) Gu, Professor
PhD, University of Illinois, 2004

Distributed systems, operating systems, computer networks

Zhishan Guo, Associate Professor
PhD, University of North Carolina, Chapel Hill, 2016

Real-time scheduling theory, machine learning theory, and their applications to Cyber-Physical Systems

Khaled Harfoush, Associate Professor
PhD, Boston University, 2002

Computer networking, Internet measurements, peer-to-peer systems, routing protocols

Christopher G. Healey, Goodnight Distinguished Professor
PhD, University of British Columbia, Canada, 1996

Visualization and computer graphics: methods for rapidly, accurately, effectively visualizing large complex datasets

Steffen Heber, Professor
PhD, Universität Heidelberg, Germany, 2001

Algorithms to compare and analyze gene order permutations, animation development for bioinformatics education

Arnav Jhala, Associate Professor
PhD, NC State University, 2009

Artificial intelligence, storytelling in games, intelligent machinima generation, smart graphics, and intelligent user interfaces

Guoliang Jin, Assistant Professor
PhD, University of Wisconsin-Madison, 2014

Architecture and operating systems, parallel and distributed systems, software engineering and programming languages

Alexandros Kapravelos, Associate Professor
PhD, University of California-Santa Barbara, 2015

Systems and software security

Thierry Ketchizo Wandji, Director of Cybersecurity Education
PhD, George Washington University, 2015

Cybersecurity research and education

Jung-Eun Kim, Assistant Professor
PhD, University of Illinois at Urbana-Champaign, 2017

Resource-/time-dependent machine learning, AI/machine learning for cyber-physical and embedded systems, safety-/time-critical systems, and embedded multicore systems

Sandeep Kuttal, Associate Professor
PhD, University of Nebraska-Lincoln, 2014

Human-computer interaction, software engineering, artificial intelligence, end-user programming, gender studies, and empirical evaluations

James C. Lester, Distinguished University Professor
PhD, University of Texas, 1994

Artificial intelligence, intelligent user interfaces, intelligent tutoring systems, computational linguistics

Jiajia Li, Assistant Professor
PhD, Georgia Institute of Technology, 2018

High performance computing

Jianqing Liu, Assistant Professor
PhD, University of Florida, 2018

Cyber security, embedded and real-time systems, networking and performance evaluation

Xiaorui Liu, Assistant Professor
PhD, Michigan State University, 2022

Large-scale distributed optimization, machine learning on graphs, and robust and secure machine learning

Xu Liu, Associate Professor
PhD, Rice University, 2014

Program analysis in high performance computing systems

Yuchen Liu, Assistant Professor
PhD, Georgia Institute of Technology, 2022

Embedded and real-time systems, networking and performance evaluation, scientific and high performance computing

Collin Lynch, Associate Professor
PhD, University of Pittsburgh, 2014

Graph-based educational data mining, development of robust intelligent tutoring systems, adaptive educational systems for ill-defined domains

Chris Martens, Assistant Professor
PhD, Carnegie Mellon University, 2015

Formal methods for creative media, game design, believable virtual agents, collaborative digital storytelling, simulation modeling

Noboru Matsuda, Associate Professor
PhD, University of Pittsburgh, 2005

Technology innovation and integration to advance the sciences of learning

Tim Menzies, Professor
PhD, University of New South Wales, 1995

Artificial intelligence, data-mining and search-based software engineering

Bradford Mott, Senior Research Scientist
PhD, NC State University, 2006

Artificial intelligence, game-based learning environments, computational models of interactive narrative

Frank Mueller, Professor
PhD, Florida State University, 1994

Compilers and code optimization, concurrent and distributed, real-time and embedded systems

Kemafor Anyanwu Ogan, Associate Professor
PhD, University of Georgia, 2007

Semantic computing: semantic Web, databases, data mining, information retrieval, services computing

John-Paul Ore, Assistant Professor
PhD, University of Nebraska-Lincoln, 2019

Software engineering, robotics, program analysis, and system testing using high-resolution physical simulators

Chris Parnin, Associate Professor
PhD, Georgia Institute of Technology, 2014

Graphics and computer interaction, software engineering, programming languages

Thomas Price, Assistant Professor
PhD, NC State University, 2018

Computing education, intelligent tutoring systems, educational data mining, and novice programming environments

Michael Rappa, Distinguished University Professor
PhD, University of Minnesota, 1987

Analytics, e-commerce, open courseware, open educational content, technology management

Bradley Reaves, Assistant Professor
PhD, University of Florida, 2017

Measuring and improving the security and privacy of computer systems, with emphasis on telephony networks and software for mobile platforms

David Roberts, Associate Professor
PhD, Georgia Institute of Technology, 2010

Machine learning and artificial intelligence and their application to interactive technological experiences

Gregg Rothermel, Professor and Department Head
PhD, Clemson University, 1985

Software engineering and program analysis with emphases on the application of techniques to problems in software maintenance and testing, end-user software engineering, and empirical studies.

George N. Rouskas, Alumni Distinguished Graduate Professor
PhD, Georgia Institute of Technology, 1994

Network architectures and protocols, optical networks, grid computing

Alessandra Scafuro, Assistant Professor
PhD, University of Salerno, 2013

Cryptography, secure computation

Muhammad Shahzad, Associate Professor
PhD, Michigan State University, 2015

Embedded and real-time systems, networking and performance evaluation, cyber security

Don Sheehy, Associate Professor
PhD, Carnegie Mellon University, 2011

Computational geometry and topological data analysis

Xipeng Shen, Professor
PhD, University of Rochester, 2006

Architecture and operating systems, extreme-scale data-intensive computing

Munindar Singh, Alumni Distinguished Graduate Professor
PhD, University of Texas, 1993

Multiagent systems, intelligent agents, service-oriented computing, agent languages and protocols

Matthias Stallmann, Professor
PhD, University of Colorado, 1982

Algorithm design and analysis of serial and parallel models of computation

Kathryn Stolee, Associate Professor
PhD, University of Nebraska-Lincoln, 2013

Program analysis, empirical software engineering and crowdsourcing

Sharma Thankachan, Associate Professor
PhD, Louisiana State University, 2014

Algorithms and theory of computation

Ranga Raju Vatsavai, Professor (joint apt. w/ORNL)
PhD, University of Minnesota, 2008

Advanced data sciences, geospatial analytics

Mladen Vouk, Distinguished Professor
PhD, King's College, England, U.K., 1976

Software engineering, scientific computing, computer-based education, cloud computing, data science

Benjamin Watson, Associate Professor
PhD, Georgia Institute of Technology, 1997

Relationships between computer graphics and design

Laurie Williams, Distinguished University Professor
PhD, University of Utah, 2000

Agile software processes, software security, open software systems, healthcare information technology

Dongkuan Xu, Assistant Professor
PhD, The Pennsylvania State University, 2022

Efficient artificial intelligence, including parameter, data, and computation efficiency.

Man-Ki Yoon, Assistant Professor
PhD, University of Illinois at Urbana-Champaign, 2017

Trustworthy computing for cyber-physical systems, real-time embedded computing, internet-of-things, and accountable computer systems

Ruozhou Yu, Assistant Professor
PhD, Arizona State University, 2019

Computer networks, distributed systems, and cybersecurity

Teaching Professors

Bitu Akram, Assistant Teaching Professor
PhD, NC State University, 2019

Advanced learning technologies, and improving access and quality of computer science education

Suzanne Balik, Assistant Teaching Professor
PhD, NC State University, 2014

Graphics, human computer interaction

Lina Battestilli, Associate Teaching Professor
PhD, NC State University, 2005

Computer science education, cloud computing and datacenter networks, networking architecture

Alexander Card, Assistant Teaching Professor
PhD, NC State University, 2022

Game design

Ignacio Dominguez, Assistant Teaching Professor
PhD, NC State University, 2018

Human behavior in video games and virtual environments that can be used to identify, predict, and influence behavior and decision-making

Adam Gaweda, Assistant Teaching Professor
PhD, NC State University, 2022

Artificial intelligence and intelligent agents

Sarah Heckman, Alumni Distinguished Undergraduate Teaching Professor
PhD, NC State University, 2009

Computer science and software engineering education, open educational resources

Jamie Jennings, Assistant Teaching Professor
PhD, Cornell University, 1995

Theory, programming languages, software engineering, robotics, and artificial intelligence

Shuyin Jiao, Assistant Teaching Professor
PhD, University of Houston, 2015

Program Analysis and computer education

Jason King, Associate Teaching Professor
PhD, NC State University, 2016

Logging for user accountability, nonrepudiation and forensicability

Sterling McLeod, Assistant Teaching Professor
PhD, University of North Carolina at Charlotte, 2019

Artificial intelligence, robotics, and operating systems

Jessica Young Schmidt, Associate Teaching Professor
PhD, NC State University, 2012

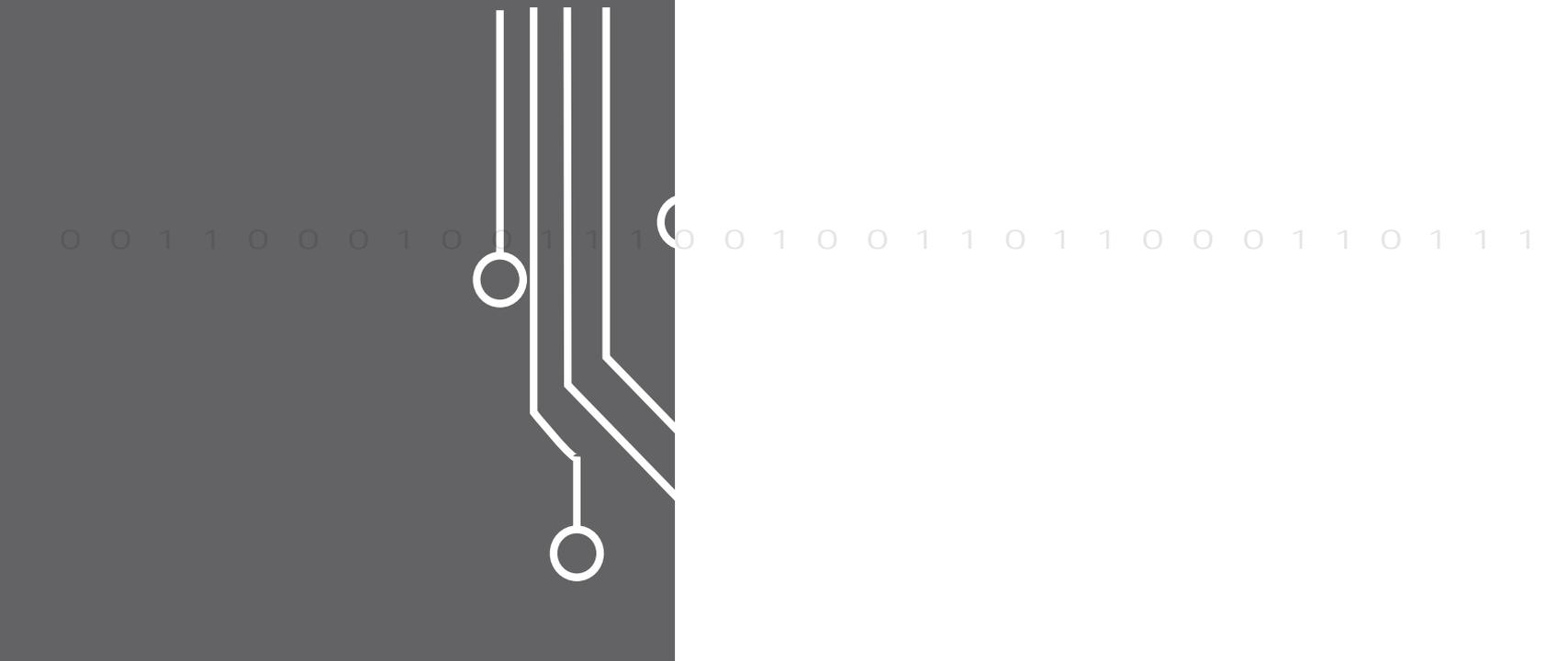
Scholarship of teaching and learning

David Sturgill, Associate Teaching Professor
PhD, Cornell University, 1996

Parallel computation and its application to computationally hard problems, parallelism, machine learning intelligence



*List includes 2021-22 faculty and faculty promotions.



Computer Science Research

Our key research areas are in:

- **Artificial Intelligence and Theory** including Intelligent Agents, Machine Learning, Knowledge Representation, Planning, Natural Language Processing, Computational Economics and Management, Algorithms, Theory of Computation
- **Computational Applications and Analytics** including Data Intensive Computing, Scientific Computing, Bioinformatics, Data/Text Mining, Information Visualization, HealthCare Information Technology, Analytics Clouds, Data Science
- **Games, Interaction, and Education Informatics** including Games, Human-Computer Interaction, Graphics, Intelligent Tutoring, Undergraduate Education in Computing
- **Cybersecurity** including Information Assurance, Privacy, Policies, Regularity Compliance, Networking and Performance Evaluation, Web Security, Mobile Security, Crypto, Internet of Things
- **Networks** including Software and Network Systems Security, Performance Analysis, Wireless and Mobile Networking, Network Analytics, Internet of Things, Internet Architecture and Protocols
- **Software Engineering** including Requirements, Formal Methods, Policies, Reliability Engineering, Process and Methods, Programming Languages, Testing and Verification
- **Systems** including Computer Architectures and Operating Systems, Databases, Embedded and Real-Time Systems, Parallel and Distributed Systems, High Performance Computing, Cloud Computing

NC State University is a Tier 1 research institute, and with 13 research centers and more than 35 research labs and groups, research is at the very core of the NC State Computer Science Department's mission.

NC STATE Engineering

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Editor: Ken Tate; Associate Editor: Tammy Coates

1,250 copies of this document were printed at a cost of \$1,560.

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