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.
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 (www.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 $9.5 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 Institute (SSCSI). It brings together researchers, industry partners and government agencies to develop scientific tools, metrics, data formats, and method to reduce risks with software. The SSCSI team is made up of Drs. Laurie Williams, William Enck, and Alexandros Kapravelos from NC State; Dr. Yaserin 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) will bring eight of North Carolina's universities and community colleges together with public agencies and private-sector businesses to work on a multi-institutional effort to help the state's economy. The program is funded by a $9.5 million grant from the National Science Foundation (NSF). The goals of the program are to create a cybersecurity workforce that can meet the needs of the state’s manufacturing enterprises and small businesses.

- Protecting information technology (IT) and operational technology (OT) is crucial to safeguard the manufacturing industry. As part of the coalition, 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.

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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 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 2019-2020 ($11.7M). New research awards were up 31% over 2020-21 ($14.9M), and up 35% over 2019-20 ($14.4M).

- For more information on the department's research activities, please visit csc.ncsu.edu/research.
Selected Research Projects

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

Science and Technologies for Phosphorus Sustainable (STEPS) Center. Jacob Jones, Rada Chirikova. $4,999,334 by National Science Foundation.


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


Generating Data Driven Technologies to Improve Individualized STEM Instruction by Intelligent Tutor. Min Chi, Tiffany Barnes, Thomason Price. $1,998,578 by National Science Foundation.


Improving Student Learning with Explanation-Based Classroom Response Systems. James Lester, Woomeek Min. $1,599,645 by National Science Foundation.


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


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


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

Elements: Can EMERALD Be Adapted to Computational Science?. Timothy Menzies. $952,129 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.


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-Volume Memory. Xipeng Sheng. $499,998 by National Science Foundation.

Detecting the 1%: Growing the Science of Vulnerability Detection, Laurie Williams, Timothy Menzies. $499,999 by National Science Foundation.


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


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 AI, deep learning on graphs, and graph neural networks. 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, data mining 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 Gao has joined the department as an Associate Professor. His research interests are in real-time scheduling, machine learning (binary, context 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 network-layer design and evaluation, network security, 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 robotic motion planning, computer vision, and computer science education. He received his Ph.D. in 2019 from the University of North Carolina at Charlotte.

Dr. Sharma Valliyth Thanakshan has joined the department as an Associate Professor. His research interests are in machine learning, AI/machine learning for cyber-physical and embedded systems, safety-critical systems and real-time multisystem 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. His research interests are in human-computer interaction, software engineering, AI, with a focus on the human cognition of software engineering for designing intelligent development tools. He received his Ph.D. in 2018 from the University of Nebraska-Lincoln.

Dr. Jiale 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. Xianlu Liu has joined the department as an Assistant Teaching Professor. His research interests are in network and wireless systems, mobile computing, and networking 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. Yukun 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, privacy, low-power Internet-of-Things and quantum networks. He received his Ph.D. in 2018 from the University of Florida.

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 communication efficiency (weight sharing learning); domains (natural language understanding, computer vision, etc.). He received his Ph.D. in 2019 from the Pennsylvania State University.

Dr. Man-Ki Youn 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 2021 from the University of Illinois at Urbana-Champaign.
Researchers

Tillit Barnes, Distinguished Professor
PhD, NC State University, 1992
Educational data mining, serious games for education, health and energy, broadening computing participation

Donald Bitner, Distinguished University Research Professor
PhD, University of Illinois, 1989
Computational social science, application of biological systems, computer-based education

Franc Bogla, Visiting Research Professor
PhD, University of Colorado, 1979
Distributed and collaborative social science databases, data mining and user interfaces for the Internet

Vassila Christa, Assistant Professor
PhD, University of North Carolina, 2018
Human-computer interaction, advanced learning technologies

Raja Y. Chokra, Professor
PhD, Stanford University, 2000
Database performance, query processing efficiency, data sciences

MembreZ A. O'Brien, Associate Professor
PhD, University of Illinois at Urbana-Champaign, 2007
Software engineering, security, and cloud computing

Milo“ Chi, Assistant Professor
PhD, University of Pittsburgh, 2009
Machine learning, artificial intelligence, cognitive science and learning science

Alexandros Kapravelos, Associate Professor
PhD, University of California-Davis, 2015
Systems and software security

Thiery Kembem-Undjo, Director of Cybersecurity Education
PhD, George Washington University, 2015
Cybersecurity research and education

Jang-Gun Kim, Assistant Professor
PhD, University of Illinois at Urbana-Champaign, 2017
Resource-based intelligent machine learning, Artificial intelligence for physical and embedded systems, safety-critical systems, and embedded multicoresystems

Sandhya Kuttam, Assistant Professor
PhD, University of Nebraska-Lincoln, 2014
Human-computer interaction, automation engineering, artifical intelligence, end-user programming, gender studies, and empirical evaluations

James C. Levine, Distinguished University Professor
PhD, University of Texas, 1984
Artificial intelligence, computer-human interaction, intelligent tutoring systems, computational linguistics

Jaeil Lim, Assistant Professor
PhD, Georgia Institute of Technology, 2018
High-performance computer science

Jianguo Liu, Assistant Professor
PhD, University of Illinois, 2011
Cybersecurity, embedded and real-time systems, networking and performance evaluation

Xiaolei Liu, Assistant Professor
PhD, University of Illinois, 2016
Large-scale distributed optimization, machine learning on graphs, and robust and secure machine learning

Xu Liu, Associate Professor
PhD, Rice University, 2016
Program analysis in high performance computing systems

Yasunari Liu, Assistant Professor
PhD, Georgia Institute of Technology, 2022
Embedded and real-time systems, re-modeling and performance evaluation of scientific and high-performance computing

Collin Lynch, Associate Professor
PhD, University of Pennsylvania, 2013
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

Roberta Matsuda, Associate Professor
PhD, University of Illinois at Urbana-Champaign, 2012
Technology innovation and advancement to the science of learning

Tom Menzies, Professor
PhD, New South Wales, 1990
Artificial intelligence, computer science, and computational learning

Bradford Mitt, Senior Research Scientist
PhD, NC State University, 2007
Artificial intelligence, game-based learning environments, computational models of interaction

Frank Mueller, Professor
PhD, Florida State University, 1984
Compliance and cost optimization, concurrent and distributed real-time and embedded systems

Kenneth Arpanov Ogen, Assistant Professor
PhD, University of Georgia, 2007
Semantic computing, semantic web, databases, data mining, information retrieval, software composition, and software development

John Paul Ote, Assistant Professor
PhD, University of Wisconsin-Madison, 2019
Software engineering, robotics, program analysis, and system testing using high-resolution physical simulations

Chris Parme, 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 systems for mobile platforms

David Roberts, Associate Professor
PhD, Georgia Institute of Technology, 2010
Machine learning and artificial intelligence and their application to interactive technological environments

Gregg Rutherford, Professor and Department Head
PhD, Clemson University, 1985
Software engineering and program analysis with emphasis on the application of techniques in software maintenance and testing, and user software engineering, and empirical studies

George W. Rojas, Alumni Distinguished Graduate Professor
PhD, Georgia Institute of Technology, 1984
Network architecture and protocols, optical networks,grid computing

Alexandra Scarfino, Assistant Professor
PhD, University of Salerno, 2013
Cryptography, secure computation

Muhammad Shafique, Associate Professor
PhD, Michigan State University, 2015
Embedded and real-time systems, networking and performance evaluation, cyber security

Don Shehory, Associate Professor
PhD, Carnegie Mellon University, 1990
Computational geometry and topological data analysis

Xiaoye Shen, Associate Professor
PhD, University of Rochester, 2006
Algorithm theory, complexity, and applications
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Xiaorui Liu, Assistant Professor
PhD, Georgia Institute of Technology, 2018
Large-scale distributed optimization, machine learning on graphs, and robust and secure machine learning

Yuchen Liu, Associate Professor
PhD, Georgia Institute of Technology, 2018
Program analysis in high performance computing systems

Xiaolong Liu, Associate Professor
PhD, University of Illinois, 2011
Large-scale distributed optimization, machine learning on graphs, and robust and secure machine learning

Yuchen Liu, Associate Professor
PhD, Georgia Institute of Technology, 2018
Program analysis in high performance computing systems

Yixin Liu, Assistant Professor
PhD, University of Illinois, 2011
Large-scale distributed optimization, machine learning on graphs, and robust and secure machine learning

Veronica Catete, Assistant Professor
PhD, University of Nebraska-Lincoln, 2019
Advance learning technologies, computer and video games, graphics, human computer interaction, and user experience, software engineering and programming languages

Sandeep Kuttal, Associate Professor
PhD, University of Nebraska-Lincoln, 2014
Artificial intelligence, computer-human interaction, intelligent tutoring systems, computational linguistics

Laurie Williams, Distinguished University Professor
PhD, University of Utah, 2000
Apt software processes, software security, open systems, healthcare information technology

Douglas Yu, Assistant Professor
PhD, The Pennsylvania State University, 2022
3D web art and digital humanities, including parameters, data, and computation efficiency

Max Xi Yeon, Assistant Professor
PhD, University of Illinois at Urbana-Champaign, 2017
Threat analysis for cyber-physical systems, real-time embedded computing, internet of things, and dependable computer systems

Shruthi Yu, Assistant Professor
PhD, Arizona State University, 2019
Computer networks, distributed systems, and cybersecurity

Teaching Professors

Bita Akram, Assistant Teaching Professor
PhD, NC State University, 2017
Advanced learning technologies, and improving access and quality of computer science education

Suzanne Babb, Assistant Teaching Professor
PhD, NC State University, 2014
Game design, human-computer interaction

Lina Battistelli, Assistant Teaching Professor
PhD, NC State University, 2005
Computer science education, cloud computing and datacenter networks, networking and distributed systems

Alexandros Kapravelos, Assistant Professor
PhD, NC State University, 2007
Game design

Ignatios Dimounguete, Assistant Teaching Professor
PhD, North Carolina State University, 2015
Human behavior in video games and virtual environments that can be used to identify, predict, and inform behavior and decision making

Adam Gaweda, Assistant Teaching Professor
PhD, NC State University, 2022
Artificial intelligence and intelligent agents

Jonathan Williams, Distinguished University Teaching Professor
PhD, NC State University, 2001
Computer science and software engineering education, open educational resources

Jenny Jengst, Assistant Teaching Professor
PhD, North Carolina State University, 2014
Programming theory, programming languages, software engineering, robotics, and artificial intelligence

Juan Xue, Assistant Teaching Professor
PhD, University of Houston, 2015
Program analysis and program education

Jaeck King, Associate Teaching Professor
PhD, North Carolina State University, 2014
Legacies of poverty, inequality, and femininity

Stephen L. Parker, Assistant Teaching Professor
PhD, University of North Carolina at Charlotte, 2010
Trustworthy computing for cyber-physical systems, real-time embedded computing, internet of things, and dependable computer systems

Laurie Williams, Distinguished University Professor
PhD, University of Utah, 2000
Apt software processes, software security, open systems, healthcare information technology

Douglas Yu, Assistant Professor
PhD, The Pennsylvania State University, 2022
3D web art and digital humanities, including parameters, data, and computation efficiency

Max Xi Yeon, Assistant Professor
PhD, University of Illinois at Urbana-Champaign, 2017
Threat analysis for cyber-physical systems, real-time embedded computing, internet of things, and dependable computer systems

Shruthi Yu, Assistant Professor
PhD, Arizona State University, 2019
Computer networks, distributed systems, and cybersecurity

* List includes 2021-22 faculty and faculty promotions.

www.csc.ncsu.edu
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


• **Software Engineering** including Requirements, Formal Methods, Policies, Reliability Engineering, Process and Methods, Programming Languages, Testing and Verification


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.