

0 0 1 1 0 0 0 1 0 0 1 1 1 0 0 1 0 0 1 1 0 1 1 0 0 0 1 1 0 1 1 1

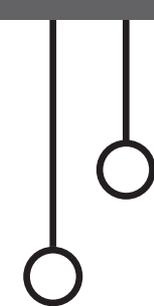
# RESEARCH

2020 – 2021

NC State was recently recognized as the **#1 institution worldwide for Computer Science Education (CSEd) research** based on publication data collected between 2015-2020 and presented at the 2021 SIGCSE Technical Symposium on Computer Science Education.

The ranking was based on factors including publications by institution, participation in doctoral consortia and participation as contributors to computer science education.

NC State generated 73 CSEd research publications between 2015 and 2020, coming from 32 unique authors. Additionally, NC State was tied for having the second highest student participation in doctoral consortiums worldwide.



## INSIDE:

- Highlights
- Projects
- Faculty Profiles

The NC State Computer Science (CSC) Department is home to 13 research centers, and more than 35 research labs and groups. This issue of the Research Newsletter contains a snapshot of the Department's research activities during the last fiscal year. We would love to feature all of our research, but space simply will not allow.

Conducting impactful and pertinent research, along with providing the best possible education to our students, remain key to the mission of the CSC Department. We have a highly accomplished faculty that are well known in their areas of research. Our key research areas are in Theory (Algorithms, Theory of Computation), Systems (Computer Architectures and Operating Systems, Embedded and Real-Time Systems, Parallel and Distributed Systems, Scientific and High Performance Computing), Artificial Intelligence (Intelligent Agents; Data-Mining, Information and Knowledge Discovery, Engineering and Management; eCommerce Technologies;

Information Visualization, Graphics and Human-Computer Interaction), Networks (Networking and Performance Evaluation), Security (Software and Network Systems Security, Information Assurance, Privacy), Software Engineering (Requirements, Formal Methods, Reliability Engineering, Process and Methods, Programming Languages), and Computer-Based Education.

Research expenditures of 2020-21 totalled over \$12.5M, while new research awards totalled over \$14.9M, both new records for the department. Research expenditures for the 2020-2021 academic year were up 7.5% over 2019-20 and up 20.6% over 2018-19.

Some of our 2020-21 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](http://csc.ncsu.edu)) to learn more about the department, our faculty and staff, and our state-of-the-art research.

*(continued on page 3)*

# Research Highlights

- The National Science Foundation (NSF) announced that NC State will lead a new research initiative aimed at creating artificial intelligence (AI) tools to advance human learning and education to a wide variety of audiences. **Dr. James Lester**, Distinguished University Professor of Computer Science, is the principal investigator for the new **NSF AI Institute for Engaged Learning**. The institute will be supported by a five-year, \$20 million grant from the NSF.

The investment is part of a broader effort by NSF to advance our understanding of AI technologies and how they can drive innovation to address real-world challenges. In addition to NC State, the new institute will include researchers from Indiana University, the University of North Carolina at Chapel Hill, Vanderbilt University and the educational non-profit organization Digital Promise.

- NC State was recently recognized as the **#1 institution Worldwide for Computer Science Education (CSEd) research** based on publication data collected between 2015-2020 and presented at the 2021 SIGCSE Technical Symposium on Computer Science Education. The ranking was based on factors including publications by institution, participation in doctoral consortia and participation as contributors to computer science education.

The paper presented at the 2021 SIGCSE Technical Symposium on Computer Science Education, "Where is Computer Science Education Research Happening?" analyzed 1,099 publications from 2015 to 2020 that were collected from the Innovation and Technology in Computer Science Education (ITiCSE) and ACM International Computing Education Research (ICER) conferences, and from the ACM Transactions on Computing Education (TOCE) journal. ITiCSE and ICER are two major international conferences, and TOCE is a leading journal in CSEd. However, the ITiCSE and ACM ICER conferences are not the only conferences where the department's faculty members publish. The faculty publishes papers in many other noteworthy conferences and publications.

From this analysis, researchers found that NC State produced the greatest count of publications, generating 73 CSEd research publications between 2015 and 2020 coming from 32 unique authors. Additionally, NC State was tied for having the second-highest student participation in doctoral consortiums worldwide.

- Global technology leader **Cisco Systems** and the NC State Department of Computer Science have long enjoyed a deep and sustained partnership over the decades. The partnership took a giant step forward in 2020 as Cisco made a \$250,000 unrestricted lead gift via the Silicon Valley Community Foundation in support of **Dr. Laurie Williams** and the **Secure Computing Institute at NC State**. In particular, the unrestricted gift provides foundational funding to support the department's mission to increase its role as a national leader in cybersecurity education and research, which has been forged by Williams, Distinguished University Professor in the department, and fellow CSC faculty members, Drs. William Enck, Douglas Reeves and Sarah Heckman.
- Three assistant professors in the NC State Computer Science Department have received a **Faculty Early Career Development Award**, also known as the CAREER Award, from the National Science Foundation (NSF). The award, one of the highest honors given by NSF to young faculty members in science and engineering, was received by **Drs. Alexandros Kapravelos, Christopher Pamin, and Ruozhou Yu**. The CSC Department has now had 34 faculty receive CAREER Awards, to date.
- Hang bugs – when software gets stuck, but doesn't crash – can frustrate both users and programmers, taking weeks for companies to identify and fix. **Dr. Helen Gu**, professor of computer science, and other researchers from NC State have developed an automated program, called HangFix, that can spot and fix the problems in seconds. HangFix detects hang bugs, diagnoses the relevant problem and applies a patch that corrects the root cause of the error. The researchers tested a prototype of HangFix against 42 realworld hang bugs in 10 commonly used cloud server applications. The bugs were drawn from a database of hang bugs that programmers discovered affecting various websites. HangFix fixed 40 of the bugs in seconds.
- **Dr. Laurie Williams** has been named a **Distinguished University Professor**. She is co-director of the NC State Science of Security Lablet, the Secure Computing Institute and the North Carolina Partnership for Cybersecurity Excellence (NC-PaCE). Williams was also named a **2020 Association for Computing Machinery (ACM) Fellow**. She is the second ACM Fellow in the CSC Department at NC State, joining **Dr. Frank Mueller** who became a Fellow in 2018.

(continued from page 1)

Below are some selected highlights and numerous prestigious and professional accomplishments by our faculty and staff that deserve special recognition:

- The UNC Staff Assembly presented **Dr. Veronica Cateté**, a computer science research scientist, with the **2020 Erskine Bowles Staff Service Award**. Recipients exemplify excellence in their professional interactions and customer service within their university employment; provide extraordinary service to their campus and the UNC System outside their job description; and provide exemplary service to their surrounding community. Cateté is the first recipient of this award from NC State. Cateté was also named one of two **NC State College of Engineering's 2021 Awards for Excellence** recipients.
- **Dr. Lina Battestilli**, teaching associate professor, was named one of five **2020-2021 Faculty Fellows by NC State's Digital Education and Learning Technology Applications (DELTA)** program. The main goal of the program is to promote excellence in teaching with technology by fostering the exchange of ideas and interdisciplinary partnerships.
- **Dr. Lina Battestilli** was also recently presented the NC State Computer Science Department's **2020-2021 "Person of Exceptional Performance" (PEP) Award**. She was recognized for her dedication to teaching and research, and for her passion and commitment to establishing and maintaining a diverse computer science community at NC State.
- **Dr. Munindar Singh**, Alumni Distinguished Graduate Professor of Computer Science, recently became NC State's **first Elected Foreign Member of Academia Europaea**. Academia Europaea is the Pan-European Academy of Sciences, Humanities and Letters. Singh was elected a member of the Informatics section for his distinguished contributions to computer science, especially in decentralized AI, multiagent systems, and service-oriented computing.
- **Dr. Munindar Singh** was also recently elected a **Fellow of the American Association for the Advancement of Science (AAAS)**, for his distinguished contributions to the field of computer science, particularly to foundations of multiagent systems and their applications in service-oriented computing, sociotechnical systems and governance.



- **Dr. Munindar Singh** was also recently presented with the **NC State Outstanding Graduate Mentor Award** in the area of Mathematical Sciences, Physical Sciences, and Engineering.
- **Dr. Tiffany Barnes**, professor of computer science, has been named a **2020 Distinguished Member of the Association for Computing Machinery (ACM)** for her outstanding educational contributions to computing.
- The ACM Symposium on Cloud Computing 2020 (SoCC '20) recently awarded **Dr. Helen Gu**, professor of computer science, and her co-authors the **10-Year Best Paper Award** for their paper "CloudScale: Elastic Resource Scaling for Multi-Tenant Cloud Systems."
- **Dr. William Enck**, associate professor of computer science, along with his fellow researchers recently won the **2020 ACM Special Interest Group in Operating Systems (SIGOPS) Hall of Fame Award**.

Producing well educated students who are prepared for the workforce is also key to the mission of the department. Our graduates continue to be in high demand with annual salaries for our undergraduates averaging over \$83,000/year, the highest median salary of all NC State departments in December 2021. MS graduates reported annual salaries averaging \$112,000, and it's even higher for our PhD graduates. Our students are recruited and hired by companies like IBM, Cisco Systems, NetApp, SAS and other top financial and IT organizations, as well as other high-tech companies.

The year 2021 will be yet another year that will be long-remembered by NC State's faculty, staff and students, and even though challenges remain, I can say with confidence that the CSC Department's dedication to cutting-edge research and commitment to academic excellence will remain central to our mission.

Thank you for your continued support of the Department, the College of Engineering, and NC State University!

Dr. Gregg Rothermel  
Professor and Department Head

# Selected Research Projects

*AI Institute for Engaged Learning*, **James Lester**. **\$19,996,290** 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**. **\$2,748,558** 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**.

*Building a Computational Thinking Foundation in Upper Elementary Science with Narrative-Centered Maker Environments*, **Bradford Mott, James Minogue, Kevin Oliver**. **\$1,599,339** by **National Science Foundation**.

*Augmented Cognition for Teaching: Transforming Teacher Work with Intelligent Cognitive Assistants*, **James Lester, Bradford Mott**. **\$1,499,736** 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**. **\$1,198,348** by **US Department of Agriculture (USDA) – National Institute of Food and Agriculture**.

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

*Primary AI: Integrating Artificial Intelligence into Upper Elementary Science with Immersive Problem-Based Learning*, **James Lester, Bradford Mott**. **\$985,585** 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, Wenyuan Tang**. **\$750,000** by **US Department of Energy (DOE) – Energy Efficiency & Renewable Energy (EERE)**.

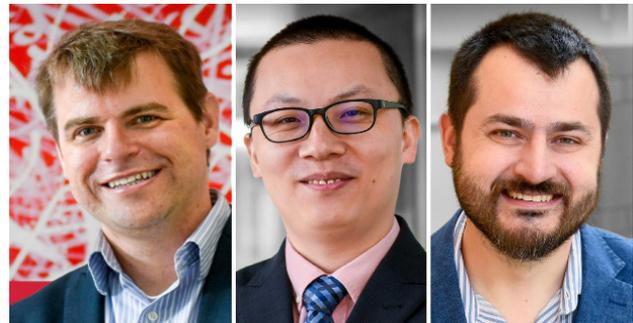
*Intelligent Support for Creative, Open-ended Programming Projects*, **Thomason Price, Tiffany Barnes, Christopher Martens**. **\$749,920** by **National Science Foundation**.

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

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

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

*Simulating Social Influence Based on Real-World Geographic Data: Emergent Narratives and Interactive Hypothesis Testing*, **Christopher Martens**. **\$577,574** by **US Air Force – Office of Scientific Research**.



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

*CAREER: Understanding and Supporting Programmer Cognition*, **Christopher Pamin**. **\$555,882** by **National Science Foundation**.

*CAREER: Explorable Formal Models of Privacy Policies and Regulations*, **Christopher Martens**. **\$555,000** by **National Science Foundation**.

*Beyond CS Principles: 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**.

*Automated Discovery of Cross-Language Program Behavior Inconsistency*, **Christopher Pamin, Kathryn Stolee**. **\$499,994** by **National Science Foundation**.

# Senior Faculty Spotlight

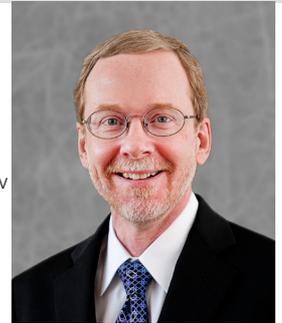
## DR. JAMES LESTER

*Distinguished University Professor*

James C. Lester is a Distinguished University Professor of Computer Science and Director of the Center for Educational Informatics at NC State University. His research centers on transforming education with artificial intelligence. His current work ranges from AI-driven narrative learning environments and virtual agents for learning to multimodal learning analytics and sketch-based learning environments. The AI-driven learning environments he and his team create have been used by thousands of K-12 students around the globe.

Lester's foundational work on pedagogical agents has been recognized with the IFAAMAS Influential Paper Award by the International Federation for Autonomous Agents and Multiagent Systems. He is the recipient of a National Science Foundation CAREER Award and Best Paper Awards at the International Conference on Artificial Intelligence in Education, the

ACM International Conference on Intelligent User Interfaces, the AAAI International Conference on Artificial Intelligence and Interactive Digital Entertainment, and the International Conference on User Modeling, Adaptation, and Personalization. He is a Fellow of the Association for the Advancement of Artificial Intelligence (AAAI). Additionally, he has been recognized with the NC State University Outstanding Teacher Award.



Lester received his PhD in Computer Science (1994), MSCS in Computer Science (1988), and his BA in Computer Science (1986) from the University of Texas, Austin. He also received a BA in History (1983) from Baylor University.



## DR. MUNINDAR SINGH

*Alumni Distinguished Graduate Professor*

Dr. Munindar P. Singh is an Alumni Distinguished Graduate Professor in the Department of Computer Science at NC State University. He is a codirector of the Department of Defense-sponsored Science of Security Labet at NC State, one of six nationwide.

Singh's research interests include computational aspects of sociotechnical

systems. He focuses on challenges such as ethics, safety, resilience, autonomy and heterogeneity, trust, privacy, and security. His research concerns various aspects of AI and multiagent systems and allied topics in social computing and software engineering.

Singh is a Fellow of AAAI (Association for the Advancement of Artificial Intelligence), AAAS (American Association for the Advancement of Science), and IEEE (Institute of Electrical and Electronics Engineers), and was elected 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.

He recently won NC State University's Outstanding Graduate Faculty Mentor Award as well as the Outstanding Research Achievement Award (twice). He was selected as an Alumni Distinguished Graduate Professor and elected to NC State's Research Leadership Academy. He also won NC State's Outstanding Faculty Mentor Award.

Singh received his PhD in Computer Science (1993) and his MSCS with a minor in Philosophy (1988) from the University of Texas, Austin, and his B.Tech in Computer Science & Engineering (1986) from the Institute of Technology, Delhi, India.

## DR. LAURIE WILLIAMS

*Distinguished University Professor*

Laurie Williams is a Distinguished University Professor in the Computer Science Department at NC State University. One of the foremost researchers in agile software development and in the security of healthcare IT applications, she is a co-director of the NC State Secure Computing Institute and the NC State Science of Security Labet. She is also the Chief Cybersecurity Technologist of the SecureAmerica Institute.

Williams' research focuses on software security; agile software development practices and processes, particularly continuous deployment; and software reliability, software testing and analysis. She has more than 240 refereed publications.

Throughout her career she has received many accolades and awards including a National Science Foundation CAREER Award and an

ACM Special Interest Group on Software Engineering (SIGSOFT) Influential Educator Award. She was named an ACM Distinguished Scientist, an IEEE Fellow, and at NC State she was named a member of the NC State Research Leadership Academy, and received the NC State Alumni Association Outstanding Research Award. In 2006, she won the Outstanding Teaching award for her innovative teaching and is an inductee in the NC State's Academy of Outstanding Teachers.



Williams received her PhD in Computer Science (2000) from the University of Utah, her MBA (1990) from Duke University's Fuqua School of Business, and her BS in Industrial Engineering (1984) from Lehigh University.

# Researchers\*

**Dennis R. Bahler, Associate Professor**  
PhD, University of Virginia, 1987

Artificial intelligence: constraint processing, machine learning, hybrid neural-symbolic computing

**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

**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

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

Data science

**Jon Doyle, SAS Distinguished Professor**  
PhD, Massachusetts Institute of Technology, 1980

Artificial Intelligence, mathematical and philosophical foundations, rational agents, decision making

**Patrick Dreher, Research Professor**  
PhD, University of Illinois, 1991

Cloud computing, scientific and high performance computing

**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

**Vincent Freeh, Associate Professor**  
PhD, University of Arizona, 1996

Operating systems, compilers, programming languages, storage

**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

**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, Assistant Professor**  
PhD, University of California-Santa Barbara, 2015

Systems and software security

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

Cybersecurity research and education

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

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

**Xu Liu, Assistant Professor**  
PhD, Rice University, 2014

Program analysis in high performance computing systems

**Collin Lynch, Assistant 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

**Harry Perros, Alumni Distinguished Graduate Professor**  
PhD, Trinity College, Ireland, 1975

Performance analysis of optical networks, performance monitoring of grids, queueing networks



**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

**Douglas S. Reeves, Professor**  
**PhD, The Pennsylvania State University, 1987**

Architecture and operating systems, cyber security, networking and performance evaluation

**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

**Nagiza Samatova, Professor**  
**PhD, Russian Academy of Science (CCAS), 1993**

Graph theory and algorithms, bioinformatics, systems biology, data management, data integration, data science

**Carla D. Savage, Professor**  
**PhD, University of Illinois, 1977**

Combinatorics, combinatorial algorithms, network algorithms, graph theory, discrete mathematics

**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

**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

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

Computer networks, distributed systems, and cybersecurity

## Teaching Professors

**Bitra Akram, Teaching Assistant Professor**  
**PhD, NC State University, 2019**

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

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

Graphics, human computer interaction

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

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

**Ignacio Domínguez, Teaching Assistant 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

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

Computer science and software engineering education, open educational resources

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

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

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

Program Analysis and computer education

**Jason King, Teaching Assistant Professor**  
**PhD, NC State University, 2016**

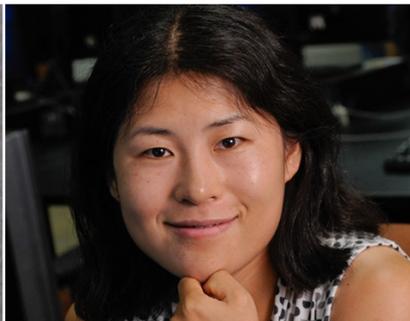
Logging for user accountability, nonrepudiation and forensicability

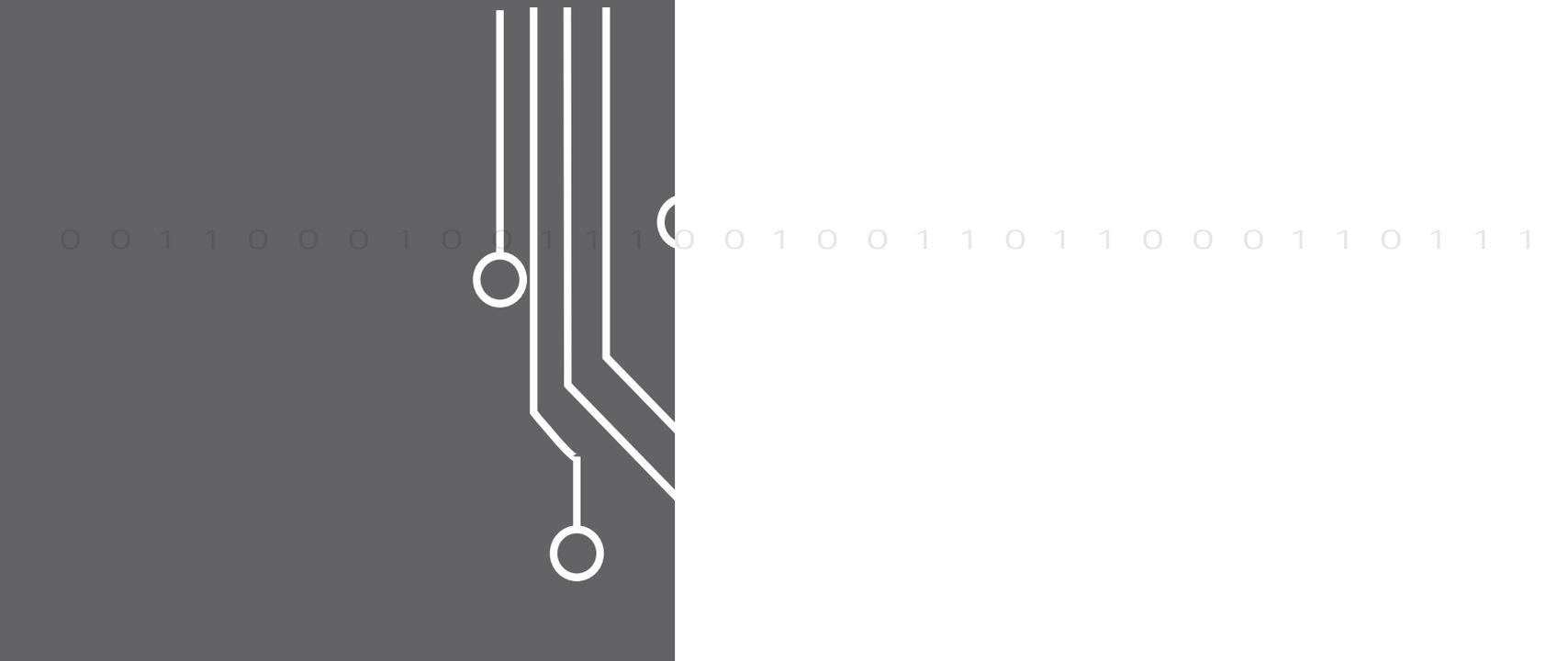
**Jessica Young Schmidt, Teaching Associate Professor**  
**PhD, NC State University, 2012**

Scholarship of teaching and learning

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

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





## 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
- **Cyber Security** 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

*The department has a number of teaching and research laboratories, centers, institutes and other facilities that support its education, research and outreach missions.*

**NC STATE** Engineering

**Department of Computer Science**  
Campus Box 8206  
Raleigh, NC 27695-8206

Editor: Ken Tate; Associate Editor: Tammy Coates

1,500 copies of this document were printed at a cost of \$1,621.

[www.csc.ncsu.edu](http://www.csc.ncsu.edu)