Greetings, and welcome to the 2018-2019 issue of the NC State Computer Science (CSC) Department’s Research newsletter! This newsletter provides a snapshot of the research activities in the department during the last fiscal year. We would love to share all of our research with you, but space simply will not allow.

Research is key to our mission, and the CSC Department is home to 13 research centers, and more than 35 research labs and groups. Current research productivity in the department stands at more than $64M in active research grants, and annual expenditures are in the $10M range. This ranks us in the top ten departments for sponsored research funding among computer science departments in colleges of engineering in the United States. Some of our 2018-2019 research highlights are listed on page two, and a sampling of some of our research projects appears on page four of this newsletter. I encourage you to visit our website (csc.ncsu.edu) to learn more about the department, our faculty and staff, and our state-of-the-art research.

Building on the NC State Computer Science Department’s success as a global leader in the artificial intelligence space, we are pleased to announce the addition of an endowed Goodnight Distinguished Professorship in Artificial Intelligence and Machine Learning. This Professorship will allow us to recruit exceptional talent to help shape breakthrough discoveries and future research. This person will represent the department and university as a renowned scholar with expertise in the area of artificial intelligence, and will be a key leader in the vibrant and expanding artificial intelligence community at NC State and beyond. He or she will be expected to have a well-established record as a researcher, teacher, and thought leader in artificial intelligence with worldwide recognition and stature.

(continued on page 3)
Research Highlights

• **Dr. Chris Martens**, assistant professor of computer science, has received a Faculty Early Career Development Award, also known as the CAREER Award, from the National Science Foundation (NSF). The NSF will provide $500,000 in funding over five years to support Martens’ project, “Explorable Formal Models of Privacy Policies and Regulations.” The CAREER Award is one of the highest honors the NSF gives to young science and engineering faculty. **Martens is the Computer Science Department’s 30th CAREER Award winner.**

• NC State was recently re-designated a National Center of Academic Excellence in Cyber Defense Research. In 2008, NC State was selected by the National Security Agency (NSA) and the Department of Homeland Security (DHS) as one of the first 23 National Centers of Academic Excellence in Information Assurance Research (CAE-R). NC State, one of only two universities from the state of North Carolina to receive the CAE-R distinction, recently had the designation renewed, and will hold this distinction until 2024.

• **Dr. James Lester** has been named Distinguished University Professor in the Department of Computer Science at NC State. A Fellow of the Association for the Advancement of Artificial Intelligence (AAAI), he is the founding director of the Center for Educational Informatics. He is internationally recognized for his research on artificial intelligence technologies for education.

• **Drs. William Enck, Bradley Reaves** and PhD student **T.J. O’Connor** have identified flaws in “smart home” Internet-of-Things (IoT) devices that allow third parties to prevent devices from sharing information. “We’ve found that there are widespread flaws in the design of these devices that can prevent them from notifying homeowners about problems or performing other security functions,” says Enck. The devices are designed with the assumption that wireless connectivity is secure and won’t be disrupted, which isn’t always the case. The team has found potential solutions that address the device’s vulnerabilities.

• A team of faculty and researchers at NC State were recently awarded a three-year $1 million NSF grant in collaboration with the Wake County Public School System, UNC-Charlotte and Charlotte-Mecklenburg Schools to broaden participation in computer science (CS) and computational thinking (CT) in North Carolina. **Drs. Eric Wiebe, Dave Frye and Sherry Freeman** from the NC State College of Education’s Friday Institute for Educational Innovation and **Dr. Tiffany Barnes** from the Department of Computer Science will lead this project, titled EcoCS: Developing a Systemic, Scalable Model to Broaden Participation in Middle School Computer Science Using an RPP Approach.

• Researchers from NC State have developed a technique for measuring speed and distance in indoor environments, which could be used to improve navigation technologies for robots, drones, or pedestrians trying to find their way around an airport. The technique uses a novel combination of Wi-Fi signals and accelerometer technology to track devices in near-real time. The technique, called “Wi-Fi-assisted Inertial Odometry (WIO),” uses Wi-Fi as a velocity sensor to accurately track how far something has moved. PhD student **Raghav Venkatnarayan** and assistant professor **Muhammad Shahzad** are the co-corresponding authors on the paper about the work.

• A paper co-authored by **Nachiappan Nagappan, Laurie Williams, Miriam Ferzli, Eric Wiebe, Kai Yang, Carol Miller** and **Suzanne Balik** has been recognized as the #2 paper on the list of the “Top Ten Symposium Papers of All Time.” The paper, “Improving the CS1 Experience with Pair Programming,” which was written in 2003, was recognized at the 50th annual ACM Special Interest Group on Computer Science Education (SIGCSE) Technical Symposium held last March in Minneapolis, MN. The top ten papers were chosen from among the best papers that were presented over the last 49 years.
As you may remember, I took over the reins of the department last November (it’s hard to believe it’s been almost a year!). I am so grateful to the faculty and staff for welcoming me to NC State, and for making me feel part of the Pack! As new department head, I am happy to share some of the most recent successes of the department, our faculty, staff and students have experienced over the past year. Here are a few highlights that deserve special recognition:

- Dr. Chris Martens, assistant professor of computer science, has received a Faculty Early Career Development Award, also known as the CAREER Award, from the National Science Foundation. The award is one of the highest honors NSF gives to young science and engineering faculty members. NSF will provide $500,000 in funding over five years to support Martens’ project, “Explorable Formal Models of Privacy Policies and Regulations.” Martens becomes the department’s 30th CAREER Award winner.
- Dr. Mladen Vouk, professor, and former department head of the Computer Science Department, was recently named Associate Vice Chancellor for Research Development and Administration at NC State.
- Dr. Patrick Dreher, research professor in the Department of Computer Science, and associate faculty member in the Department of Physics, was recently named the chief scientist of the IBM Quantum Computing Hub.
- NC State’s Engineering Online ranked 8th nationally on the 2019 US News and World Report’s Best Online Engineering Programs; and ranked 6th on the list of the Best Online Computer Information Technology Programs. The online graduate engineering program was also rated in the top 10 on a list of Best Online Graduate Engineering Programs for Veterans.
- NC State’s Undergraduate Game Design Program is ranked 23rd on The Princeton Review’s annual list of the “Top 50 Undergraduate Schools to Study Game Design for 2019.”
- NC State ranks #1 in tenure-track female faculty among all computer science departments in colleges of engineering.
- The Game Design Program has also been ranked #5 on The Bachelor Degree Center’s list of the 25 Best Bachelor’s in Game Design Degree Programs for 2019.
- Over the past 10 years, NC State ranks #2 in the world in publishing at conferences and journals dedicated to games and interactive entertainment computing research.

Our faculty and staff have received numerous prestigious and professional recognitions:

- Dr. Tim Menzies has been selected as a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) for 2019;
- Dr. Carla Savage was named a Society for Industrial and Applied Mathematics (SIAM) Fellow, Class of 2019;
- Dr. Frank Mueller was named a 2018 Association for Computing Machinery (ACM) Fellow, the first faculty member in NC State’s Computer Science Department to be recognized with this prestigious honor;
- Dr. Xipeng Shen was named a 2018 Distinguished Member of the Association for Computing Machinery (ACM);
- Ken Tate, Director of Engagement and External Relations, was recognized by the Triangle Business Journal as one of their 2018 Leaders in Diversity;
- Dr. Donald Bitzer received the Alexander Quarles Holladay Medal for Excellence, the highest honor bestowed by NC State and the University’s Board of Trustees;
- Dr. James Lester has been named a Distinguished University Professor;
- Tammy Coates, Assistant Director of External Relations, was honored with a 2019 College of Engineering Award for Excellence;
- Dr. Sarah Heckman, Director of Undergraduate Programs and Teaching Associate Professor, received the 2018-2019 Computer Science Department’s Person of Exceptional Performance (PEP) 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 $76,000, and our MS graduates are averaging $112,000. And for graduates with a PhD, it’s even higher! Our top employers are IBM, Cisco, Amazon, VMWare, NetApp, SAS and other top financial and IT organizations, as well as other high-tech companies.

I am excited about and encouraged by all of the accomplishments of the department, faculty, staff and students! I look forward to many more successful years!

Dr. Gregg Rothermel
Professor and Department Head
Selected Research Projects

Collaborative Research: Integrating Computing in STEM: Designing, Developing and Investigating a Team-based Professional Development Model for Middle and High School Teachers, Tiffany Barnes. $861,773 by National Science Foundation.

IUCRC Pre-Proposal Phase I NC State University: Center for Accelerated Real Time Analytics (CARTA), Rada Chirkova. $747,647 by National Science Foundation.

Developing Integrated teaching Platforms to Enhance Blended Learning in STEM, Collin Lynch, Tiffany Barnes, Sarah Heckman. $599,992 by National Science Foundation.

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

CAREER: Improving Adaptive Decision Making in Interactive Learning Environments, Min Chi. $547,810 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.

Supporting Regular Expression Testing, Search, Repair, Comprehension, and Maintenance, Kathryn Stolee. $499,996 by National Science Foundation.

CSR: SmartChainDB – Enabling Smart Marketplaces with a Scalable Semantically-Enhanced Blockchain Platform, Kemafor Ogan, Alessandra Scafuro, Binil Starly. $499,773 by National Science Foundation.

Taming Web Content Through Automated Reduction in Browser Functionality, Alexandros Kapravelos. $406,609 by National Science Foundation.

Investigating Emergency Response Performance with VR-Based Intelligent User Interfaces, James Lester, Bradford Mott, Randall Spain. $1,112,175 by National Science Foundation.

Scalable Holistic Autotuning for Software Analytics, Timothy Menzies, Xipeng Shen. $898,349 by National Science Foundation.

Cognitive Human Enhancements for Cyber Reasoning Systems, Alexandros Kapravelos. $884,817 by Arizona State University/DARPA.


DIP: Integrated Data-driven Technologies for Individualized Instruction in STEM Learning Environments, Min Chi, Tiffany Barnes. $1,999,438 by National Science Foundation.

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


National Science Foundation.

Supporting Student Planning with Open Learner Models in Middle Grades Science, James Lester. $1,499,183 by National Science Foundation.

Developing an Online Environment for Learning Algebra by Teaching a Synthetic Peer, Noboru Matsuda. $1,399,947 by US Department of Education (DED).

Collaborative Research: Fostering Collaborative Computer Science Learning with Intelligent Virtual Companions for Upper Elementary Students, Collin Lynch, Eric Wiebe. $1,399,088 by National Science Foundation.


Investigating Emergency Response Performance with VR-Based Intelligent User Interfaces, James Lester, Bradford Mott, Randall Spain. $1,112,175 by National Institute of Standards and Technology.

Scalable Holistic Autotuning for Software Analytics, Timothy Menzies, Xipeng Shen. $898,349 by National Science Foundation.

Cognitive Human Enhancements for Cyber Reasoning Systems, Alexandros Kapravelos. $884,817 by Arizona State University/DARPA.

CSR: SmartChainDB – Enabling Smart Marketplaces with a Scalable Semantically-Enhanced Blockchain Platform, Kemafor Ogan, Alessandra Scafuro, Binil Starly. $499,773 by National Science Foundation.
New Faculty Profiles

BITA AKRAM joined the department in fall 2019 as a teaching assistant professor. Her research focus is on designing advanced learning technologies for instructional support and improving access and quality of computer science education by developing innovative computer science curricula. Prior to joining the faculty, she was a research assistant at the NC State Center for Educational Informatics and the Friday Institute for Educational Innovation. She received her PhD (2019) from NC State University.

DON SHEEHY joined the department in fall 2019 as an associate professor. His research is in the areas of computational geometry and topological data analysis. Prior to coming to NC State, he was on the faculty at the University of Connecticut. He received his BSE in computer science from Princeton University, and his PhD (2011) from Carnegie Mellon University.

DON SHEEHY joined the department in fall 2019 as an associate professor. His research is in the areas of computational geometry and topological data analysis. Prior to coming to NC State, he was on the faculty at the University of Connecticut. He received his BSE in computer science from Princeton University, and his PhD (2011) from Carnegie Mellon University.

JOHN-PAUL ORE joined the department in fall 2019 as an assistant professor. His research interests are in the areas of software engineering, robotics, program analysis, and system testing using high-resolution physical simulators. He received his PhD (2019) from the University of Nebraska - Lincoln.

IGNACIO DOMÍNGUEZ joined the department in fall 2019 as a teaching assistant professor. His research studies human behavior in video games and virtual environments to create computational models of interaction that can be used to identify, predict, and influence behavior and decision-making. He received his MS and PhD (2018) in computer science from NC State University.

RUOZHOU YU joined the department in fall 2019 as an assistant professor. His research interests are broadly in the areas of computer networks, distributed systems and cybersecurity. He received his BS from the Beijing University of Posts and Telecommunications, and his PhD (2019) from Arizona State University.

BITA AKRAM joined the department in fall 2019 as a teaching assistant professor. Her research focus is on designing advanced learning technologies for instructional support and improving access and quality of computer science education by developing innovative computer science curricula. Prior to joining the faculty, she was a research assistant at the NC State Center for Educational Informatics and the Friday Institute for Educational Innovation. She received her PhD (2019) from NC State University.

DR. GREGG ROTHERMEL
Department Head and Professor of Computer Science
Rothermel became the Head of the Department of Computer Science in November, 2018. He comes to NC State from the University of Nebraska-Lincoln where he was a professor and Jensen Chair of Software Engineering.

He received his PhD in Computer Science from Clemson University, his MS in Computer Science from SUNY Albany, and a BA in Philosophy from Reed College. Prior to returning to academia, he was a software engineer, and Vice President of Quality Assurance and Quality Control for Palette Systems, a manufacturer of CAD/CAM software.

Rothermel’s research interests include software engineering and program analysis, with emphases on the application of program analysis techniques to problems in software maintenance and testing, end-user software engineering, and empirical studies.

Rothermel is an IEEE Fellow and an ACM Distinguished Scientist. He is currently General co-Chair for the 2020 ACM/IEEE International Conference on Software Engineering, serves as an Associate Editor for IEEE Transactions on Software Engineering and Methodology, and is a member of the Editorial Boards of the Empirical Software Engineering Journal and Software Quality Journal.

Senior Faculty Spotlight

DON SHEEHY joined the department in fall 2019 as an associate professor. His research is in the areas of computational geometry and topological data analysis. Prior to coming to NC State, he was on the faculty at the University of Connecticut. He received his BSE in computer science from Princeton University, and his PhD (2011) from Carnegie Mellon University.

DON SHEEHY joined the department in fall 2019 as an associate professor. His research is in the areas of computational geometry and topological data analysis. Prior to coming to NC State, he was on the faculty at the University of Connecticut. He received his BSE in computer science from Princeton University, and his PhD (2011) from Carnegie Mellon University.

JOHN-PAUL ORE joined the department in fall 2019 as an assistant professor. His research interests are in the areas of software engineering, robotics, program analysis, and system testing using high-resolution physical simulators. He received his PhD (2019) from the University of Nebraska - Lincoln.

IGNACIO DOMÍNGUEZ joined the department in fall 2019 as a teaching assistant professor. His research studies human behavior in video games and virtual environments to create computational models of interaction that can be used to identify, predict, and influence behavior and decision-making. He received his MS and PhD (2018) in computer science from NC State University.

RUOZHOU YU joined the department in fall 2019 as an assistant professor. His research interests are broadly in the areas of computer networks, distributed systems and cybersecurity. He received his BS from the Beijing University of Posts and Telecommunications, and his PhD (2019) from Arizona State University.
Researchers*

Dennis R. Bahler, Associate Professor
PhD, University of Virginia, 1987
Artificial intelligence: constraint processing, machine learning, hybrid neural-symbolic computing

Tiffany Barnes, 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

Steffen Heber, Associate 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 Interim Associate Department Head
PhD, NC State University, 2001
Network design: optical, wireless sensor and mesh networks; future Internet design

William Enck, Associate Professor
PhD, The Pennsylvania State University, 2011
Systems security, mobile operating systems security

Vincent Freeth, 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

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

Emerson Murphy-Hill, Associate Professor
PhD, Portland State University, 2009
Software engineering, especially the intersection of human-computer interaction and software engineering.

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, Assistant 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, queuing networks

Thomas Price, Assistant Professor
PhD, NC State University, 2018
Computing education, intelligent tutoring systems, educational data mining, and novice programming environments

*List includes 2018-19 faculty as well as faculty promotions, and faculty joining the department in August 2019.
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 emphasis 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, Assistant 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
Multidisciplinary 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 Stoele, Assistant Professor
PhD, University of Nebraska-Lincoln, 2013
Program analysis, empirical software engineering and crowdsourcing

Blair Sullivan, Associate Professor (joint apt. w/ORNL)
PhD, Princeton University, 2008
Algorithms and theory of computation, scientific and high performance computing, and analytics

Ranga Raju Vatsavai, Associate 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 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

Bita 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 Dominguez, 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 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

Jason King, Teaching Assistant Professor
PhD, NC State University, 2016
Logging for user accountability, nonrepudiation and forensicability

Jessica Young Schmidt, Teaching Assistant 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

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

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