

Faculty Members

Dr. Monica Anderson, Assistant Professor, *robotics*

Dr. Richard Borie, Associate Professor, *algorithms and theory*

Dr. Marcus Brown, Associate Professor, *human-computer interaction*

Dr. David Cordes, Professor and Department Head, *systems, software engineering*

Dr. Jeffrey Carver, Assistant Professor, *empirical software engineering*

Dr. Brandon Dixon, Associate Professor, *theory, software engineering, security*

Dr. Jeff Gray, Associate Professor, *software engineering & languages*

Dr. Xiaoyan Hong, Associate Professor, *mobile networks, privacy, security*

Dr. Nicholas Kraft, Assistant Professor, *software engineering and languages*

Dr. John Lusth, Associate Professor, *programming languages*

Dr. Allen Parrish, Professor, *software engineering*

Dr. Randy Smith, Associate Professor, *software engineering*

Dr. Susan Vrbsky, Associate Professor, *databases, real-time systems, data Grids*

Dr. Yang Xiao, Associate Professor, *security, sensor and wireless networks, telemedicine*

Dr. Jingyuan (Alex) Zhang, Associate Professor, *collaborative software, mobile computing*

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University of Alabama Center for Advanced Public Safety (CAPS)

This effort is committed to using state of the art technologies to offer products and specialized software development services in a variety of areas. Our four main focus areas are: Highway Safety, Homeland Security, Judicial Management and Law Enforcement. CAPS includes the analysis and presentation of spatially-enhanced information, with emphasis on traffic safety, criminal justice, and homeland security data domains.

Software Tools and Empirical Evaluation Lab (STEEL)

Research efforts include reverse engineering, program comprehension, software language engineering (e.g., domain-specific languages), software maintenance and evolution (e.g., identification and analysis of code clones), interoperability, model-driven engineering and model transformation, static and dynamic program analysis, software testing, software quality, issues of modularity and separation of concerns (e.g., aspect- and feature-oriented software development), software architecture and compiler technology.

Empirical software engineering is being used to provide a better understanding of the effectiveness and usefulness of various software engineering tools and techniques with an eye towards process improvement. Work is ongoing to understand the methods that scientists and engineers use to effectively develop software.

Research is also being conducted in CS and software engineering education; research focused on improved learning of software engineering concepts in a wide range of CS courses.

Distributed Autonomy Lab

Research focuses on using teams of robots to accomplish high-level tasks. Appropriate shared representations and communications paradigms are tested in simulation and in a lab environment. Collaborations exist between software engineering, behavioral science, and networking. Research includes the study of appropriate multi-robot experimental frameworks through evaluation of measurement tools, software architectures, and development and simulation environments. A specialized testing facility is instrumented with ground truth localization and image systems for data collection.

Databases and Green Grids

Research addresses the issue of developing strategies for data grids that increase efficiency and reduce the energy consumed through replication and scheduling. Experiments are being performed on a 10-node, low-energy, low-cost green cluster to evaluate the new strategies in order to make data grids greener. Efforts are also

underway to address the issues of satisfying multiple constraints of mobile databases, including designing strategies for concurrency control and data dissemination with real-time constraints, and investigating databases in cloud computing.

Networking and its Applications

Current research activities focus on routing, mobility, privacy, security, monitoring, MAC, quality of service and bio-inspired communications. Focus includes surveillance application, quality of service, cache access and replacement policies, coverage and connectivity, energy efficiency and vehicle networks.

Bio-inspired networking studies communication paradigms in animals and applies these paradigms to the computing and networking fields.

Security topics include password protection, lightweight cipher, intrusion detection, denial of service mitigation, secure protocols, vulnerabilities and attacks, network accountability, anonymous communications systems, and privacy in wireless networks.

Vehicle networks show promise for improving driving safety and roadway system efficiencies. Focus is on secure and trustworthy vehicle communication given dynamic network conditions and tight response time constraints.

Other applications include developing technologies for quality, secure, reliable tele-healthcare, particularly in cardiovascular diseases, diabetes, and elder healthcare.

Collaborative Software

Focuses on the use of collaborative software with a variety of computing devices ranging from smart phones to wall-sized display systems by one or multiple co-located users in a variety of environments. Research topics include software architecture, multiple cursor support, advanced display/interactions techniques and secure information access.

Computer-assisted Music Generation

Constructing frameworks that permit musically-inclined individuals to produce professional sounding music without mandating that they play an instrument. Focus includes using software engineering and artificial intelligence techniques to efficiently generate realistic instrumental tracks and developing an annotated audio stream standard that simplifies post-processing of the instrumental tracks.

Graph Algorithms

Research involves determining which graph problems have efficient algorithms. Focus includes pursuit-evasion problems, wherein pursuers cooperate to capture all evaders using minimum travel distance or elapsed time.