



EMORY  
LANEY  
GRADUATE  
SCHOOL

## NATURAL SCIENCES

# COMPUTER SCIENCE AND INFORMATICS

Join us in shaping the future of science! The Computer Science and Informatics graduate program at Emory University focuses on emerging, interdisciplinary areas of computing research. Our main concentrations are Data Science and Biomedical Informatics with a curriculum grounded in foundations, data and information management, security and privacy, and computing systems.

The Computer Science and Informatics (CSI) PhD and MS programs specialize in large-scale data systems and analytics, biomedical informatics, information retrieval and natural language processing, text and data mining, and privacy and security. CSI integrates collaborative opportunities with the Emory School of Medicine, Rollins School of Public Health, the Nell Hodgson Woodruff School of Nursing, Woodruff Library, and the Centers for Disease Control and Prevention.

The Biomedical Informatics concentration (BMI) within CSI focuses on effective use of biomedical data, information, and

knowledge in medical research as well as decision support driven by efforts to improve human health. Graduate student research involves developing advanced computational techniques and strategies, which can directly impact patient care, and influence both clinical and biomedical research.

CSI is jointly administered by the Departments of Mathematics and Computer Science, Biostatistics and Bioinformatics, and Biomedical Informatics. Faculty members from all three departments teach courses, conduct research rotations and advise graduate dissertations.

### PROFESSIONAL DEVELOPMENT

The Laney Graduate School offers a range of programs that encourages students to develop their professional skills, engage with broader professional communities, and prepare for their careers.

VISIT [GS.EMORY.EDU](https://gs.emory.edu) TO LEARN MORE.

## ACADEMIC PROGRAMS

The PhD and MS programs in Computer Science build on Emory's traditional strengths in medicine, life sciences, humanities, and social and behavioral sciences. Both programs offer challenging academics, a diverse student body and access to cutting-edge research and faculty within the program and across Emory University. The PhD degree is suitable for those wishing to pursue careers in academia, industry, government, or health-care. Possible areas of specialization for the PhD include:

### DATA SCIENCE

The Data Science track focuses on data security, privacy, information retrieval, statistical analysis, and data integration in the context of social, spatiotemporal, medical, public health, clinical, and biological data management. Research projects and course offerings span multiple departments including research groups in Biology, the School of Medicine, the Winship Cancer Institute, and the Rollins School of Public Health.

### BIOMEDICAL INFORMATICS

The Biomedical Informatics (BMI) track focuses on the effective use of biomedical data and information, in conjunction with clinical research, to improve human health. Graduates find careers in teaching and research facilities of educational and medical institutions, industry and hospitals, law and government regulatory agencies. Graduate study comprises of developing advanced computational techniques and strategies that directly impact patient care and clinical and biomedical research. This is an interdisciplinary concentration, jointly administered by departments of Biomedical Informatics, Mathematics and Computer Science, Biostatistics and Bioinformatics.

### DISCRETE MATHEMATICS AND THEORETICAL COMPUTER SCIENCE

This track focuses on graph theory, theory of computation, approximation and geometrical algorithms, combinatorial optimization, and mathematical programming. Research in traditional Computer Science as well as Bioinformatics and Computational Biology is pursued under this track.

### SYSTEMS AND DISTRIBUTED COMPUTING

Conducts research in storage, cache memories, network science, distributed systems, collaboration technologies, and high-performance computing. Students can work on research projects in Grid and Cloud computing, particularly for eScience, health care, and major technology companies.

### SCIENTIFIC COMPUTING

With strong connections to Radiology, Medicine, and Pediatrics to characterize research in this sub-area, this track emphasizes numerical linear algebra, image processing, iterative methods, optimization, partial differential equations, and computational fluid dynamics.

## ALUMNI

Since the official start of the CSI PhD and MS programs in 2007, 26 PhD students and many more MS students have graduated and obtained successful careers in industry or academia.

### RECENT PHD GRADUATES

- SANJAY AGRAVAT (PhD, 2015) Data Scientist at Keysight Technologies. "Advancing the Elucidation of the Human Glycome Through an Expert-based Systems Approach." Advisor: Lee Cooper.
- LUCA BONOMI (PhD, 2015) Postdoc at UC San Diego. "Big Data Goes Personal: Privacy and Social Challenges." Advisor: Li Xiong.
- JULIANNE CHUNG (PhD, 2011) Assistant Professor at Virginia Tech. "Numerical Approaches for Large-Scale Ill-Posed Inverse Problems." Advisor: James Nagy.

- LIYUE FAN (PhD, 2014) Assistant Professor at SUNY Albany. "Preserving Individual Privacy for Spatio-Temporal Data Analytics." Advisor: Li Xiong.
- QI GUO (PhD, 2012) Applied Scientist at Microsoft, now at Google. "Predicting Search Intent, Performance, and Relevance from Interaction Data." Advisor: Eugene Agichtein.
- PAWEL JURCZYK (PhD, 2009) Software Engineer at Google. "Scalable and Privacy-Preserving Integration of Distributed Heterogeneous Data." Advisor: Li Xiong.
- DMITRY LAGUN (PhD, 2014) Research Scientist at Google. "Modeling User Attention and Interaction on the Web." Advisor: Eugene Agichtein.
- MICHAEL NALISNIK (PhD, 2016) Data Scientist at Digital Envoy. "Scalable Computational Pathology: From Interactive to Deep Learning." Advisor: Lee Cooper
- SEBASTIEN SIVA (PhD, 2011) Assistant Professor at Georgia Gwinnet College. "Solving Constraint Satisfaction Problems in Relational Algebra." Advisor: James Lu.
- XIAOFENG XU (PhD, 2016) Research Staff at Facebook. "Indexing Moving Objects for Spatiotemporal Queries." Advisor: Li Xiong.

### RECENT MS GRADUATES

- LINLIN CHAI, Software Engineer at Amazon
- LIYUAN HAN, Software Engineer at Microsoft
- HAOJIAN JIN, Research Engineer at Yahoo Labs
- AMEEN KAZEROUNI, Data Scientist at Zappos
- YANDONG LIU, Software Engineer at Uber
- AKSHATHA PAI, Software Engineer at Varian
- JING SUN, Software Engineer at Google
- TUNAN WU, Lead Software Engineer, Fuhu Inc



### AWARD-WINNING RESEARCH

- BEST PAPER AWARDS: IEEE MDM 2016; ACM SIGSPATIAL 2015; ACM SIGIR 2011; ICCS 2008
- BEST STUDENT PAPER AWARDS: ACM SYSTOR, 2016; ACM SIGIR 2014; ACM WSDM 2014; IFIP DBSec 2013

## RESEARCH AREAS

### DATABASES AND INFORMATION MANAGEMENT

We work on storage, organization, management and retrieval of medical, public health, web and biological data.

Faculty: Eugene Agichtein, Shun Yan Cheung, James Lu, Ymir Vigfusson, Li Xiong

### DATA MINING AND MACHINE LEARNING

We study algorithms and methods for finding patterns and insights in data to build more intelligent and effective systems.

Faculty: Eugene Agichtein, Jinho Choi, Gari Clifford, Lee Cooper, Joyce Ho, Shamim Nemati, Zhaohui "Steve" Qin, Ymir Vigfusson, Avani Wildani, Li Xiong

**DATA AND NETWORKED SYSTEMS**

We research how to build and improve scalable distributed systems, databases and networking to support the collection, analysis and understanding of large volumes of data.

Faculty: Dorian Arnold, Shun Yan Cheung, Davide Fossati, Ken Mandelberg, Vaidy Sunderam, Ymir Vigfusson, Avani Wildani

**CENTER FOR LANGUAGE AND INFORMATION RESEARCH (CLIR)**

We study computational linguistics and develop new techniques for natural language processing, information retrieval, web search, and text and social media mining.

Faculty: Eugene Agichtein, Jinho Choi, Phillip Wolff

**BIOMEDICAL INFORMATICS (BMI)**

Biomedical informatics leverages virtually all areas of biomedical, computational, physical and social science. Research groups include cancer, clinical phenotyping, mHealth, health care analytics, human genetics, high-throughput drug discovery, infectious diseases, neurosciences, pathology, radiology and real-time streaming health analytics, among others.

Faculty: Gari Clifford, Lee Cooper, Joyce Ho, Jun Kong, Qiao Li, Qi Long, Shamim Nemati, Andrew Post, Zhaohui (Steve) Qin, Ashish Sharma, Yan Sun, Li Xiong

**SCIENTIFIC COMPUTING**

Scientific computing research involves the development of fast, reliable numerical algorithms that are needed to solve difficult mathematical problems in a wide variety of applications.

Faculty: Michele Benzi, James Nagy, Lars Ruthotto, Vaidy Sunderam, Alessandro Veneziani

**IMAGING INFORMATICS**

Development of methods for labeling anatomic and micro-anatomic structures found in images, systems software and techniques for management and analysis of very large image data, and techniques and software tools for sharing this labeling information in a computational grid architecture.

Faculty: Lee Cooper, Jun Kong, James Nagy, Lars Ruthotto, Ashish Sharma

**THEORY AND DISCRETE MATHEMATICS**

At the heart of finding and exploiting patterns in data is the art of understanding what patterns are and computational methods for analyzing them. The theory and discrete mathematics group investigates fundamental questions in computer science and mathematics.

Faculty: Dwight Duffus, Michelangelo Grigni, Vojtech Rodl

**HUMAN COMPUTER INTERACTION**

We study how the true power of data analysis and computation can be unleashed through novel and improved interfaces to computers and other devices.

Faculty: Eugene Agichtein, Lee Cooper, Davide Fossati, Joyce Ho, Ashish Sharma

**COMPUTATIONAL NEUROSCIENCE**

Our research investigates how the brain organizes and analyzes information, as well as how we can use these observations to influence data computation in other domains.

Faculty: Gordon Berman, Babak Mahmoudi, Shamim Nemati, Ilya Nemenman, Avani Wildani

**DATA PRIVACY AND ASSURED INFORMATION MANAGEMENT**

The AIMS research group conducts research at the intersection of data management and information privacy and security aimed at enhancing privacy, confidentiality, trust, interoperability, and scalability of healthcare and spatiotemporal information systems.

Faculty: Li Xiong

**DISTINGUISHED FACULTY AWARDS**

- NSF CAREER Award (Ymir Vigfusson, Systems Lab)
- NIH KoI Award (Jun Kong, BMI and Shamim Nemati, BMI)
- NSF/NIH and PCORI Awards (Li Xiong, AIMS Lab)
- A.P. Sloan Research Fellowship (Eugene Agichtein, IR Lab)
- British Computer Society, Karen Spärck Jones Award in Information Retrieval (Eugene Agichtein, IR Lab)
- IEEE Computer Society, Gordon Bell Prize for Parallel Processing Research (Vaidy Sunderam, Systems Lab)
- R&D 100 Awards 1999 & 2011 (Dorian Arnold)
- SIAM Fellow (Michele Benzi, James Nagy), ACM Distinguished Speaker (Dorian Arnold)

**FACULTY****CORE FACULTY**

- EUGENE AGICHTEIN, PhD, Columbia University, 2005. Information retrieval, Text and Data Mining.
- DORIAN ARNOLD, PhD, University of Wisconsin, 2008. Operating and Distributed Systems, High-Performance Computing.
- MICHELE BENZI, PhD, North Carolina State University, 1993. Scientific Computing.
- JINHO CHOI, PhD, University of Colorado at Boulder, 2012. Natural Language Processing, Machine Learning.
- SHUN YANG CHEUNG, PhD, Georgia Tech, 1990. Networking Performance Evaluation.
- GARI CLIFFORD, DPhD, University of Oxford, 2003. Machine Learning, Signal Processing for Data Fusion.
- LEE COOPER, PhD, Ohio State University, 2009. Machine Learning, Medical Imaging, Genomics.
- DAVIDE FOSSATI, PhD, University of Illinois at Chicago, 2009. Technology Enhanced Learning, Educational Data Mining, Computer Science Education.
- MICHELANGELO GRIGNI, PhD, MIT, 1991. Complexity Theory, Approximation Algorithms.
- JOYCE HO, PhD, University of Texas - Austin, 2015. Data Mining, Machine Learning.
- JUN KONG, PhD, Ohio State University, 2008. Biomedical Image Analysis, Imaging Informatics.
- QIAO LI, PhD, Shandong University, China, 2005. Biomedical Informatics.
- JAMES LU, PhD, Northwestern, 1992. Applied Artificial Intelligence, Language Tools.
- BABAK MAHMOUDI, PhD, University of Florida, 2011. Machine Learning, Optimization and Computational Neuroscience
- KEN MANDELBERG, PhD, Cornell, 1973. Operating Systems.
- JAMES NAGY, PhD, North Carolina State University, 1991. Scientific Computing, Imaging Informatics.
- SHAMIM NEMATI, PhD, MIT, 2013. Machine Learning, Physiological Signal Processing.
- JIM NETTLES, PhD, Emory University, 2005. Structural Biology, Cancer Research, Bioinformatics.

- **ANDREW POST, MD, PhD**, University of Pennsylvania, 1999. Language and Information Research, Biomedical Informatics.
- **ZHAOHUI (STEVE) QIN, PhD**, University of Michigan, 2000. Statistical Genetics, Genomics.
- **LARS RUTHOTTO, PhD**, University of Munster, Germany, 2012. Scientific Computing, Imaging Informatics.
- **ASHISH SHARMA, PhD, USC**, 2005. Medical Imaging, Data Fusion, Information Visualization, Cloud Computing.
- **VAIDY SUNDERAM, PhD, Kent (England)**, 1986. Distributed Systems, High-Performance Computing.
- **ALESSANDRO VENEZIANI, PhD**, University of Milan, 1998. Scientific Computing.
- **YMIR VIGFUSSON, PhD**, Cornell University, 2010. Distributed Systems, Security, Data Replication.
- **LANCE WALLER, PhD**, Cornell University, 1991. Biostatistics and Bioinformatics.
- **AVANI WILDANI, PhD**, University of California, Santa Cruz, 2013. Systems Optimization, Data Mining, Archival Storage.
- **LI XIONG, PhD**, Georgia Tech, 2005. Data Privacy and Security, Spatiotemporal Data Management.



- **MARY GALINSKI, PhD**, Sackler Institute of Biomedical Sciences, New York University School of Medicine, 1987. Malaria research and epidemiology.
- **YING GUO, PhD**, Emory University, 2004. Imaging Statistics.
- **VICKI HERTZBERG, PhD**, University of Washington, 1980. Behavior and Health, Statistical Modeling.
- **CARLOS MORENO, PhD**, Emory University, 1998. Cancer Bioinformatics, DNA Microarray Analysis, Systems Biology.
- **ILYA NEMENMAN, PhD**, Princeton, 2000. Theoretical and Computational Biology.
- **GEOFFREY SMITH, PhD, MD**, Emory University School of Medicine, 2010. Informatics, Immunology.
- **YAN SUN, PhD**, Wayne State University School of Medicine, 2001. Biomedical Informatics.
- **TOMMY THOMAS, MD, PhD**, University of Alabama at Birmingham, 2005. Biomedical Informatics, Neurology.
- **PHILLIP WOLFF, PhD**, Northwestern, 1999. Future Thinking, Casual Reasoning, Natural Language and Machine Learning.
- **HAO WU, PhD**, The Johns Hopkins University, 2010. Bioinformatics and Computational Biology.
- **TIANWEI YU, PhD**, University of California, Los Angeles, 2005. Bioinformatics.

**AFFILIATED FACULTY**

- **GORDON BERMAN, PhD**, Cornell University, 2009. Computational Ethology and Neuroscience.
- **SHERI CHERNETSKY TEJEDOR, PhD**, The Johns Hopkins University, 2002. Biomedical Informatics.
- **CHRISTOPHER FLOWERS, MD**, Stanford University School of Medicine, 1997; MS, Stanford University, 1997; MS, University of Washington-Seattle, 2002. Lymphoma Research, Oncology Informatics.

**EMORY UNIVERSITY**

Emory University is one of the major scientific research and medical research centers in the Southeast and is among the fastest growing Medical Centers in the United States. Emory is consistently ranked in the top 20 institutions nationally for NIH research support. Newsweek magazine, in a testament to our quality and dedication to education, recently named Emory University as one of the 25 “New Ivies.” Emory is recognized as a leader in higher education in sustainability and has won numerous awards. The Best Colleges has placed Emory in the top 10 in the nation in the categories of greenest universities and the most beautiful college campuses.



Requests for Additional Information:

Recruitment and Admissions  
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**LANEY GRADUATE SCHOOL DEGREE PROGRAMS**

Anthropology	<i>Genetics and Molecular Biology</i>	Biomedical Engineering	Development Practice	Health Services Research and Health Policy	Nursing
Art History	<i>Immunology and Molecular Pathogenesis</i>	Biostatistics	Economics	Hispanic Studies	Nutrition and Health Sciences
Behavioral Sciences and Health Education	<i>Microbiology and Molecular Genetics</i>	Business	English	History	Philosophy
Bioethics	<i>Molecular and Systems Pharmacology</i>	Chemistry	Environmental Health Sciences	Islamic Civilizations Studies	Physics
Biological and Biomedical Sciences	<i>Neuroscience</i>	Clinical Psychology	Environmental Sciences	Mathematics	Political Science
<i>Biochemistry, Cell and Developmental Biology</i>	<i>Population Biology, Ecology, and Evolution</i>	Cognition and Development (Psychology)	Epidemiology	MD/PhD	Religion
<i>Cancer Biology</i>		Comparative Literature	Film and Media Studies	Music	Sociology
		Computer Science and Informatics	French	Neuroscience and Animal Behavior (Psychology)	Women's, Gender, and Sexuality Studies