

RIT

B. Thomas Golisano College of Computing and Information Sciences
DEPARTMENT OF COMPUTER SCIENCE

ANNUAL REPORT
2021

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WELCOME FROM THE CHAIR



It is my pleasure to welcome you to the Department of Computer Science at RIT (CS@RIT), home to more than 40 faculty and 1400 students with expertise across the discipline. We offer an ABET-accredited 5-year BS degree in Computer Science that includes one year of co-op education and produces graduates who have gone on to great success in industry and academia. Our MS program is the largest and most successful graduate program at RIT, attracting students from around the world, and we also offer several advanced certificates in different areas within CS. The PhD program, is also administered within the B. Thomas Golisano College of Computing and Information Sciences. Together, these programs offer our

students at all levels the opportunity to engage in research, experiential learning, and depth of study within the discipline, alongside dedicated faculty and a strong team of student-centered advisors and staff.

The department is also privileged to work with a large network of alumni, and an advisory board that includes members from Amazon, Google, Intel, and Xerox along with other leading technical companies and high-profile universities. This enables us to maintain a relevant curriculum and strong network for our new graduates, leading to a job placement rate of over 98%. Our research profile is also strong and growing, with several million dollars of grants awarded in the last five years, and five new tenure-track faculty with excellent research profiles hired since 2018. Active research areas within the department include algorithms, computing education, cryptography, data science, distributed systems, graphics and visualization, machine learning and pattern recognition, programming languages, security, and theory. Our faculty, both tenure-track and lecturers, are dedicated to teaching and providing an engaging, rigorous, and welcoming classroom environment. We are proud to be the home of five different winners of RIT's most prestigious teaching awards.

It is an exciting time to be a member of the Computer Science profession, with the chance to contribute to society in many important ways. Here at CS@RIT, we continue to grow and improve as we strive to be an environment where students, staff, and faculty can all work together to enable each other's success!

Zachary Butler,
Professor and Chair

ABOUT THE DEPARTMENT

Overview of our Programs

BS in Computer Science

RIT established one of the first undergraduate schools of computer science and technology in the nation in 1972. The program was initiated while the department was in the Institute College (later changed to the College of Applied Science and Technology). The program has been ABET (<https://www.abet.org>) accredited since 1989. Currently, the BS in computer science is the largest undergraduate program at RIT. This program receives over 2750 applications each year; more than 12% of all applications to the undergraduate programs at RIT. The BS is a 5-year comprehensive and rigorous program that includes one year of mandatory co-op. The employment rate of our graduates is more than 98%.

Fall 2021	
BS students	1044
Fulltime equivalent	900
Credit hours	10,788

BS Student Outcomes

To allow our BS graduates to meet our long-term program educational objectives, the department has developed seven student outcomes, which describe what our students are expected to know and be able to do by graduation. Students graduating from our BS program are able to:

1. Apply the theory and principles of computer science;
2. Demonstrate fluency in high-level programming languages, environments, and tools for computing;
3. Demonstrate knowledge of the principles of computer organization, operating systems, and networks;
4. Apply computing skills and work effectively in teams in industry or research;
5. Demonstrate advanced knowledge of a selected area within the computer science discipline;
6. Prepare technical documents and make effective oral presentations; and
7. Comprehend and analyze both legal and ethical issues involving the use of computing in society.

MS in Computer Science

The MS in Computer Science is by far the most successful graduate program at RIT, attracting 800-1000 applications each year – this is nearly 18% of all applications to graduate programs at RIT. The MS graduation rate is more than 98% with 150-200 graduations each year. The MS program is preceded by a set of bridge courses, and includes an optional co-op of up to one year.

Fall 2021	
MS students	374
Fulltime equivalent	322
Credit hours	3179

BS/MS in Computer Science

Students have the ability to complete a joint BS/MS degree in computer science. The degree program, including 1-year mandatory co-op, can be completed in 6 to 6.5 years. We also offer joint BS/MS programs with computer security, software engineering, and computer engineering technology.

Program Educational Objectives

Our program educational objectives are broad statements that describe what graduates are expected to attain within a few years of graduation. Our graduates will be able to:

1. Pursue advanced study in computing or participate in modern software development;
2. Collaborate successfully with colleagues and clients;
3. Work as ethical and responsible members of the computing profession and society.

Industrial Advisory Board

The Computer Science Industrial Advisory Board (IAB) consists of leaders from industry and government sectors who help the department ensure “real-world” concerns are incorporated into our programs. One of the primary goals of the Board is to help the department to create curricula that continue to meet the changing needs of industry. The IAB convenes annually with department members to share information about computer science curricula and the skills and training needed to advance the computing industries.

CS Industrial Advisory Board Members

Bridget Beamon - Robertson Senior Professional Engineer The Johns Hopkins University Applied Physics Laboratory	Sal Ceravolo Strategic Planning and Research Manage REDCOM Laboratories	David Cok Senior Principal Consultant
David Doerman Professor University at Buffalo	Erik Haddad UX Engineer Google	Tad Hunt Product Manager Google
James Janicki Business Unit Director Sparton Corporation	Sean Janis Engineering Manager, Mobile Shopping Amazon	Michael Kirby Vice President, Embedded Hard- ware/Software for Controller Prod- uct Development Xerox
Juli Klie President Veritor	Mike Kurdziel Communications Systems L3Harris Technologies	John Marshall Distinguished Engineer Cisco Systems
Paul Monette Director of Quality Engineering CloudCheckr	Craig Paton Global Head of Investments Tech- nology Citibank	Aaron Rallo CEO TSO Logic
Laura Weime Game Developer Relations Engineer Intel	Aaron Robinson Senior Software Engineer Microsoft	Anoop Thomas Senior Graphics Programmer Rockstar Games

Co-operative Education

A co-op is a full-time paid work experience directly related to a student's course of study and career interests. The goals of co-operative education for computer science students include the application of theory to real-world situations and the opportunity to work with others in a professional environment. The co-op program prepares students for software development and provides background in communication skills, professional responsibilities, and ethical behavior mandated by today's team-oriented work environment.

BS students are required to complete a minimum of three co-op work assignments. One assignment occurs during summer and two assignments take place during semesters. MS degree students optionally complete up to 12 months of co-op work assignments.

The employment outcomes for computer science students and graduates remain bright. RIT sponsors and supports university-wide career fairs where employers and students connect. The Winter and Spring Career Fairs each draw around 250 employers and approximately 4000 students, leading to an average of 1500 interviews on the following day.

The average co-op wages are \$23.82/hr for BS students and \$31.44/hr for MS students. Organizations hiring Computer Science students include Amazon, Apple Inc., Cisco Systems, Citigroup, Datto Inc, Factset Research Systems, Fidelity Investments, General Electric, Google, Harris Corporation, IBM, Intel, Intuit, Lockheed Martin, Meta, Microsoft, National Security Agency, Oracle, Ortho-Clinical Diagnostics, Paychex, Rochester Software Associates, Square, Thomson Reuters, Vanguard, Windstream, and Xamarin.

For more information, see <https://www.rit.edu/emcs/oce/student/intro-to-co-op>.

News

The following selected news items originally appeared on the Computer Science Department website during the 2021 Academic year. Items may be edited for content and formatting.

March 2021



With a global pandemic on our hands, a group of professors and student volunteers came together to build a software system that helps people get vaccinated against COVID-19. Among these students was Peter Hogya, a fourth-year computer science major from Bayville, N.Y., who has been instrumental in this “need-of-the-hour” innovation involving the distribution of these vaccinations.

The team, which also includes students Antony Lin and Nicholas Mulhern, and recent graduate Thomas Ryszkiewicz, is working with coaches at RIT’s Simone Center for Innovation and Entrepreneurship to bring the idea to the next level.

“It all started when I attended a virtual hackathon for the Society for Imaging in Informatics and Medicine in Wisconsin in the summer of 2020...MassVaxx was initially an idea that came from a professor at the Opus College of Engineering while in conversation with an incident management team who expressed a need for a tool to distribute COVID-19 vaccines. The professor worked on this idea and brought it to the hackathon. With the news of the release of the vaccine, our team, which consisted of students well versed in biomedical engineering and computer science, decided to aim at a way to get these vaccines out to the mass population, and this was when MassVaxx was born.”

Several engineering and computer science students who worked at Teknic, a local motion controller device company, developed a robotic bartender to model how electronic equipment can be integrated with the company’s newest technology. “The robotic bartender is a mix of fun and serious engineering,” said Abe Amirana, Teknic’s director.

Integrating high-tech, brushless servo motors, connections to multiple networked devices such as digital and analog sensors, solenoids, LEDs, pneumatics and other hardware devices, the robotic bartender is capable of producing thousands of mixed drink combinations. Users can interact with the bartender through a touch screen interface, browse an extensive menu, vary combinations, and place an order.

The team was made up of mechanical, electrical, computer, and software engineering students. Brandon Key, now a software engineer with Teknic, is a graduate of RIT’s computer engineering program. He and project teammates Cody Burrows and Alex Amari, both computing science majors, were instrumental in coordinating the robotic bartender’s multiple system devices. All three have been hired by Teknic.



April 2021

Kellen Dorchen, a Computer Science Master student has been awarded a GEM Fellowship to complete his MS CS degree. As part of the fellowship, Kellen will receive full tuition and a stipend for his remaining 3 semesters of study at RIT. He will also work this and next summer in an internship at MITRE.



GEM is a network of corporations, government laboratories, universities, and research institutions. Their mission is to enhance the value of the nation's human capital by increasing the participation of underrepresented groups (African Americans, American Indians, and Hispanic Americans) in graduate STEM programs.

RIT is a GEM University Partner and, as such, agrees to support up to two GEM Industry Fellows per year. His employer sponsor is the MITRE Corporation.



Fourth-year applied mathematics and computer science double major, Quinn Kolt, from Solon, Ohio, was selected as one of 410 scholars from a pool of 1,256 nominees by the Barry Goldwater Scholarship and Excellence in Education Foundation, in partnership with the Department of Defense National Defense Education Programs. Since 2005, RIT has had 30 Goldwater Scholars and seven honorable mentions.

The award is based on academic merit and research experience, and virtually all intend to obtain a Ph.D. as their highest degree. Kolt has worked on a variety of mathematical research, including projects on an upper bound for a cyclic sum of probabilities with mentor Professor James Marengo, methods for stochastic inverse problems with mentor Professor Akhtar Khan, direct methods for the time-harmonic viscoelastic scalar wave inverse problem with mentor Assistant Professor Olalekan Babaniyi, and Legendre transformations with mentor Professor Emeritus David Farnsworth.

Khan introduced Kolt to a wide variety of topics related to his work in theoretical and applied inverse problems and variational inequalities, and Kolt decided to work on stochastic inverse problems as it combined many of their favorite fields of math. Kolt said they struggled with the complex, abstract material at first, but eventually gained traction and were exhilarated by the theoretical and computational details.

May 2021



Rajendra Raj, professor of computer science, has been appointed co-chair of an international task force to revise computer science curriculum in the next decade. About every 10 years, a joint task force is assembled to establish international curricular guidelines for undergraduate programs in computer science. The group aims to update curriculum to keep it modern and relevant. This is the first time someone from RIT has been selected to co-lead the task force.

The joint task force includes a steering committee of 19 members from organizations representing a diverse set of colleges and universities in the U.S., Brazil, China, Egypt, India, and Ireland. The joint task force includes members from the IEEE Computer Society, the Association for Computing Machinery (ACM) and the Association for the Advancement of Artificial Intelligence (AAAI). This is the first time AAAI will participate in the revision process for computer science curricula.

“We are determining what the next generation of computer science students should be learning, focusing on the breadth of knowledge and skills that computer science graduates need to have, distinguishing themselves from the many specialized computing disciplines,” said Raj. “Artificial intelligence is one of those areas that has become essential to both computer scientists and everyday technology users.”

As co-chair of the task force, Raj sees artificial intelligence playing an important role in future computer science curriculum. He noted that at RIT, undergraduate computer science majors already take a required course in artificial intelligence. The Department of Computer Science added this requirement almost a decade ago in anticipation of the current growth of artificial intelligence.

Raj also hopes to use curriculum changes to create more alternative pathways for students to get into computer science degree programs, making the field more inclusive. While introductory computer science courses are intended for first-year students who don’t already know programming, Raj said that is often not the case. Students come to college with a wide range of skills and that can make it difficult for instructors and students.

“It should be easier for people from diverse backgrounds to enter into the major, regardless of what prerequisites they were able to take in high school,” said Raj. “We need to make the introductory CS courses more accessible to someone who is a good student, but may not know how to code.”

July 2021



Saranya Dadi, a second-year computer science student at RIT, is conducting research to make machine learning for automated surveillance systems fairer. However, she's not just focusing on making it faster or more efficient, she also wants to make sure machine learning is ethical.

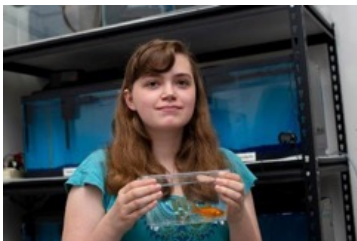
"Just because a computer doesn't have feelings and emotions, doesn't mean there's no bias," said Dadi, who is originally from India. "It is crucial that these

systems ensure effective performance and accurately safeguard the interests of organizations, without compromising individual privacy."

For the project, she has been conducting a literature review to better understand the current landscape of machine learning ethics and how it's being used in automated surveillance systems around the world. She is investigating the ethical ramifications of biased results, examining applications of automated surveillance and their implications on privacy. She is also recommending possible solutions. Based on her readings and ethical codes for computing professionals, she has begun to explore a six-step framework aimed at reducing bias in machine learning systems.

Dadi became interested in this research area after recent movements against racial injustice and taking an ethical perspective course at RIT that brought up a case where an insurance company was unintentionally using a healthcare algorithm that favored white patients over black patients. As someone who has lived in many different areas around the world and has always had an interest in international relations (even doing an international relations immersion at RIT), she began thinking about her major in a new way.

"I wondered what my role as a computer science student is and how I can make the world a little better with what I do," said Dadi. "I want to make sure computer scientists understand the impact we have and consider ethics and who our work affects."



Kaitlin Gunther, a fourth-year psychology and computer science double major from Webster, N.Y., is trying to better understand how fish view the world.

Her research, conducted in RIT's Comparative Cognition and Perception Lab, explores the ability of goldfish to recognize a 3D object viewed from different orientations. Gunther is specifically interested in whether goldfish recognize colorless objects as accurately as they recognize colorful ones.

Gunther trained goldfish to identify colorless objects by tapping them with their nose. Either a 3D model of a turtle or a frog, both painted black, were inserted into the fish tanks. When the fish identified the correct object (half were trained to identify the turtle and half were trained to identify the frog), they were reward-

ed with food. Continuing this research, Gunther trained goldfish to identify colorless objects by tapping them with their nose. Either a 3D model of a turtle or a frog, both painted black, were inserted into the fish tanks. When the fish identified the correct object (half were trained to identify the turtle and half were trained to identify the frog), they were rewarded with food. The fish were then presented with the same objects at different orientations to see if they still recognized them.

“We’re continuing to collect data, but we have three preliminary conclusions. First, some goldfish are able to successfully discriminate between rotated 3D stimuli that lack color cues, but many fish struggle with this task. Second, the lack of color cues seems to make it more difficult for fish to learn to discriminate between 3D stimuli. And third, color appears to be important for visual object discrimination of rotated shapes in goldfish.” Next, Gunther plans to explore whether goldfish have the ability to visually differentiate between pictures of goldfish and other objects, such as geometric shapes and other fish species. The study will provide insight into whether goldfish use vision to identify other individual goldfish.

September 2021

Dr. Leon Reznik has just been awarded a grant from the US Civilian Research and Development Foundation. The grant, titled “Security evaluation and improvement of the personal cyberinfrastructure with new tools and education development,” merges cybersecurity research with education. The team will study the human aspects of cybersecurity in mobile and home computing environments, both in the US and Ukraine, and bring this research into the classroom at RIT.



Many only dream of racing the historic oval at Indianapolis Motor Speedway. Several RIT engineering and computing students will make that dream come true. Members of RIT’s Autonomous Vehicle team will join partner universities as finalists in the inaugural Indy Autonomous Challenge taking place in October in Indianapolis. Over 20 laps on the legendary racetrack, with the newest in autonomous technology installed, one team has a chance to take home the \$1.5 million prize. RIT, part of the MIT-PITT-RW team—made up of stu-

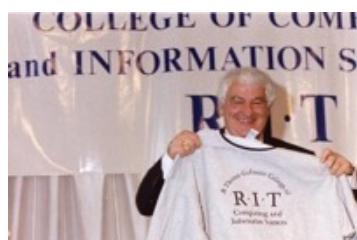
dents from Massachusetts Institute of Technology, the University of Pittsburgh, and the University of Waterloo (Canada)—will participate in the international competition to test their technology know-how and to help promote autonomous driving by using the motorsports world as a proving ground for innovation.

Teammate Charlie King, a fifth-year management information systems student in Saunders College of

Business and an amateur race car driver from Wellesley, Mass., brings both race experience and information system knowledge. Keats will oversee race and track operations from car prep and warm ups to getting systems up and running. Van Pham, from Ho Chi Minh City, Vietnam, and J.P. Ramassini, from Pittsburgh, Pa., both fourth-year computer science majors in the Golisano College of Information and Computing Science, are managing the simulator infrastructure connected to the racecar.

October 2021

Golisano College of Computing and Information Sciences celebrates 20th anniversary



Golisano College of Computing and Information Sciences (GCCIS) was created to house RIT's growing computing programs 20 years ago, after Paychex founder Tom Golisano gave a \$14 million gift to the university. When RIT announced that it was creating one of the nation's first computing colleges back in February 2001, Wikipedia was less than a month old.

Twenty years later, RIT's Golisano College of Computing and Information Sciences (GCCIS) has evolved into the largest college at RIT with 23 degree programs and advanced certificates in a growing number of computing disciplines. Internationally, GCCIS is highly-ranked for its specialties in game design and development, computer science, cybersecurity, and more.

December 2021

New machine learning techniques developed by scientists at Rochester Institute of Technology are revealing important information about how pulsars—rapidly rotating neutron stars—behave. In a new study published by Monthly Notices of the Royal Astronomical Society, the researchers outlined their new techniques and how they applied to study Vela, the brightest radio pulsar in the sky.

Pulsars can provide astrophysicists extremely accurate clocks because they emit beams of electromagnetic radiation, often at extraordinarily precise rates. But each pulse is different, and the sheer volume of pulses emitted leaves a lot for scientists to sift through to understand their characteristics. For example, Vela rotates about 11 times per second, providing about 120,000 pulses for scientists to analyze during a three-hour span using radio



telescopes in Argentina operated by RIT and the Instituto Argentino de Radioastronomía (IAR).

“We wanted to look at the statistics of these pulses, but to do this in human terms takes a lot of time and results in a lot of mistakes,” said Carlos Lousto, lead author of the paper and a professor in the School of Mathematical Sciences and a member of the Center for Computational Relativity and Gravitation. “The technology we have developed opens up a plethora of applications in astrophysics. I’m particularly excited for the students involved in this project—they have a brilliant future and will have the right preparation and background to make an impact on science with these very powerful techniques.”

The study revealed that pulses can be categorized into four clusters that correspond to emission regions at different heights in the pulsar magnetosphere, and that several times each day the pulsars emit so-called mini-giant pulses, with about 10 times the average pulse amplitude.

Lousto said their techniques could also help scientists learn more about “glitches,” large, sporadic disruptions in the rotation speed of young pulsars like Vela as they cool down. While the observing run of this study occurred over four days in January and March, Vela experienced a glitch in July that the researchers plan to investigate further.

The techniques can also be used to study millisecond pulsars, which rotate much more rapidly than pulsars like Vela. Millisecond pulsar timing can be used to detect and analyze gravitational waves.

Lousto said several students made key contributions to the project, notably Ryan Missell '20 (computer science), a computing and information sciences Ph.D. student advised by Professor Linwei Wang; Harshkumar Prajapati, an imaging science Ph.D. student advised by Associate Professor Nathan Cahill; and Valentina Sosa Fiscella, an astrophysical sciences and technology Ph.D. student advised by Lousto.

Courses of Study

- Principles of Data Mining
- Intro to Big Data
- Database Systems Implementation
- Data Security and Privacy
- Big Data Analytics
- Data Cleaning and Preparation

Opportunities

- Analytics Manager
- Database Administrator
- Data Scientist



What students are saying

- All about data storing, querying, processing and application both in theory and practical implementation. - Zizhun Guo
- There is enough diversity in the courses. It helps to know where my interest lies and what courses align with that interest. - Sapan Singh
- Very well-designed coursework if you are looking to dig deeper into data analytics and databases. - Aniket Giriyalkar

The data science cluster studies the foundational data management and knowledge discovery challenges prevalent in design, analysis and organization of data. The courses cover general database issues, including database design, database theory, data management and data mining.

Courses of Study

- Intro to Computer Vision
- Intelligent Security Measurement
- Foundations of Intelligent Systems
- Mobile Robot Programming
- Image Understanding
- Neural Networks and Machine Learning
- Pattern Recognition

Opportunities

- AI Developer
- AI Engineer
- Azure/AWS Scientist
- Data Scientist
- ML Data Developer



What students are saying

- Provides mathematical foundations for the higher-level AI concepts that everyone talks about. Now, you're one of the people who can actually work with it, not just talk about it. - Dylan P. Jackson
- The artificial intelligence cluster has helped me demystify machine learning. This cluster exposes you to cool concepts and projects that you can easily apply to real world problems. - Yancarlos Diaz
- Artificial intelligence has great scope in almost all the possible fields(-finance, space, health, etc) you can think of and also a lot of potential for research as it is continuously growing. - Karan Manghi

Artificial intelligence encompasses the study of algorithms and architectures that enable effective decision making in complex environments. Artificial Intelligence aims to create technology that allows computers and machines to function in an intelligent manner. The ability of your computer to make decisions about how to solve problems without insight from users makes this discipline one of the most in demand for both research and careers-oriented students.

Courses of Study

- Aspect Oriented Programming
- Design Patterns & C#/.Net
- Functional Programming
- Efficient Design in Modern C++
- Software Development Tools
- Compiler Construction

Opportunities

- Apple
- Microsoft
- Oracle
- Facebook
- Google



What students are saying

- It is a fantastic way to learn about languages. - Robert Svetlichniy
- We communicate with computers using programming languages. This cluster covers the core fundamentals of how programming languages work, and that empowers you to master any languages and tools you encounter in the field. - Apurav Khare
- Every snippet of code belongs to some language and the courses help one learn the intricacies involved in creating a language. It's amazing to understand why and how a line of code behaves the way it does. -Maheen Riaz Contractor

The languages and tools cluster focuses on language design and implementation. Students will learn how languages are specialized to solve particular problems as well as how those languages and the software written in them is architected. Students will gain a broader understanding of compiler construction, language parsing and tools used in a language. Students specializing in this cluster gain a broad understanding of theoretical and applied knowledge.

Courses of Study

- Data Comm & Networks
- Data Security & Privacy
- Machine Learning
- Secure Coding

Opportunities

- NSA
- Google
- L3 Harris
- Northrup Grumman
- Lockheed Martin



What students are saying

- It helps you understand the implications of seemingly simple decisions when designing systems. - Nathaniel Heitsch
- The Security cluster helped me get a step closer to understanding the current security landscape of the tech industry. I was introduced to both basic and advanced topics in security which also intersect with other clusters such as Artificial Intelligence and Data Science.- Calvin Ryan D'Souza

The security area spans topics from networking to cryptography to secure databases. By choosing different domains in which to study security students can gain a broad understanding of both theoretical and applied knowledge.

Courses of Study

- Intro to Computer Graphics
- Foundations of Computer Graphics
- Global Illumination
- Computer Animation
- Scientific Visualization
- Computational Geometry

Opportunities

- Disney
- Pixar
- Dreamworks
- Electronic Arts
- Apple



What students are saying

- This cluster deals with computer graphics and how modern day game engines, computer animations and various other computer graphics related things work - Manan Joshi
- Lots of fun with using math and physics to make images and animation! - Caleb Adrian
- It's awesome. Being able to create images and renderings is exciting. - Boyuan Li

The graphics and visualization cluster provides the technical foundations for studies in computer graphics and image understanding. Areas for further study include graphics programming, rendering and image synthesis, computer animation and virtual reality, image processing and analysis, and data visualization.

Courses of Study

- Data Comm & Networks
- Distributed Systems
- Parallel Computing
- Cryptography
- Cloud Computing
- Network Security

Opportunities

- General Dynamics
- PayPal
- Cloudflare
- Dropbox
- Raytheon



What students are saying

- Distributed nature of things has always fascinated me to a point of becoming an addiction and RIT has provided me with an ideal platform to nurture my passion for distributed systems. - Moiz Arif
- RIT's High-Performance Distributed Systems Laboratory has been instrumental in fostering my passion for bridging the gap between high performance computing and Big Data analytics. - Avinash Maurya
- Distributed systems allow me to understand life better. It is the interpretation of how every domain has evolved in the World, and my daily interactions with such systems provide valuable insights on how to improve efficiency. - Kevin Assogba

This area studies systems formed from multiple cooperating computers. This includes the analysis, design, and implementation of distributed systems, distributed middleware, and computer networking protocols, including security.

Courses of Study

- Advanced Algorithms
- XTreme Theory
- Cryptography
- Complexity
- Computational Geometry
- Programming Language Theory

Opportunities

- Security
- Cryptography
- Internet Algorithms
- Algorithmic Game Theory
- Geometric Algorithms



What students are saying

- Exploring theoretical computer science can be difficult due to the intricacy and span of the area. Pursuing the theory cluster allowed me to explore areas such as complexity theory, computational geometry, and combinatorial computing and facilitate what otherwise would have been a daunting experience. -Zohair Hassan

The theory area studies the fundamentals of computation. These fundamentals include complexity theory to determine the inherent limits of computation and communication and cryptography and the design and analysis of algorithms to obtain optimal solutions within those limits.

Staff Spotlight

Cindy Wolfer

Where is your degree from (and in what)?

I earned B.A. degrees in Psychology and Sociology from Geneseo State University, an M.S. in Education in School Counseling from The College at Brockport, and Permanent School Counseling Certification in New York State.

Where did you grow up?

For over 50 years I have lived south of RIT campus in Avon. In December 2019, we purchased the only residential house directly on the Avon Circle Park, the heart of the village. Built in 1900, our huge Victorian has so much space, history, and character. We have filled it with rescued dogs, and enjoy visits from children, grandchildren, extended family, and friends.



What did you do before RIT?

I have an extensive background in the field of education. My career in school counseling includes serving as the director of school counseling programs in two large Rochester area school districts. I also spent time working in the Registrar's office at Nazareth College.

What are your professional interests?

My professional interests include career exploration and planning, goal setting, and student empowerment. This year I was selected to serve as a mentor for the NACADA's Graduate & Professional Studies Mentoring program, and was also featured in the August 2021 addition of that community's newsletter. I have done informal research and literature reviews regarding the challenges faced by graduate students; more specifically, challenges and opportunities for advisement of international students in the graduate setting. Along the way, I have shared what I have learned with my university advising colleagues. I continue to push myself to share with a greater advising audience and to keep adding to my own educational growth. I am excited to be serving as a mentor in the national advising association's inaugural mentoring program where I am learning as much as I am sharing.

Describe a particularly rewarding RIT-related experience (i.e., student interaction, classroom)?

From orientation through graduation, I find student advising rewarding. My advising approach acknowledges and shows concern for a student's personhood while asking them to academically 'hit the ground running'. I understand to grow, students need to bring their most prepared and focused self to their studies. The ebb and flow of guiding students developmentally through our academic culture, no matter their background, is the most rewarding component of my role.

UNDERGRADUATE STUDIES

First Year Computer Science

The undergraduate first year curriculum at RIT is a challenging yet rewarding experience. Students learn Python, Java, object-oriented programming, data structures, algorithms, and other core topics of Computer Science through a unique problem-solving approach to teaching.

Each week begins with a new problem to solve, and the pedagogical goals of the course are introduced as potential solutions. This approach encourages students to thoughtfully consider which algorithms and data structures they should use, as opposed to simply translating notes on a board into source code.

Imagine being given a set of railcars encircling a board. The goal is to make the rail lines as long as possible to the center of the board or to a power station on the edge of the board. The player with the total of the longest route wins. This is the type of problem that students will solve in the introduction sequence at RIT.

Students develop solutions by working in small teams of three to four people, with pen and paper before taking the solutions to a computer. This problem-solving approach teaches students how to adapt their knowledge to a variety of applications and domains. Students, by the end of their program, will have the ability to continue to learn and adapt to new situations by applying the problem-solving skills learned in their first year. Lab time is also provided for students to implement weekly labs with the assistance of their instructor and student assistants. Teaching Assistants provide weekly recitations so that students can get additional reinforcement of the material after the two-hour lecture. In addition to the time spent in the classroom, the department provides a tutoring center where students can get additional assistance for topics.

Each of the introductory courses culminates in a project that utilizes many of the concepts they have learned throughout the semester. Some projects have included a competition with other students in a rousing game of Cable Car, where students compete against each other to form the longest path possible without intersecting their opponents' paths; while other projects have involved data analytics, network programming, text processing and significant aspects of program design.

Undergraduate Research

Reynold Bailey, Professor of Computer Science and Associate Undergraduate Program Coordinator, recently completed a 3-year National Science Foundation Research Experience for Undergraduates (REU) Site award, “Computational Sensing,” on which he served as co-PI, alongside PI Cecilia Ovesdotter Alm, Associate Professor in the College of Liberal Arts. The goal of this REU Site project is to give students experience with fundamental research in acquisition and fusion of multisource sensing data related to human beings. Students are challenged to make sense of human behaviors and cognitive processes with hardware, software, and complex thinking, exploring the nexus of computational science, scientific practice, and the human experience. Traditionally, sensors have been understood narrowly, often as physiological measurements. This project envisions sensing in broader, new ways, as time-evolving measurable data directly linked to individuals and, by extension, to their communities. With this understanding, sensing data may involve language, social network and environment signals, or emotional-creative reactions.

“REU Site: Extremal Graph Theory and Dynamical Systems” is a competitive NSF award to create research experiences for undergraduates hosted by RIT during summers. Professor Narayan from the School of Mathematical Sciences (SMS) is the PI of his project, and Professor Radziszowski from CS is a co-PI, as the only member on the project’s team not from the School of Mathematical Sciences. The current award of \$287,556 is funding 10 students (selected from about 150 applicants from across the US) for each of three summers to work with mentors on research projects during an 8-week residence workshop on the RIT campus. The students working with Professor Radziszowski focus on the computational aspects of Ramsey theory. This project award has been renewed three times, and has been running at RIT since 2007. The typical outcomes of each summer are student presentations at the annual Young Mathematicians Conference and at the Joint AMS Meetings, and papers published in conference proceedings and specialized journals.

Study Abroad

The Computer Science Department has created multiple opportunities for students to continue their studies while experiencing the world from a different perspective. Although there are many study-abroad options available to students at RIT, the CS Department programs are unique in that all participating students take computer-science-based coursework while abroad. We encourage undergraduate students to explore the options that the department offers, and encourage all students to check out additional [study abroad opportunities](#) offered by RIT.

Osnabrück, Germany

We offer a semester study abroad program in Osnabrück, Germany (in affiliation with SUNY Oswego). Students attend the University of Osnabrück and carry a minimum of 12 credit hours per semester in the Cognitive Science Program and focus on artificial intelligence, functional programming, neural networks, and German language and culture. This program kicks off in the beginning of April and runs through mid-July every year. This program is open to all computing students.

PhD Student Spotlight

Behrooz Mansouri

I am Behrooz Mansouri, last year Ph.D. student in computer science at RIT. I was born in Tehran, Iran. My research interest is Information Retrieval. At the moment, I am working on developing math-aware search systems. I chose this topic as I was interested in working on domain-specific search systems. Also, dealing with math documents that have both text and formula was challenging and I thought there is much that can be done in this area. Overall, the main reason I like computer science is that there is so much we can do with computers to make the world a better place! The person who inspired me the most to go to computer science was my father's co-worker who would fix our PC whenever it had issues. He always looked professional, smart, and helpful. I decided to learn more and more about computers after meeting him and as time passed, I got more interested in computer science!



I am involved in MathSeer Project, developing math-aware search systems that would be integrated into CiteSeerX. Also, I am co-organizing the ARQMath lab at CLEF (Conference and Labs of the Evaluation Forum). ARQMath is an international lab that was started in 2020 and I consider it as one of the most important contributions I had in my Ph.D. program which I am proud of. Besides research, I have been the president of the PARS (Persian Association of RIT students) club for almost three years which aims to introduce the Persian culture to RIT students. After my Ph.D., as I love both teaching and research, I am planning to become a faculty member.

Honors & Awards

The Richard T. Cheng Endowed Scholarship

- **Himani Munshi**
- **Klaus Curde**
- **Aaron Cote**

Established in November of 1997 by Dr. Richard T. Cheng, current President of ECI Systems & Engineering, and former Chair of Computer Science at RIT from 1973 to 1976. Applicants must be majoring in Computer Science, be in at least their second year of study, demonstrate academic achievement (at least a 3.0 overall GPA and a 3.2 GPA in computer science courses), and financial need.

Kenneth and Margaret Reek Scholarship

- **Renee Veit**

Established in 1999 by Ken and Margaret Reek, both alumni of RIT's Computer Science Program and former faculty members in the department. The scholarship was established to assist students who might not otherwise be able to attend RIT. Applicants must be majoring in computer science, demonstrate academic achievement (at least a 3.0 overall GPA and 3.2 GPA in computer science courses), and financial need.

Carl Reynolds Computer Science Scholarship

- **Jessica Zhao**

Established in 2008 in memory of Carl Reynolds, who was a member of the faculty of RIT's Computer Science Department from the fall of 2004 until his death in the spring of 2008. Applicants must be majoring in Computer Science and in their first year of study. The award recognizes students who demonstrate academic achievement (at least a 3.0 GPA overall and a 3.2 GPA in computer science courses) and who combine academic accomplishments with a willingness to help and mentor fellow students.

Outstanding First Year Student Scholarship

- **Ananya Misra**

The outstanding first-year student scholarship recognizes a first year Computer Science major who maintains high academic standards while also contributing positively to the culture within the department. The award is given annually to an undergraduate student majoring in Computer Science in their first year who has earned an overall GPA 3.5 or higher.

Outstanding Fifth Year Student Award

- **Bradley Klemick**

The outstanding fifth-year student award recognizes a fifth year Computer Science student for maintaining high academic standards during his or her studies at RIT and who has made significant contributions to the department. The award is given annually to a student who has maintained a 3.0 GPA or higher average during his or her five years of study.

Alumni Scholarship

- **Will Mackin**
- **Ayush Goel**

The Alumni Scholarship recognizes a Computer Science BS student for maintaining high academic standards (at least a 3.5 overall GPA) during their studies at RIT and who has made significant contributions to the department. The award is made possible by generous donations from computer science alumni.

Faculty Spotlight

Joe Geigel

Where is your degree from (and in what)?

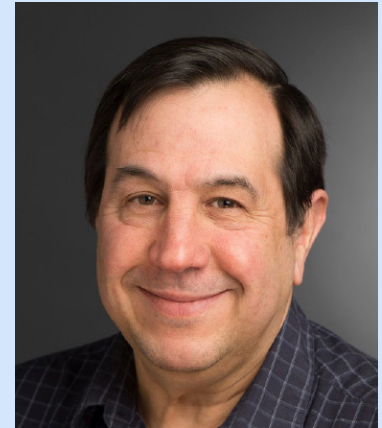
D.Sc. in Computer Science from the George Washington University in D.C.

Where did you grow up?

Small town in central New Jersey. Though I've spent a good part of my life in Rochester, I still think of myself as a "Jersey Boy" at heart.

What did you do before RIT?

I've worked at a variety of places including RCA, Bell Labs, and the Pittsburgh Supercomputing Center. It was a position in Kodak's research labs that first brought me to Rochester. Right before RIT, I was working at a Broadway related Web site.



What are your professional interests?

My area is Computer Graphics and more specifically Virtual and Augmented Reality, animation, rendering, and sound. For the past 20 years, my research has focused on using these technologies in live theatre, dance, and musical performances.

What are your personal interests?

I'm a big fan of Pop music from the 1960s to the 2010s. I'm also a fan of musical theatre and the history of Broadway.

Describe a particularly rewarding RIT-related experience (i.e., student interaction, classroom)?

My most rewarding experience while at RIT is following the alumni who pass thru our programs. I've been fortunate to work with the best student teams, especially on projects involving virtual theatre and have seen my students move on to great things in entertainment studios like Pixar, Dreamworks, Rockstar Games, and Sony Imageworks, and in other graphics companies such as Intel, nVidia, and AMD. I attend SIGGRAPH, the premiere conference on Computer Graphics and Interactive Techniques annually. Attending the RIT alum receptions to catch up with past students, is a highlight of the conference.

Describe a particularly challenging RIT-related experience?

Like many, the past several COVID years have been challenging, but I am encouraged by RIT's resilience in getting past it.

Class of 2021 (BS)

Abbey, Frank
Adams, Samuel
Agger, Matt
Ahern, Conor
Amirkulov, Jahongir
Anderson, William
Arcoraci, Matthew
Armstrong, Peter
Armstrong, Robert
Avenoso, Robin
Baik, JiWoo
Baker, Nate
Barkevich, Kevin
Barricelli, Anthony
Barton, Michael
Becker, Kevin
Bendinsky, Elijah
Berhane-Meskel, Leul
Bernstein, Ari
Bianconi, Mike
Binder, Sam
Bloomingdale, Carson
Bogdany, Rachael
Bolha, Emerson
Bryla, Ryan
Campbell, Ian
Canning, Michael
Cao, Jimmy
Casalnova, Claire
Castles, Elyse
Cervantes, Ryan
Chabot, Andrew
Clark, Skyler
Clements, Matthew
Cogliano, Reed
Cohn, Maxwell
Cole, Randy
Collins, Kyle
Cote, Aaron
Cui, Yongchun
DeFrancisci, Patrick
Deng, Perry
Dennis, Matthew

Diaz, Yancarlos
Dicarlo, Anthony
Dinehart, Patrick
Dioguardi, Cory
Drobnak, Mark
Dunn, Griffin
Dunn, Kelsey
Edvalson, Tony
Farr, Henry
Feeley, Jared
Frazer, Luke
Gingras, Andrew
Glod, Nate
Godlewski, Jarod
Green, James
Gregorek, Kurt
Groppe, Marilyn
Gruss, Owen
Haen, Christopher
Halbur, Alexis
Hall, Thomas
Haluptzok, Chase
Heberger, Kyle
Heiles, Arthur
Hen, Dom
Hicks, Paige
Hill, Spencer
Jackson, Dylan
Jagtap, Tejaswini
Jamison, Leah
Johnson, Tim
Johnson, Zachary
Jones, Nicholas
Joy, David
Kimbrell, Caitlin
Kott, Devin
Kubiak, Patrick
Kutrolli, Ionis
Lang, Eric
Law, Wheeler
Leuschner, William
Levie, Alexander
Lewis, Will
Leyva, Jorge

PhD Student Spotlight

Tejaswini Ananthanaraya

Where are you from?

I am from Mumbai, India.

Tell us something about your research project. How did you choose computer science and your particular topic?

My Ph.D. thesis topic was “A comprehensive approach to Sign Language Translation”. I worked on providing an autonomous solution using AI (Deep Learning) for facilitating better communication between the DHH community and non-signers. My work looked at not only translating sign language to text (facilitating non-signers) but also text to sign language thus providing a platform that would help in engaging in a conversation between signers and non-signers.



Please describe an accomplishment you are proud of.

I am very proud of all my conference and journal submissions. But there are two very dear to me, one of them is a journal article that took a lot of team effort and time (published in TACCESS journal) and the other one is my novel deep learning methodology accepted into an A-rated conference - Interspeech).

Is there someone who inspired you to go into Computer Science? If so, who and why.

I come from a digital design background, but the work done in the AI field by professors like Dr. Ifeoma Nwogu and Dr. Raymond Ptucha inspired me to step into this field.

What do you want to do after you graduate?

I have joined Sony Electronics as a Sr. Algorithm Engineer.

Li, Alice
Li, Vincent
Lymer, Kyle
Maartens, Neil
Maffei, Spencer
Malik, David
Manelius, Jacob
Mao, Yuying
McGrath, Jeremy
Melanson, Johan
Menzel, Samuel
Merino, Abigail
Miller, Elliot
Moir, James

Molina Recinos, Valeria
Moore, Daniel
Moore, Joshua
Morris, Daman
Moss, Eric
Mulya, Mond
Munshi, Himani
Murphy, Anna
Nafiuazzaman, Navid
Necoechea, Andrew
Noel, Alex
Novins, Jon
Odegaard, Tanner
Ozturkoglu, Efe

Pagano, Ryan
Pagliaro, Michael
Paradis, Kevin
Patterson, Brett
Paul, Suwamik
Pimm, Jennifer
Podlaszewski, Eric
Polanco, Esteban
Puccini, Giovana
Pueschel, Nicholas
Pugachev, Artem
Quispe, Konce
Raina, Nikhil
Rauh, Brian
Reed, Andrew
Register, Paula
Richmond, Matthew
Ripper, Jarod
Rovero, Audrey
Rutherford, Mark
Sakai, Sumire
Sawant, Onkar
Schenk, Joshua
Schleicher, Lucas
Shriver, Owen

Singh, Pardeep
Sivak, Corrina
Smith, Jamie
Smith, Matthew
Smith, PJ
Snook, Aidan
Spangler, Josh
Sullivan, Ruby
Sunderhaft, Nate
Szeto, Lucas
Taffe, Alex
Takatsuka, Mark
Tamrakar, Abhaya
Tang, Adam
Taylor, Stan
Tellier, Joshua
Tewari, Varnit
Tillinghast, Sam
Todd, Kevin
Tregea, Sam
Turetsky, Aaron
Verdesi, Jacob
Veronesi, Curtis
Villalobos, Isaias

GRADUATE STUDIES

Graduate Research

Students in the RIT Computer Science master's program are required to finish a master's project or thesis to complete their degree. Faculty in the department carry out research in a wide variety of Computer Science areas (see the *Research Areas* section near the back of the report).

MS projects may be implementation-based, or a narrowly-focused research effort. Project students are required to take the Master's Project Colloquium (CSCI-788), in which students study technical writing, presentation skills, strategies for research programming, experimental design, and analysis of results. Projects culminate with a poster presentation session and final report submitted to their advisor.

A **master's thesis** is a research-based undertaking, normally requiring 2-3 semesters to complete. A thesis culminates with an oral presentation and defense of the thesis document to a committee of three faculty members. Successfully defended theses are archived by RIT. Often, thesis students also complete an independent study with their advisor, to obtain sufficient time for studying background literature and identifying a research problem of interest. Master's students wishing to pursue a PhD or research-related positions in academia or industry are well-served by the additional time and technical depth that a thesis requires. A list of master's theses completed in 2021 may be found in the *Publications* section.

A number of our MS project and theses students have published research papers, provided tools for research, and contributed to educational activities and exhibitions.

Master's Project Best Poster and Report Awards (2021)

Each semester at the master's project poster session, up to three posters are selected for the Best Poster Award. All award recipients traditionally receive a gift card and book from Prof. Bischof, the master's program coordinator.

Spring 2021

Best MS Project Poster Award

1st Place Poster: Mark Thomas Drobnak: P4 Safety Verification

Advisor: Dr. Minseok Kwon

2nd Place Poster: Zizhun Guo: Explore the Object Detection Performance in relation to Input Image Deterioration

Advisor: Dr. Leon Reznik

3rd Place Poster: Yuying Mao: Analyzing RuDiK and its Rule-Discovery Algorithm

Advisor: Dr. Carlos Rivero

Fall 2021

Best MS Project Poster Award

1st Place Poster: Amrutha Varshini Mandalreddy: Explore Efficient Blockchain Alternatives for IoT Devices

Advisor: Dr. Mohan Kumar

2nd Place Poster: Renke Wang: A Computational Approach For Modeling Face to face Interaction

Advisor: Dr. Ifeoma Nwogu .

3rd Place Poster: Udit Harminder Wasan: Deepfake Detection using Deep Learning

Advisor: Dr. Hans-Peter Bischof

Honors & Awards

Outstanding Graduate Student Award

- **Lingmin Hou**

The outstanding graduate student award recognizes a Computer Science graduate student for maintaining high academic standards (at least a 3.5 overall GPA) and for making significant contributions to the department and the Computer Science Graduate Program.

TSO Logic - An Amazon Web Services Company Scholarship

• Divya Kumar

Selection for this scholarship will be based on the recipient's matriculation in a degree-granting program in RIT's B. Thomas Golisano College of Computing and Information Sciences. Preference will be given to second-year graduate students enrolled in computer science. Recipients should demonstrate an area of interest in edge computing and/or big data analytics as evidenced by coursework and research topics and be in good academic standing.

Class of 2021 (MS)

Achyuthuni, Sri Rachana

Agarwal, Nishith

Akadkar, Ekta Rajio

Albinhashim, Monim

Alsulami, Ammar

Amirkulov, Jahongir

Ansari, Sharjeel

Apte, Saurabh Sanjay

Arya, Tejas

Avenoso, Robin

Badame, Vaishnavi

Badod, Divesh Shyam

Bapat, Siddharth

Batchelder, Luke

Batra, Mayank

Bhagwat, Pratik

Bhatia, Sheenam

Bhave, Anuradha Nitin

Bhensadadia, Raj Bakulbhai

Bhide, Jaideep Milind

Bujala, Varun Reddy

Byreddy, Vishnu Saketh

Chabot, Andrew

Chandra, Shaivya

Chaudhari, Abhilekh Sunil

Chaudhary, Lipisha Nitin

Chen, Kaijia

Chetwani, Himanshi

Cholleti, Suhas

Cole, Lauren

Damania, Ronit Jitesh

Das, Anushree Sitaram

Dengxiong, Sherwin

Diaz, Yancarlos

Dicarolo, Anthony

Dixit, Abhay Rajendra

Dongargaonkar, Soham

Drobnak, Mark

Dusane, Tanay Pramod

Fan, Lihao

Fernandez, Carlos

Gada, Dhruv Manish

Gadipudi, Gautam

Gali, Geeta Madhav

Goldberg, Ben

Griffith, Drew

Groszewski, Jake

Guliani, Ishan

Guo, Zizhun

Guo, DaTong

Hao, Haiting

Hari, Asmita

Hegde, Gagan

Hou, Lingmin

Jain, Ankit

Jaitapkar, Ashwini Mangesh

Jajoo, Mukunda Ujwal

Jamadagni, Mugdha Sanjay

Jethra, Bhavin

Kalam, Devavrat Vijaykumar

Kallu, Mouna Reddy

Kamath, Milind Madhav

Karda, Uddesh Narayan

Karia, Yash Kishore

Karrothu, Akhil
Karwa, Vishvesh Rajesh
Katta, Rishab
Kaushik, Nikhil
Kellicutt, Caleb
Khanna, Sujit Pramod
Khatwani, Aishwarya Raju
Kirit, Neel
Kluszczewski, Joseph
Kotian, Kavya Bhaskar
Kott, Devin
Krishnan, Narayanan Asuri
Kshirsagar, Akshay Ramesh
Kulkarni, Aditya
Kumar, Ashwani
Kunjilikattil, Rohit Girijan
Kunnumbrath Manden, Aswathi
Lad, Aishwarya
Lad, Vivek Govind
Landge, Aditya Avinash
Leuschner, William
Li, Boyuan
Li, Zilong
Makhija, Karan Pankaj
Malhotra, Goldy
Mandalreddy, Amrutha Varshini
Manghi, Karan
Mao, Yuying
Mehta, Aseem
Mehta, Dhruvil Mayur
Mehta, Chaitanya Shailesh
Mishra, Satwik
Mishra, Prakash Suresh
Moore, Daniel
Morris, Daman
Munjekar, Aditi Anant
Muralidharan, Divya
Murkute, Jaideep Vitthal
Nadkarni, Kedar Ganesh
Nagulapally, Sharath Chandra
Nandal, Suchit Dharampal
Nandamuri, Sowrabh Chandraa
Narkhede, Sarang Murlidhar
Ning, Yuyao

Nunna, Santosh Kumar
Nyathawada, Saral
Obied, Antoun
Paladugu, Venkata Karteek
Parameshwara, Nishi
Parchand, Nihal Surendra
Peechatt, Michael
Pejakkala Kakrannaya, Vishwal
Peng, Litong
Poddar, Saloni Omprakash
Prasad, Ishika
Purshotam, Prashanth Kumar
Qian, Martin
Rao, Aishwarya
Raval, Tejas Subhash
Ravikumar, Arjun
Reddy, Siddhant
Reed, Quintin
Rode, Sonia
Roy, Bikash
Sahlot, Rishabh Manish
Salunkhe, Sharwari Shridhar
Sapkal, Poornima Narendra
Sarde, Omkar Popatrao
Sarkar, Diptanu
Sarvaiya, Soumil Pramod
Sehgal, Jagwant
Shah, Saloni
Shanbhag, Tejal
Sharma, Srijan Kumar
Shehzad, Amar
Shen, Jiaqing
Shetty, Srujan Ganesh
Shitut, Kunal
Shrivastava, Adya
Shriver, Owen
Shukla, Saurabh
Singh, Sudhir Kumar
Singh, Rishabh Sudhakar
Sirohi, Amogh Vikram
Smith, Matthew
Sood, Adhiraj
Spindler, Adam
Srinivasan, Vedanth

Sundaram, Karthik Ponraj
Sunthankar, Omkar
Suryawanshi, Pradumna Vilas
Thakkar, Sarthak Umeshkumar
Thakur, Jeet Bhavesh
Tuli, Rahul
Unganlawar, Saket Sanjay
Vadaga, Manohar
Vaidya, Omkar Sundeep
Vaidya, Hitesh
Valera, Namrata Kamlesh
Veerepalli, Girish Kumar Reddy
Venkataramana, Amritha

Vicinthangal Prathivaathi, Aravind
Vyas, Jaineel
Walia, Michael
Wang, Renke
Wang, Ruiqi
Wasan, Udit Harminder
Wisnewski, Sean
Yadav, Nikhil Ramlakhan
Yedur Prabhakar, Ravikiran
Zhang, Liyi
Zhang, Xinyu
Zhang, Yujie

Faculty Spotlight

Where is your degree from (and in what)?

I earned degrees in Computer Science from UNED in Madrid, Spain.

Where did you grow up?

I grew up in Sevilla (south of Spain).

What did you do before RIT?

Most of my career experience is as a back-end developer in the industry. I have eight years of experience working with Java-based projects in Spain. Before becoming a lecturer at RIT, I worked as a senior developer in a startup called Cognivue in Victor, NY.

**What are your professional interests?**

The courses that I am currently teaching are the ones that interest me the most. I like to learn about programming languages and databases. I am also interested in Computer Graphics. I took some courses as a student during my MS here at RIT, and I found Computer Graphics very interesting.

What are your personal interests?

- Dancing: I am currently taking open-style dance lessons - and I love it.
- Roller skating: I bought my first roller skates this summer, and I enjoyed going outdoors.
- Gardening

Describe a particularly rewarding RIT-related experience (i.e., student interaction, classroom)?

The most recent rewarding experience was an email from one of my students telling me it was very inspiring to have a female instructor teaching a graduate course.

Describe a particularly rewarding RIT-related experience (i.e., student interaction, classroom)?

My first time teaching the Advanced Object-Oriented Programming course was challenging for me. After so many years working with Java in the industry, I thought I was prepared to teach that course, but I ended up re-learning things I had forgotten and learning things entirely new for me. I spent so many hours reading the Java spec that semester :)

What is daily working life like for you during pandemic?

What is right now? We thankfully are going back to the regular teaching mode previous to the pandemic, so things are getting more manageable. I spend most of my time getting ready for lectures and creating the content for the courses: lecture material, labs, and such.

PhD Program

The [Golisano Computing College PhD program](#) began in Fall 2006. Since that time, the program has grown from a handful of students to over 100. Our PhD students carry out research in both fundamental and applied Computer Science.

Our program is research-focused. Admitted PhD students have chosen their advisor prior to admission. During the first year of the program, in addition to coursework students complete their research potential assessment, which requires writing, presenting, and defending a mock conference paper to the PhD faculty from across the Golisano Computing College. This requires our students to engage directly in research when they enter the program. To complete the program, they must also write and defend a thesis proposal and their final dissertation.

The Computing and Information Sciences PhD graduates advised by CS faculty have gone on to successful careers in industry and academia, including faculty positions at the Stevens Institute of Technology and The College of the Holy Cross, postdoctoral positions (e.g., at University at Buffalo), and senior positions at corporations including Google and Appnexus.

PhD Students Advised by CS Faculty



Moiz Arif

Next-Generation Data Centers for Emerging Distributed and Parallel Workloads

Advisor: M. Mustafa Rafique



Kevin Assogba

Heterogeneous memory systems for Function-as-a-Service computing

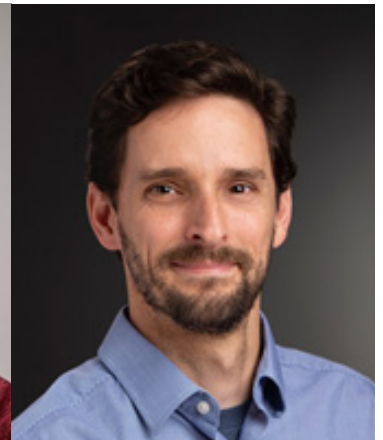
Advisor: M. Mustafa Rafique



Kevin Barkevich

Accelerating eye-tracking using deep learning

Advisors: Reynold Bailey, Gabriel Diaz



Carlos Barrios

Edge Computing, IoT, Opportunistic Networks, Pervasive and Mobile Computing

Advisor: Mohan Kumar



Angelina Brilliantova
Optimization and Sampling problems related to Biological Networks
Advisor: Ivona Bezakova



Sergei Chuprov
Security and Safety in AI Systems
Advisor: Leonid Reznik



Eduardo Coelho de Lima
Graph machine learning operations
Advisor: Minseok Kwon



Abhisek Dey
TBD
Advisor: Richard Zannibi



Lalitha Donga
IoT devices in healthcare: security and privacy
Advisors: Rajendra Raj, Bo Yuan, Andy Meneely



William Gebhardt
TBD
Advisor: Alex Ororbia



Rinaldo Iorizzo
TBD
Advisors: Rajendra Raj, Bo Yuan, Andy Meneely



Robert Jimerson
TBD
Advisor: Chris Homan



Brandon Keller
Software security and vulnerabilities
Advisors: Rajendra Raj, Bo Yuan, Andy Meneely



Asuri Krishnan-Narayanan
TBD
Advisor: Carlos Rivero



Behrooz Mansouri
Information Retrieval, Machine Learning
Advisor: Richard Zanibbi



Avinash Kumar Maurya
Optimizing large-scale data movement in next-generation HPC datacenters
Advisor: Mustafa Rafique



Hannah Miller
TBD
Advisors: Ivona Bezakova
& Edith Hemaspaandra



Justin Ronaldo Namba
NoSQL Data Integration & Analysis
Advisor: Michael Mior



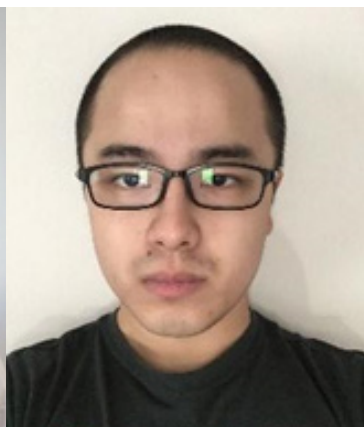
Udaychandra Anand
Nayak
NoSQL Data Integration & Analysis
Advisor: Michael Mior



Michael Peechatt
TBD
Advisor: Carlos Rivero



Ayush Kumar Shah
Visual parsing of graphical structures
Advisor: Richard Zanibbi



Wenbo Sun
Design and Theoretical Analysis of Randomized and Approximation Algorithms
Advisor: Ivona Bezakova



Allahsera Auguste
Tapo
TBD
Advisor: Chris Homan



Tharindu Cyril Weera-sooriya
Machine Learning on Social Data, Label Distribution Learning
Advisor: Chris Homan



Shuang Wei
TBD
Advisor: Michael Mior



Zhizhuo Yang
Active inference, predictive processing, reinforcement learning, eye tracking and XR
Advisor: Reynold Bailey



Timothy Zee
Interpretable AI
Advisor: Ifeoma Nwogu

CS ALUMNI

Igor Khokhlov

What year did you graduate? Where are you working now?

I graduated in the Summer of 2020 and then got a position of postdoctoral research scientist under the supervision of Dr. Mehdi Mirakhorli, who gave me an opportunity to proceed with research in artificial intelligence and cybersecurity. In 2021, I received the position of Assistant Professor of Cybersecurity at Sacred Heart University, where I am currently working.

Why did you choose Computer Science as your major?

I chose computer science as my major as I was working as a software developer before I started my Ph.D. As a software developer, I was interested in various research in the computer science fields and especially in cybersecurity. I have spent some time with Ph.D. students from RIT and I liked how the Ph.D. program works, so I decided to apply. After the interview with Dr. Leon Reznik, my future science adviser and mentor, I liked the research topic and was admitted to the program. During my Ph.D., Dr. Reznik exposed me to various computer science fields, such as data science, security, and artificial intelligence.

How did your time at RIT prepare you for your position?

I am extremely grateful to Dr. Reznik, who became my close friend and showed me how to do research, how to write papers, and how to be a good mentor to other students. This experience helps me now in my current position. I think my greatest accomplishment during my Ph.D. is that I managed to finish it in four years and publish three journal papers (two of them as the first author) and 22 conference papers (18 of them as the first author).



Michael Lyman

What year did you graduate? Where are you working now?

I graduated in Fall 2013 with a BS in Computer Science and a minor in Game Design & Development, and shortly after took a software engineering job with Lockheed Martin Missions Systems and Training in Orlando, FL; though I soon discovered that the defense industry was not a good culture fit. After a job search I ultimately found my way back into the games industry when I accepted an offer from Warner Brothers Games, Boston (formally Turbine, Inc.) and left the Sunshine State behind. I have now been at WB for over six years as a software engineer in various roles on multiple projects.



Why did you choose Computer Science as your major?

As a high school student I did not have a specific career path calling me -- I considered both fine arts and mechanical engineering before landing on computer science, a decision that was driven by my interest in video games. Like many of my peers I had been an avid gamer from a young age, but unlike my friends I took the hobby even further and began pouring hundreds of hours after school into a program called "Game Maker Studio", designing and creating my own games at home. I was hooked.

How did your time at RIT prepare you for your position?

In my CS classes I received a robust education in computing, specifically in data structures and algorithms, which has been the backbone of my skill set as a software engineer. RIT CS also offered many opportunities to work in multidisciplinary teams on collaborative projects which directly translates to my experience in the games industry, working alongside artists and designers to create impactful player experiences. Looking back, I am grateful for the breadth of specializations and hands-on learning that the RIT Computer Science degree offered which allowed me to tailor my education and set me up for success in the gaming industry.

What year did you graduate?

I graduated with a MS in Computer Science with a specialization in Computer Graphics and Computer Vision from Rochester Institute of Technology in May 2019. I went ahead to pursue a Masters in Entertainment Technology from Carnegie Mellon University and graduated in May 2021.

Where are you working now?

I am currently working as a Technical Artist for Electronic Arts where I am responsible for coordinating with supervisors, lead artists, and art directors to develop content for game teams. My role involves designing complex skeletons, control rigs, secondary animation and skin deformations. My work involves understanding real-time computation and human anatomy to achieve accurate deformation results and control systems.

**Why did you choose Computer Science as your major?**

I chose Computer Science as my elective in high school. I enjoyed the experience of being introduced to new programming languages and concepts, however, the reason that pushed me to pursue Computer Science was its diversity and exploration potential. As a part of the course in my school, I was assigned a film project and as a creative student on the team, I was responsible for creating the art assets in Maya. This interdisciplinary approach that encouraged creativity to be channeled by computing tools to bring an inanimate world alive gave me a powerful platform to shape my journey ahead which would eventually make me a Technical Artist in the gaming industry!

How did your time at RIT prepare you for your position?

Choosing the Computer Graphics Concentration at RIT, gave me an opportunity to learn to apply my creativity into developing interactive experiences and games either as a part of my coursework or as a part of my work as a Research Assistant for Dr Joe Geigel in the CS Computer Graphics and Applied Perceptions Lab and MAGIC at RIT. The courses helped me gain a strong understanding of the Graphics pipeline, while the collaborative projects as a Research Assistant helped me gain practical expertise in the Art-Programming pipeline in game engines. Along with helping me build my skill set, RIT also helped me widen my vision for career avenues in the world of games and films by giving me the wonderful opportunity to participate as an exhibitor in Imagine RIT, Frameless Symposium, and the 2019 International Conference for Interactive Digital Storytelling. Culminating all my experiences together, RIT was truly instrumental in shaping my journey ahead not only as a programmer, but also as a collaborator, team-player, and interdisciplinary. No part of my journey would have been possible without my learnings and experiences under the continual guidance and support of Dr Geigel and everyone at RIT which truly helped me discover and explore my career path forward!

CS FACULTY AND STAFF

Faculty



Pakeeza Akram
Visiting Lecturer



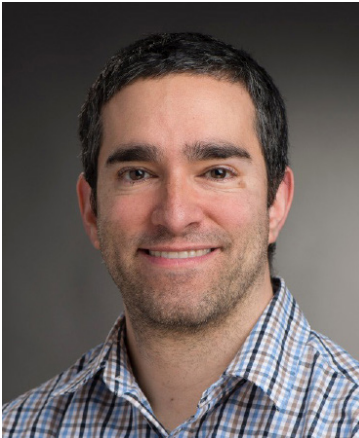
Dr. Reynold Bailey
Professor and Associate
Undergraduate Program
Coordinator



Dr. Ivona Bezáková
Professor



Dr. Hans-Peter Bischof
Professor and Graduate
Program Director



T.J. Borrelli
Principal Lecturer



Jeremy Brown
Lecturer



Dr. Zack Butler
Chair, Professor



Ting Cao
Lecturer



Warren R. Carithers
Associate Professor



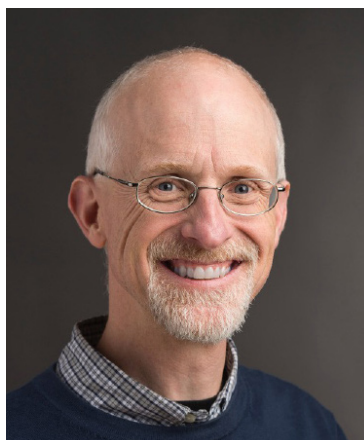
Maria Jose Cepeda
Garcia
Lecturer



Christian Chilan
Lecturer



Varsha Dani
Assistant Professor



Dr. Aaron Deever
Senior Lecturer and
Undergraduate Program
Coordinator



Razieh Fathi
Visiting Lecturer



Matthew Fluet
Associate Professor



Timothy Fossum
Lecturer



Joe Geigel
Professor



Susan Haller
Lecturer



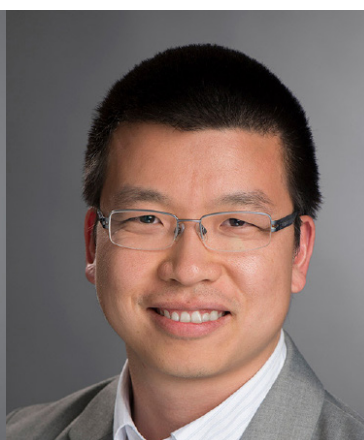
James Heliotis
Professor



Edith Hemaspaandra
Professor



Christopher Homan
Associate Professor



Peizhao Hu
Associate Professor



Scott Johnson
Senior Lecturer



Thomas Kinsman
Senior Lecturer



Mohan Kumar
Professor



Minseok Kwon
Professor



Xumin Liu
Associate Professor



Michael Mior
Assistant Professor



Arthur Nunes-Harwitt
Senior Lecturer



Ifeoma Nwogu
Assistant Professor



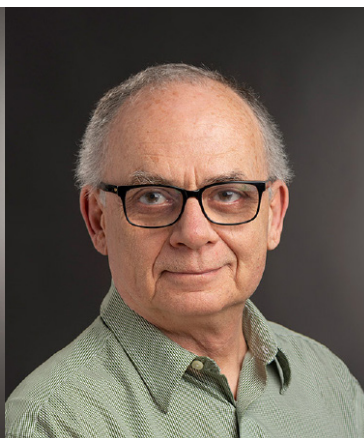
Jansen Orfan
Lecturer



Alexander Ororbia
Assistant Professor



Monika Polak
Lecturer



Stanislaw Radziszowski
Professor



M. Mustafa Rafique
Assistant Professor



Rajendra Raj
Professor



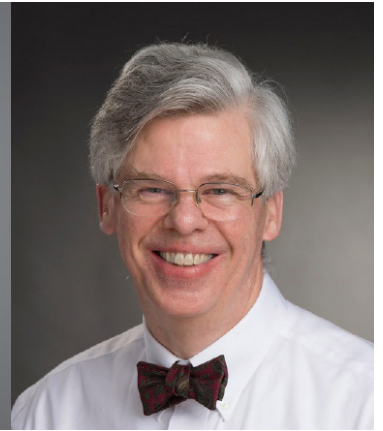
Leonid Reznik
Professor



Carlos R. Rivero Osuna
Associate Professor



K Stuart Smith
Visiting Lecturer



Ben Steele
Senior Lecturer



Sean Strout
Principal Lecturer



Philip White
Principal Lecturer



Richard Zanibbi
Professor

Staff



Jennifer Burt
Senior Staff Assistant &
Assistant to the Chair



James "Linus" Craig
Manager of Technical Ser-
vices



Lucieann Condino Stollery
Staff Assistant



Jason Harrison
Staff Assistant



Jordan Gates
Sr. Staff Assistant



Susan Quatro
Manager of Student Ser-
vices



Arnela Stupac-Catello
Systems Administration



Sam Waters
System Administrator

Advisors



Julia Collett
Academic Advisor



Don Denz
Academic Advisor



Omid Farahani
Academic Advisor



Christina Rohr
Senior Academic Advisor



Cindy Wolfer
Academic Advisor

Adjunct Professors

Jake Brandt
Matthew Hosking
Nelson Powell

William Childs
Mike Kirby
Laura Reznikov

Sam Fryer
Michael Kurdziel

Research Areas

Below is an alphabetical list of research areas that our faculty engage in, along with the specific faculty who teach and supervise student projects in each area.

Artificial Intelligence

Artificial intelligence encompasses the study of algorithms and architectures that enable effective decision making in complex environments. Faculty and students work on projects in computer vision, robotics, sensor networks, data mining, document recognition, information retrieval, and the theoretical foundations of decision-making.

- Zack Butler
- T.J. Borrelli
- Varsha Dani
- Edith Hemaspaandra
- Chris Homan
- Thomas Kinsman
- Jansen Orfan
- Alex Ororbia
- Leon Reznik
- Richard Zanibbi

Computer Graphics and Visualization

Computer graphics and visualization provides the technical foundations for studies in computer graphics. Areas for advanced study include advanced graphics programming, image synthesis, computer animation, virtual reality, and data visualization.

- Joe Geigel
- Reynold Bailey
- Hans-Peter Bischof
- Warren Carithers
- Sean Strout

Computer Science Education

Computer science education explores the pedagogy of computer science focusing on new methods and paradigms for the teaching of the CS curriculum.

- Ivona Bezáková
- T.J. Borrelli
- Jeremy Brown
- Zack Butler
- Joe Geigel
- James Heliotis
- Scott Johnson
- Xumin Liu
- Arthur Nunes-Harwitt
- Rajendra Raj
- Ben Steele
- Sean Strout

Data Science

Data science studies the foundational data management and knowledge discovery challenges prevalent in design, analysis and organization of data. This area can be applied in a variety of domains including data management in resource constrained environments, enterprise and multimedia databases, active and secure databases, and knowledge discovery algorithms.

- Xumin Liu
- Jeremy Brown
- Maria Cepeda
- Scott Johnson
- Thomas Kinsman
- Michael Mior
- M. Mustafa Rafique
- Rajendra Raj
- Carlos Rivero
- Leon Reznik

Distributed Systems

Distributed systems studies systems formed from multiple cooperating computers. This includes the analysis, design, and implementation of distributed systems, distributed middleware, and computer networking protocols, including security.

- Hans-Peter Bischof
- Jeremy Brown
- James Heliotis
- Peizhao Hu
- Mohan Kumar
- Minseok Kwon
- Michael Mior
- M. Mustafa Rafique
- Leon Reznik

Languages and Tools

Languages and tools studies language design and implementation together with architecture and use of software development tools.

- Hans-Peter Bischof
- Jeremy Brown
- Matthew Fluet
- James E. Heliotis
- Scott Johnson
- Arthur Nunes-Harwitt
- Rajendra K. Raj

Security

Security spans topics from networking to cryptography to secure databases. By choosing different domains in which to study security, students can gain a broad understanding of both theoretical and applied knowledge.

- Edith Hemaspaandra
- Ivona Bezáková
- T.J. Borrelli
- Aaron Deever
- Chris Homan
- Monika Polak
- Stanisław P. Radziszowski

Theory

Theory studies the fundamentals of computation which include complexity theory to determine the inherent limits of computation and communication, the design and analysis of algorithms to obtain optimal solutions within those limits, and theoretical foundations of cryptography.

- Edith Hemaspaandra
- Ivona Bezáková
- T.J. Borrelli
- Varsha Dani
- Aaron Deever
- Chris Homan
- Monika Polak
- Stanisław P. Radziszowski

New Hires

The following is a list of new faculty members who joined the computer science department in the last year.

Christian Chilan received M.S. and Ph.D. degrees from the University of Illinois at Urbana-Champaign. His computational interests include artificial intelligence, autonomous systems, robotics, and numerical analysis. He has participated in research projects for NASA centers, DOD, and DOE laboratories. Recently, Dr. Chilan made a major breakthrough in the solution of the fundamental problem of control theory. He was invited to present this result at the workshop “High Dimensional Hamilton-Jacobi Methods in Control and Differential Games” at the UCLA Institute for Pure and Applied Mathematics.

Varsha Dani joined RIT CS as an Assistant Professor. Her research interests are mainly in Theoretical Computer Science, as she enjoys thinking about the mathematics behind computers, without bothering about the actual physical computers themselves. More specifically, her recent work has been on Distributed Algorithms, and on random processes in CS. After getting a Ph.D. in Computer Science from the University of Chicago, Varsha spent many years living in Albuquerque, NM, spending time hanging out with her young children. For some part of that time, she was also a part-time post-doc at UNM, pursued other projects including running elementary and middle school math clubs, acting as an algorithms consultant at two solar power companies, and creating interactive learning content at the STEM educational website Brilliant.org. Varsha found designing interactive asynchronous learning content to be fun with some unique challenges, but she is glad to be back in the classroom. She believes the best aspect of teaching is being there to watch the gears turning in the students' minds, and seeing the spark when they “get it”. Varsha is very happy to be at RIT and is looking forward to getting to know everyone, and starting new collaborations.

Why did you choose Computer Science as your major?

During high-school I was always interested in problem solving. I was that kid who would stick with a math or physics problem with full attention for however long it took for me to solve it. This fondness for solving problems, together with a belief in technology as a tool for solving society's most complicated issues, naturally led me to computer science.

Please describe your experience as a Computer Science major.

When I had just arrived at RIT, I had little experience with computer science and was not quite sure what direction I wanted to go with my career. All I knew is that I liked solving difficult problems and that I wanted my work to have meaning.

Through my co-op experiences, I was able to significantly narrow down my career goals. Much to my surprise, I found out that I did not only enjoy the very algorithmic and mathematical parts of computer science, but also took great pleasure in working with front-end applications. This led me to search specifically for job opportunities where I could explore both of these sides of computer science. As I reached the end of my degree journey, I was able to find a company that not only fit those aspirations, but also allowed me to work on something with a great impact into the US' healthcare system.

Are you engaged in any groups or activities within Computer Science? If so, please explain.

During my time as a Computer Science student I was involved in multiple aspects of the department. I was able to learn about the department and acquire technical skills through my jobs as a student ambassador and as a research assistant. Meanwhile, my work as a Student Lab Instructor and the head of the Computer Science Community's coaching pillar, I was able to help students in their search for jobs and technical knowledge.

Are you engaged in any groups or activities outside of Computer Science? If so, please explain.

I was involved in the creation and management of two clubs: Handball Club at RIT and Brazilian Student Association. Although these clubs served different purposes, both of them became great communities that I am immensely proud of.

Please describe an accomplishment you are proud of.

I had many accomplishments during my time at RIT. Between them, the one I am most proud of is perhaps the simplest one, being able to thrive at a prestigious institution while away from home and in a different language. Graduating summa-cum-laude is something that I do not take for granted, especially with full schedules and extracurricular activities. At the end of five years of effort it is great to have something that proves to me I gave my best shot at this amazing opportunity.

What is your dream job?

Although I don't have a specific position or company that I would consider my dream job, there are a few things that I look for in my career. Firstly and most importantly I would like to work in a company where I feel my work makes a positive impact, not only in the company but in society as a whole. For that reason, my areas of interest are mostly focused on healthcare and education.

Moreover, I would like the company I work for to provide their employees with the opportunity to learn more and more about their field (as new technologies arise) as well as have the opportunity to grow within the company itself. I would like to believe that at some point in my career I will compile enough technical and leadership skills to propel me to a leadership role.

Describe any positive impacts of the actions you have been forced to take with the recent outbreak.

Much like everyone else, the pandemic had a big impact on my mental health. At some point, the increased stress brought by the covid outbreak led me to make the decision to go to therapy for the first time. Although I had never tried to seek help, I have always been the kind of person who worries a lot about everything, but I used to blame this on my personality and not think much about it. After being to a few sessions I found that I had anxiety. Knowing what it was allowed me to search for more knowledge about it and I am now able to control it much better and recognize when my worries are realistic or very far-fetched.



RESEARCH AND SCHOLARSHIP

Publications

Below is a list of publications by faculty and students from the Department of Computer Science that appeared in 2021. In computer science, many of the most prestigious publication venues are conferences rather than journals due to the rapid development in new technologies. For the same reason, technical reports are cited frequently, particularly those appearing in the arXiv.org collection maintained at Cornell University.

- [1] Huimin Zhao (PI) et al. (: RIT Subaward). *AI Institute: Molecule Maker Lab, an AI-Driven Synthesis Platform for Molecule Discovery and Manufacturing*. National AI Research Institutes. National Science Foundation: \$360,828 Sept. 2020 – Aug. 2025.
- [2] Ivona Bezáková (PI) and Edith Hemaspaandra. *Automated Feedback in Computing Theory*. DUE IUSE. NSF: \$299,417, 10/1/2018–09/30/2022.
- [3] Ivona Bezáková (PI) and Edith Hemaspaandra. *REU Supplement for award NSF-DUE-181954*. DUE IUSE. NSF: \$16,000, 08/15/2021–08/30/2022.
- [4] Leon Reznik (PI). *Data quality and security evaluation framework for mobile devices platform*. Cybersecurity Innovations for Cyberinfrastructure Program. National Science Foundation: \$250052, Sept. 1, 2016–Aug. 31, 2021.
- [5] Leon Reznik (PI). *Security evaluation and improvement of the personal cyberinfrastructure with new tools and education development*. US Civilian Research and Development Foundation - CRDF Global: \$74985, Aug. 2021 - Aug. 2022.
- [6] Leon Reznik (PI). *Self-learning capabilities for a mission oriented data quality and security assurance in military IoT systems*. US Military Academy/DoD: \$85936, Sep. 2020– Dec. 2022.
- [7] Richard Zanibbi (PI). *Improving Discovery of Scientific and Scholarly Information through Math-Aware Search*. Digital Information Technology Program Grant. Alfred P. Sloan Foundation: \$50,000, July 2017– June 2022.
- [8] Richard Zanibbi (PI) and Agarwal Anurag. *Improving Technical Paper Database Search through Math-Aware Search Engines*. CISE Information and Intelligent Systems (III) Core Programs. National Science Foundation: \$498,928, Dec. 2017 – Jan 2022.
- [9] Richard Zanibbi (PI) and C. Lee Giles. *Improving Discovery of Scientific and Scholarly Information through Math-Aware Search*. Digital Information Technology Program Grant. Alfred P. Sloan Foundation: \$470,458, July 2017– June 2022.
- [10] Xumin Liu (PI) and Erik Golen (Co-PI). *IUSE: EHR: A Data Science Learning Platform and Curricular Module for Non-Computing Majors*. IUSE. NSF: \$299,878.00, 10/1/2020–09/30/2023.
- [11] Reynold Bailey and Cecilia Alm. *FASED award supplement: REU Site: Computational Sensing for Human-Centered AI*. Facilitation Awards for Scientists and Engineers with Disabilities (FASED). National Science Foundation (NSF): \$4,188, May 2021 – May 2022.
- [12] Reynold Bailey and Cecilia Alm. *REU Site: Computational Sensing for Human-Centered AI*. Research Experiences for Undergraduates(REU). National Science Foundation (NSF): \$359,926, April 2019 – March 2022.
- [13] Reynold Bailey and Cecilia Alm. *Supplemental Funding Request to Enhance 2020 and 2021 REU Student Stipends*. Research Experiences for Undergraduates(REU). National Science Foundation (NSF): \$20,000, April 2019 – March 2022.

- [14] Reynold Bailey, Cecilia Alm, Matt Huenerfauth, Esa Rantanen, and Ferat Sahin. *NRT-AI: AWARE-AI: AWAREness for Sensing Humans Responsibly with AI*. Research Traineeship (NRT) Program. National Science Foundation (NSF): \$1,999,699, September 2021 – August 2026.
- [15] Reynold Bailey, Gabriel Diaz, and Jeff Pelz. *Improved Semantic Segmentation with Natural Gaze Dynamics (SOW 1)*. Facebook Reality Labs: \$278,214, July 2020 – July 2021.
- [16] Reynold Bailey, Gabriel Diaz, and Jeff Pelz. *Improved Semantic Segmentation with Natural Gaze Dynamics (SOW 1A)*. Meta Reality Labs: \$69,450, July 2021 – January 2022.
- [17] Ivona Bezáková (PI) and Edith Hemaspaandra (co-PI). *Automated Feedback in Computing Theory*. DUE IUSE. NSF: \$299,417, 10/1/2018–09/30/2022.
- [18] Ivona Bezáková (PI) and Edith Hemaspaandra (co-PI). *REU Supplement for Automated Feedback in Computing Theory*. DUE IUSE. NSF: \$16,000, 8/15/2021–09/30/2022.
- [19] Zack (PI) Butler and Ivona Bezáková (co-PI). *Pencil Puzzles as an Inclusive Domain for Learning Computer Science*. DUE IUSE. NSF: \$474,064, 10/1/2018–09/30/2022.
- [20] Joe Geigel. *Corporate Gift*. 2020.
- [21] Joe Geigel, M. Schweppe, and D. Munnell. *AI-Pollo - Augmented Reality Theatre*. 2020.
- [22] Christopher M. Homan (PI). *Learning Label Distributions*. Google gift: \$30,000, Nov. 1, 2021–Oct. 31, 2022, 2021.
- [23] Christopher M. Homan (PI), Michael Leventhal, Valentin Vrydian, and Marcos Zampieri. *Machine Learning and Automated Speech Recognition Dataset Development for Manding Languages*. Lacuna Fund: \$84,959.44, Nov. 1, 2021–Oct. 31, 2022, 2021.
- [24] M. Kumar, A. Ganguly, M. Kuhl, X. Liu, and M. Kwon (co-PI). *Planning Grant: Center for Smart Space Research (CSSR)*. NSF IUCRC: \$19,338, 2021.
- [25] Michael Mior. *An Interactive Exploration of Relational Database Query Processing*. RIT Provost's Learning Innovations Grants. RIT: \$4,960, Summer 2019–Fall 2021.
- [26] Stanisław Radziszowski (coPI), Marcin Łukowiak (PI), and Peter Bajorski. *Bit Stream Obfuscation for Securing IP on FPGAs*. L3Harris Technologies: \$69,411, 2019–2021, 2019,2020.
- [27] Stanisław Radziszowski (coPI), Marcin Łukowiak (PI), and Peter Bajorski. *Cross Domain Solutions Using Homomorphic/Functional Cryptography*. L3Harris Technologies: \$40,000, 2021–2022, 2021.
- [28] Stanisław Radziszowski (coPI), Marcin Łukowiak (PI), and Peter Bajorski. *Enhanced Security for the MK-3 Crypto Algorithm*. L3Harris Technologies: \$40,000, 2020–2021, 2020.
- [29] Stanisław Radziszowski (coPI), Marcin Łukowiak (PI), and Peter Bajorski. *Soldier Systems Security Architecture*. L3Harris Technologies: \$49,336, 2021–2022, 2021.
- [30] Stanisław Radziszowski (coPI), Darren Narayan (PI), Jobby Jacob, Nishant Malik, and Laura Muñoz. *REU Site: Extremal Graph Theory and Dynamical Systems*. REU Mathematics Program. National Science Foundation: \$323,995, 2020–2023, 2020.
- [31] M. Mustafa Rafique (PI). *HardLambda: A new FaaS Abstraction for Cross-Stack Resource Management in Disaggregated Datacenters*. CSR-Computer Systems Research. National Science Foundation: \$180,000, Jun. 1, 2021–May. 31, 2024.
- [32] M. Mustafa Rafique (PI). *Optimizing Asynchronous Data Movement for Deep Memory Hierarchies*. National Lab. Department of Energy (DoE): \$140,804, Sept. 1, 2020–Aug. 31, 2022.
- [33] Rajendra K. Raj (Co-PI), Bo Yuan (PI), and Andrew Meneely (Co-PI). *Renewal: Cybersecurity as a Diverse Discipline*. SFS CyberCorpsE. https://nsf.gov/awardsearch/showAward?AWD_ID=1922169. NSF: \$5,515,422.00, 8/1/2019–7/31/2024.

- [34] Rajendra K. Raj (PI). *Collaborative Research: A Data-Driven Employer-Academia Partnership for Continual Computing Curricular Change*. IUSE. https://www.nsf.gov/awardsearch/showAward?AWD_ID=2110771, Collaborative grant with University of Alabama, RIT, George Washington University, University of New Hampshire, Tuskegee University, Purdue University, University of Illinois Urbana-Champaign, and Mississippi State University. NSF: \$125,694.00 (RIT total), \$2,627,967.00 (Multi-institutional total), 06/15/2021–05/31/2024.
- [35] Carlos Rivero (PI), Zack Butler, and Hadi Hosseini. *IUSE: EHR: Using Program Dependence Graphs to Propagate Feedback to Students and Promote Responsive Teaching in Programming Assignments*. Improving Undergraduate STEM Education. National Science Foundation: \$298,728, Oct. 1, 2019–Sep. 30, 2022.

Funding

Research and academic grants that were active or newly awarded in 2021 to Computer Science faculty are listed below. The total amount of funds exceeds \$11 million, with the majority of funding coming from external grants.

Investigators	Sponsor	Project Title	Duration	Funds
Alm Cecilia, Reynold Bailey	NSF	REU Site: Computational Sensing for Human-Centered AI. Research Experiences for Undergraduates(REU)	4/2019–3/2022	\$359,926
Alm Cecilia, Reynold Bailey	NSF	Supplemental Funding Request to Enhance 2020 and 2021 REU Student Stipends	4/2019–3/2022	\$20,000
Alm, Cecilia, Reynold Bailey	NSF	FASED award supplement: REU Site: Computational Sensing for Human-Centered AI	5/2021–5/2022	\$4,188
Alm Cecilia, Bailey Reynold, Huenerfauth Matt, Esa Rantanen, Ferat Sahin	NSF	AWAREness for Sensing Humans Responsibly with AI	9/2021–8/2026	\$1,999,699
Bezakova Ivona, Edith-Hemaspaandra	NSF	Automated Feedback in Computing Theory	10/2018–09/2021	\$299,417
Bezakova Ivona, Edith-Hemaspaandra	NSF	REU Supplement for Automated Feedback in Computing Theory	08/2021–08/2022	\$16,000
Butler Zack, Ivona Bezakova	NSF	Pencil Puzzles as an Inclusive Domain for Learning Computer Science	10/2018–09/2021	\$474,064
Diaz Gabriel, Reynold Bailey, Jeff Pelz	Facebook Reality Labs	Improved Semantic Segmentation with Natural Gaze Dynamics	7/2020–7/2021	\$278,214
Diaz Gabriel, Reynold Bailey, Jeff Pelz	Meat Reality Labs	Improved Semantic Segmentation with Natural Gaze Dynamics	7/2021–7/2022	\$69,450
Diaz Gabriel, Alexander Ororbia	RIT D-RIG Seed Funding	Machine Learning for Visually Guided Action Through Active Inference	1/2021–12/2021	\$15,000

Investigators	Sponsor	Project Title	Duration	Funds
Geigel, Joe	Vicarious Visions / Activision	Unrestricted. corporate gift	2020	\$15,000
Geigel, Joe, M. Schweppe	Epic Games	AI-Pollo - Augmented Reality Theatre. Epic Mega-grant	2020-21 Academic Year	\$25,000 + 4 MAG-IC Leap devices
Christopher M. Homan	Google gift	Learning Label Distributions	11/2021–10/2022	\$30,000
Christopher M. Homan, Michael Leventhal, Valentin Vrydian, Marcos Zampieri	Lacuna Fund	Machine Learning and Automated Speech Recognition Dataset Development for Manding Languages	11/2021–10/2022	\$84,959
Christopher M. Homan, Emily Prud'hommeaux	NSF	Collaborative Research: Deep learning speech recognition for documenting Seneca, a Native American language, and other acutely under-resourced languages	6/2018–11/2022	\$3183,741
M. Kumar, A. Ganguly, M. Kuhl, X. Liu, M. Kwon	NSF IU-CRC	Planning Grant: Center for Smart Space Research (CSSR)	2021	\$19,338
Liu, Xumin, Erik Golen	NSF	A Data Science Learning Platform and Curricular Module for Non-Computing Majors	10/2020–9/2023	\$299,878
Lukowiak Marcin, Peter Bajorski, Stanislaw Radziszowski	L3Harris Technologies	Cross Domain Solutions Using Homomorphic/Functional Cryptography	2021–2022	\$40,000
Lukowiak Marcin, Peter Bajorski, Stanislaw Radziszowski	L3Harris Technologies	Soldier Systems Security Architecture	2021–2022	\$49,336
Lukowiak Marcin, Peter Bajorski, Stanislaw Radziszowski	L3Harris Technologies	Bit Stream Obfuscation for Securing IP on FPGAs	2019–2021	\$69,411
Lukowiak Marcin, Peter Bajorski, Stanislaw Radziszowski	L3Harris Technologies	Enhanced Security for the MK-3 Crypto Algorithm	2020–2021	\$40,000

Investigators	Sponsor	Project Title	Duration	Funds
Mior, Michael	RIT Pro- vost's Learning Inno- vations Grants	An Interactive Exploration of Relational Data- base Query Processing	Summer 2019–Fall 2021	\$4,960
Rafique, Mustafa M.	Depart- ment of Energy	Optimizing Asynchronous Data Movement for Deep Memory Hierarchies	9/2020–8/2022	\$140,804
Rafique, Mustafa M.	NSF	HardLambda: A new FaaS Abstraction for Cross-Stack Resource Management in Dis- aggregated Datacenters	5/2021–5/2024	\$180,000
Raj, Rajendra K.	NSF	Collaborative Research: A Data-Driven Em- ployer-Academia Partnership for Continual Computing Curricular Change	06/2021–05/2024	\$125,694 (RIT), \$2,627,967 (Multi-insitutional)
Narayan, Darren, Jobby Jacob, Nishant Malik, Laura Munoz, Stanislaw Radziszowski	NSF	REU Site: Extremal Graph Theory and Dy- namical Systems. REU Mathematics Pro- gram	2020–2023	\$323,995
Reznik, Leon	NSF	Data quality and security evaluation frame- work for mobile devices platform	9/2016–8/2021	\$250,052
Reznik, Leon	US Mili- tary Acad- emy/DoD	Self-learning capabilities for a mission-ori- ented data quality and security assurance in military IoT systems	9/2020–12/2022	\$85,936
Reznik, Leon	US CRDF Global	Security evaluation and improvement of the personal cyberinfrastructure with new tools and education development	8/2021–8/2022	\$74985
Rivero Carlos, Zack Butler	NSF	IUSE: EHR: Using Program Dependence Graphs to Propagate Feedback to Students and Promote Responsive Teaching in Pro- gramming Assignments. Improving Under- graduate STEM Education	10/2019–9/2022	\$298,728

Investigators	Sponsor	Project Title	Duration	Funds
Yuan Bo, Andrew Meenely, Rajandra K. Raj	NSF	Cybersecurity as a Diverse Discipline	1/2019–12/2024	\$5,515,422
Yuan, Bo, Andrew Meenely, Rajandra K. Raj	NSF	Renewal: Cybersecurity as a Diverse Discipline	8/2019–7/2024	\$5,515,422
Zanibbi, Richard, Anurag Agarwal	NSF	Improving Technical Paper Database Search through Math-Aware Search Engines	12/2017–1/2022	\$498,928
Rivero Carlos, Butler Zack, Hosseini Hadi	NSF	Using Program Dependence Graphs to Propagate Feedback to Students and Promote Responsive Teaching in Programming Assignments	10/2019–8/2022	\$298,728
Zanibbi, Richard Giles C. Lee	Digital Information Technology Program Grant. Alfred P. Sloan Foundation	Improving Discovery of Scientific and Scholarly Information through Math-Aware Search	7/2017–6/2022	\$470,458
Zanibbi, Richard	Alfred P. Sloan Foundation	Digital Information Technology Program Grant	7/2017–6/2022	\$50,000
Huimin Zhao et al.	National AI Research Institutes	AI Institute: Molecule Maker Lab, an AI-Driven Synthesis Platform for Molecule Discovery and Manufacturing	8/2020–8/2025	\$360,828

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