TABLE OF CONTENTS

Welcome From the Chair.......................................................... 3
About the Department ................................................................ 5

Overview of our Programs ....................................................... 5
Industrial Advisory Board ......................................................... 6
Co-operative Education .............................................................. 8
News ...................................................................................... 10

Undergraduate Studies.......................................................... 16
First Year Computer Science .................................................... 16
Undergraduate Research .......................................................... 17
Study Abroad ....................................................................... 18
Honors & Awards .................................................................. 19
Class of 2018 (BS) ................................................................. 21

Graduate Studies .................................................................... 23
Areas of Study ........................................................................ 23
Graduate Research ................................................................. 24
Honors & Awards .................................................................. 27
Class of 2018 (MS) ................................................................. 27
PhD Program ........................................................................ 30

Alumni .................................................................................. 33

Faculty and Staff .................................................................... 36
Research Areas ...................................................................... 41
New Faculty ......................................................................... 45
Interview with Alan Kaminsky ................................................. 48

Research and Scholarship ..................................................... 53
Publications ........................................................................... 53
Funding .................................................................................. 60
WELCOME FROM THE CHAIR

It is my pleasure and privilege to write this message on behalf of the faculty, staff, students, and alumni of the department of Computer Science at RIT (CS@RIT). The department of computer science offers an ABET accredited 5-year BS degree in Computer Science (CS) that includes one year of mandatory co-op while the MS program in Computer Science is the largest graduate program at RIT. CS@RIT’s BS and MS programs are highly sought after by students across the US and the world, with more than 12% of all RIT applicants seek Computer Science programs. Furthermore, CS@RIT attracts highly talented students despite the stiff competition from hundreds of computer science departments across the nation, including several in the North-East region. The department also offers popular combined BS/MS programs, in collaboration with several other programs at RIT, and a graduate certificate course in Big Data Analytics. Our PhD program is administered within the Golisano College of Computing and Information Sciences (GCCIS). RIT’s experiential programs provide opportunities for research, professional experience, study abroad, and entrepreneurship. At any given time, the department is home to nearly 1300 students. Typically, a total of 275-300 students graduate from CS programs each year.

Our faculty, comprising 29 tenured/tenure-track and 13 lecturers, are committed to excellence in teaching and research. 9 tenure-track faculty and 8 lecturers have joined our department in the last 5 years to boost our research profile and to provide a robust offering of courses across the discipline. 4 tenure-track faculty and 2 lecturers joined the department in the Fall of 2018.

In recent years, at CS@RIT we have significantly enhanced our research presence while maintaining our commitment to excellence in teaching. Many of our faculty, established and new, are actively involved in seeking funding, publishing in quality venues, and supervising BS, MS, and PhD students. In 2018, total amount of funding from active and newly awarded research grants exceeds $8.5 million, with the majority of the grants from the NSF, the NSA, the Sloan foundation, CISCO and other organizations. In the first few months of 2019, one junior faculty member received the prestigious NSF Career Award while two other junior faculty members have received NSF’s CISE Research Initiation Initiative grant (CRII). Faculty coauthored more than 55 peer-reviewed journal and conference articles in 2018. Faculty are engaged in ongoing research activities in
computing education, data science, distributed systems, graphics and visualization, artificial intelligence and pattern recognition, networking, pervasive and mobile computing, programming languages, security, and theory. The department is proud to have 4 winners of the Eisenhart Award for Outstanding Teaching.

Computer Science staff, including academic advisors contribute significantly to student success. The CS Alumni network is expansive and engaged, providing the department with invaluable feedback, and support on many fronts. The department’s Advisory Board comprises members from Amazon, Apple, Cisco, Google, IBM, Intel, Microsoft, and other leading companies.

Employment rate of our BS and MS graduates exceeds 98% while our PhD graduates have made meaningful contributions in their respective areas, and secured positions in industry and academia. As computer science continues to be the most attractive field of study to major and minor in, growth in enrollments poses challenges and opportunities.

We are proud of our achievements and excited by new opportunities as we aspire to be among the top computer science departments in the U.S. At CS@RIT, our vision is to make dreams come true. We endeavor to provide the right environment for students, staff and faculty to flourish.

Mohan Kumar

Professor and Chair

Computer Science Department

Rochester Institute of Technology
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 undergrad program in Computer Science dates back to the mid 1970s. The program was initiated while the department was in the Institute College (later changed to the College of Applied Science and Technology). The program and department were moved into the B. Thomas Golisano College of Computing and Information Sciences in 2001. 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%.

<table>
<thead>
<tr>
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<th>Fall 2018</th>
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<tbody>
<tr>
<td>BS Students</td>
<td>947</td>
</tr>
<tr>
<td>Fulltime Equivalent</td>
<td>795</td>
</tr>
<tr>
<td>Credit Hours</td>
<td>8756</td>
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**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 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 1 year.

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<tr>
<td><strong>MS Students</strong></td>
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<tr>
<td><strong>Fulltime Equivalent</strong></td>
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<tr>
<td><strong>Credit Hours</strong></td>
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</table>

**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:

- Pursue advanced study in computing or participate in modern software development;
- Collaborate successfully with colleagues and clients;
- 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 to ensure that "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 Advisory Board 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

<table>
<thead>
<tr>
<th>Name</th>
<th>Position and Company</th>
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<tbody>
<tr>
<td>Bridget Beamon</td>
<td>Robertson Senior Professional Engineer The Johns Hopkins University Applied Physics Laboratory</td>
</tr>
<tr>
<td>Sean Janis</td>
<td>Engineering Manager, Mobile Shopping Amazon</td>
</tr>
<tr>
<td>Aaron Rallo</td>
<td>CEO TSO Logic</td>
</tr>
<tr>
<td>Tony Dal Santo</td>
<td>Senior Staff Systems Engineer G2 Software Systems</td>
</tr>
<tr>
<td>Michael Kirby</td>
<td>Vice President, Embedded Hardware/Software for Controller Product Development Xerox</td>
</tr>
<tr>
<td>Aaron Robinson</td>
<td>Senior Software Engineer Microsoft</td>
</tr>
<tr>
<td>David Cok</td>
<td>Senior Principal Consultant</td>
</tr>
<tr>
<td>Juli Klie</td>
<td>President Veritor</td>
</tr>
<tr>
<td>Mary Swift</td>
<td>Advisory NLP Software Engineer at IBM Watson IBM</td>
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<tr>
<td>David Doerman</td>
<td>Professor University at Buffalo</td>
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<tr>
<td>John Marshall</td>
<td>Distinguished Engineer Cisco Systems</td>
</tr>
<tr>
<td>Anoop Thomas</td>
<td>Senior Graphics Programmer Rockstar Games</td>
</tr>
<tr>
<td>Erik Haddad</td>
<td>UX Engineer Google</td>
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<tr>
<td>Paul Monette</td>
<td>Director of Quality Engineering CloudCheckr</td>
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<tr>
<td>Kim Vangelder</td>
<td>Chief Information Officer and Eastman Kodak Company</td>
</tr>
<tr>
<td>Douglas Phair</td>
<td>Technology Evangelist MITRE</td>
</tr>
<tr>
<td>Laura Weime</td>
<td>Game Developer Relations Engineer Intel</td>
</tr>
<tr>
<td>James Janicki</td>
<td>Business Unit Director Sparton Corporation</td>
</tr>
<tr>
<td>Ajith Prabhakara</td>
<td>Manager, Product Management Amazon</td>
</tr>
<tr>
<td>Lisa Withers</td>
<td>Executive Management &amp; Consulting</td>
</tr>
</tbody>
</table>


Co-operative Education

Co-op is full-time paid work experience directly related to a student’s course of study and career interests. The goals of cooperative 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.


For more information, see https://www.rit.edu/emcs/oce/student/intro-to-co-op.
My graduate degrees are in Industrial Engineering, where I applied data mining algorithms and approaches to engineering, and manufacturing processes. I began teaching at the University at Buffalo (UB) while working on my Ph.D., teaching both engineering and computer programming courses. In 2005, I joined RIT as a faculty member in the Center for Multidisciplinary Studies, now the School of Individualized Studies (SOIS). While working at SOIS, I was an extended faculty member in Computer Science starting in 2007, led the effort to develop and teach the data mining and analytics coursework, and helped to create the department’s first advanced certificate program in Big Data Analytics. In January 2014, I formally transferred to the Department of Computer Science and became affiliated faculty in the Department of Computing Security (CSEC). Given my background in both engineering and data mining/analytics, I taught in three academic units (SOIS, Mechanical and Manufacturing Engineering Technology, and Computer Science) between 2005-2013. Additionally, in Spring 2008, I taught Data Mining in Service Environments at the University at Buffalo in the Department of Industrial and Systems Engineering. Currently, I teach primarily graduate courses in the Data Science cluster, including two courses that I developed, one on data cleaning (CSCI 721) and one on cognitive computing (CSCI 722).

My research interests lie in the application of data mining, data science, and cybersecurity to critical infrastructure protection (CIP), disaster management, and engineering design/manufacturing. The CIP and disaster work has been in conjunction with fellow members of RIT’s Collaboratory for Resiliency and Recovery (Drs. Sumita Mishra, Rajendra Raj, and Jennifer Schneider) and several students in GCCIS and CET. Together, we have explored resource allocation for first responders, developed a set of metrics to track response and recovery in a disaster, and analyzed a dozen years of 911 emergency calls, publishing the results in the top venues for CIP. Future CIP projects involve NLP analysis of the 911 call transcripts, predictive models of regional disaster events, and refining risk and recovery models for communities. Since coming to RIT I have worked on grants funded by NSF, DHS/Monroe County, and LMI.

Currently, Dr. Raj and I are co-advising a Ph.D. student, Asma Alnemari, whose dissertation area is differential privacy. I also advise MS students in CS, CSEC, and KGCOE on projects ranging from privacy, internet security, and the cost of data breaches to natural language search in engineering design documents.

I am a member of the IFIP Working Group 11.10, Critical Infrastructure Protection; serve on the editorial board of the International Journal of Data Mining, Modelling and Management; and review for several journals, including the International Journal of Critical Infrastructure Protection and the International Journal of Disaster Risk Reduction.
News

The following items are presented as they appeared on the Computer Science Department website during the 2018 Academic year.

Paper on Theatre in VR presented at London Entertainment Computing Conference

Dr. Joe Geigel, Professor of Computer Science and co-director of the CG Graphics and Applied Perception Lab, presented the paper "Creating a theatrical experience on a virtual stage" at the 14th International Conference on Advances in Computer Entertainment Technology (ACE 2017) which was held in London, UK on Dec 14-16, 2017.

The paper highlighted audience perceptions of the virtual theatre productions of Farewell to Dawn, a mixed reality performance that combines virtual and augmented reality with motion capture with a 3D distributed gaming engine.

Faculty Member Receives Prestigious Research Award in Computational Social Choice

In recognition of her academic achievements, the Alexander von Humboldt Foundation has offered Professor Edith Hemaspaandra a 3-month research award for a return visit to Germany, to continue her collaboration with specialist colleagues there. The award is a follow-up from her 2011-2012 sabbatical which was in part supported by a 45,000 euro Friedrich Wilhelm Bessel Research Award (an extremely prestigious award in recognition of career achievements in computational social choice), also sponsored by the Alexander von Humboldt Foundation. The 3-month follow-up research period begins tentatively in October 2018. Many congratulations Edith!

CS Participates in National Webinar on Data Quality and Security Evaluation

CS Professor Leon Reznik and PhD student Igor Khokhlov delivered a webinar about their research on data quality and security evaluation. The webinar is organized by Trusted CI, the NSF Cybersecurity Center of Excellence - details of the Webinar are given below.
**Trusted CI Webinar: Data Quality and Security Evaluation Framework Development**

**Description**

In this talk, we are presenting our work on building a data quality and security (DQS) framework, which integrates cybersecurity with other diverse metrics, such as accuracy, reliability, timeliness, and safety into a single methodological and technological framework.

This innovation has a high potential to enable a significant improvement in a wide spectrum of science and technology applications as it will create new opportunities for optimizing data structures, data processing and fusion procedures based on a new quality and security information application. While the developed evaluation techniques may cover a wide range of data sources, the current framework’s implementation concentrates on using an ordinary user’s owned mobile devices and Android-based smartphones in particular.

We believe that DQS evaluation framework will stimulate further improvement of the quality of the whole cyberinfrastructure and, in particular, cybersecurity.

About Trusted CI: Trusted CI is the NSF Cybersecurity Center of Excellence. The mission of Trusted CI is to improve the cybersecurity of NSF computational science and engineering projects, while allowing those projects to focus on their science endeavors. This mission is accomplished through one-on-one engagements with projects to solve their specific problems, broad education, outreach and training to raise the practice-of-security across the community, and looking for opportunities for improvement to bring in research to raise the state-of-practice. For more information about what Trusted CI does, how it can help your project, the advances it is making in cybersecurity and resources for cybersecurity professionals, please see our website trustedci.org.

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**Speaker bios:**

Leon Reznik is a Professor of Computer Science (primary affiliation) and Computing Security (secondary affiliation) at the Rochester Institute of Technology. His current research concentrates on data quality and security evaluation and assurance; cognitive sensor networks and systems; intelligent intrusion detection and big data analytics.

Igor Khokhlov is a Ph.D. candidate at the Rochester Institute of Technology. He conducts research on data quality and value evaluation for sensor-originated data. Igor’s fields of interest include Android OS, cyber-security, and AI.
**PhD Student Wins Best Paper Award at ICFHR 2018**

This past August at the International Conference on Frontiers in Handwriting Recognition (ICFHR 2018), former CS PhD student Kenny Davila and CS Professor Richard Zanibbi received the Best Paper award. Their paper, "Visual Search Engine for Handwritten and Typeset Math in Lecture Videos and LaTeX Notes" is based on Kenny's PhD dissertation.

The paper presents the Tangent-V system, which can search handwriting in lecture videos using cropped images from the video, or images of typeset formulas as queries. The extraction of whiteboard contents from the video is entirely automatic, and captures what is on the whiteboard each second of the video. The system can be used to navigate through lecture videos by clicking on 'ink' in generated keyframes that capture everything written on the board. A demonstration of the system may be found online.

Competition for the award was stiff, as ICFHR is the leading international conference on handwriting recognition and applications. During the award presentation, the originality of the work was cited as the primary reason for selecting the paper. Kenny is currently a postdoctoral researcher at the CUBS lab at the University at Buffalo, continuing his work on document/video analysis and search.

(Photo, left to right: Srirangaraj Setlur (Organizing Chair), Kenny Davila, Christian Viard-Gaudin (Program Chair), and Richard Zanibbi)

**MS Student Wins Scholarship to Attend GHC 18**

Sahana Murthy, our CS student is one of the GHC 18 Scholarship recipients (as Student Scholar). Her award is sponsored by Reddit. Congrats to Sahana!!

GHC scholarships provide funds for undergraduate students, graduate students, and faculty to attend the three-day celebration. In 2017, over 650 Scholars attended GHC where they gained access to career and academic workshops, networking opportunities, and memories that will last a lifetime. Learn more about our GHC Scholarship, please check out here.

In addition, the following students received scholarships from the CS department to attend the GHC2018.

Manali Kamalaskar (MS)
Emily Zimmerman (BS)
Theodora Bendlin (BS)
Rebecca Brown (BS)
Laura Corrigan (BS)
CS Professor Receives Nearly $1 Million for Math-Aware Search Engine Research

Two research grants have been awarded to Dr. Richard Zanibbi, Associate Professor of Computer Science and director of the Document and Pattern Recognition Lab. The total amount of funding is $969,386 across the two grants.

The first is a grant from the Alfred P. Sloan Foundation and is in collaboration with Dr. Lee Giles, David Reese Professor at the College of Information Sciences and Technology at the Pennsylvania State University in University Park, PA. The second award comes from the National Science Foundation and is in collaboration with Dr. Giles as well as Anurag Agarwal, Associate Professor in RIT’s School of Mathematical Sciences and Douglas Oard, Professor in the College of Information Studies and the Institute for Advanced Computer Studies at the University of Maryland at College Park.

The grants will fund work to improve the discovery of scientific and scholarly information by creating mature, easy-to-use information technologies supporting search of mathematical notation, and deploying these in the well-known CiteSeerX research paper search engine. Support for expert (research paper) and non-expert (Wikipedia) resources will be included in the system. The overarching goal of the work is to bring math search to the masses.

The work will be undertaken at the Document and Pattern Recognition Lab (dprl). The dprl explores ways to improve the algorithms and tools used for automatic recognition and retrieval of information in documents, images, audio and video. For more information, please visit the lab's web site at https://www.cs.rit.edu/~dprl

NSA Grant Awarded to Design Curriculum on Intelligent Secure Systems

Dr. Leon Reznik, Professor of Computer Science, was recently awarded a grant from the National Security Agency to fund the development of a novel collegiate level course on Intelligent security systems. The goal of this course is to further develop knowledge, as well as research and practical skills, in application of intelligent systems in computer security. It will continue education in artificial intelligence area as well as introduce its application into the development of computer security tools and systems.

The course idea is innovative and unique; merging together various diverse knowledge areas such as artificial intelligence and machine learning techniques and computer security systems and applications. It will review different application areas such as intrusion detection and monitoring systems, access control and biological authentication, firewalls structure and design and introduce students into the current state of intelligent methodologies in computer security and information assurance systems design.
Einstein's Prediction Confirmed: Congratulations to Dr. Hans-Peter Bischof!

Research conducted by Rochester Institute of Technology scientists was integral to the breakthrough detection of gravitational waves from binary black holes that was previously announced by the Laser Interferometer Gravitational-wave Observatory (LIGO) Scientific Collaboration.

Hans-Peter Bischof, Professor of the Department of Computer Science, is the founding faculty member of RIT team. He received his Ph.D. in computer science at the University of Osnabrück in Germany. He works in scientific visualization, high-performance computing and language design, and his visualizations of numerical relativity simulations have appeared in science magazines and in the History Channel program, The Universe: Cosmic Holes. Bischof is a member of the LIGO Scientific Collaboration.

To read more, visit the following from RIT University News Services:

- Gravitational waves detected 100 years after Einstein's prediction - RIT researchers make significant contribution to the monumental discovery: https://www.rit.edu/news/story.php?id=54606

NSF Award for Pencil Puzzles as an Inclusive Domain for Learning CS

Zachary Butler, Professor in CS, is PI of a new research award from the NSF titled, "Pencil Puzzles as an Inclusive Domain for Learning Computer Science."

Zack and co-PI Ivona Bezáková will extend previous NSF-funded research by working with instructors at several different types of institutions to "develop, deliver and analyze pencil-puzzle-based assignments in their own particular environment to answer whether these assignments are effective for all students, primarily across gender and experience levels, but also in terms of ethnicity, academic major and level, deafness, and problem solving style." More information, please check out the project homepage https://www.cs.rit.edu/~pencilpuzzle/

Congratulations to Zack and Ivona!
Ivona Bezáková, Professor in CS, is PI of another NSF award in the area of computing education. Titled "Automated Feedback in Computing Theory," this work seeks to "develop a tool that provides immediate feedback to theory of computation students on their submissions. Students can use this feedback to improve their solutions, get more practice, and increase their understanding of the material."

Congratulations to Ivona and co-PI Edith Hemaspaandra!

The ACM ICPC Programming Contest

On November 10 the Computer Science department organized and hosted the North East North America (NENA) Regional Final of the oldest world-wide programming contest in the world: the ACM (Association for Computing Machinery) ICPC (International Collegiate Programming Contest). In 2017, 49,935 students from 3,098 universities in 111 countries participated in this challenging algorithmic contest. The top teams from each region advance to the World Finals, which will be held this academic year in Porto, Portugal, in April.

The Northeast North America region, consists of colleges and universities throughout Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland, Labrador, Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut and New York State excluding New York City. The top 16 teams from the preliminary rounds of the competition are invited to participate in the Regional Final, held at RIT each year in November. The top team advances to the World Finals, plus strong-performing regions (such as ours) at last year's World Finals are awarded additional advancing slots.

The CS department has organized the contest for almost two decades. We take care of organizational issues (of which there are plenty) but also design new challenging algorithmic problem sets and create the corresponding implementations and data sets. Our Problem Design team consists of Ivona Bezáková (who also serves as the NENA Regional Contest Director), Zack Butler (the Chief Judge for the region), Aaron Deever, and Daniel Štefankovič (of University of Rochester). Several days prior to the contest and on the day of the contest many other faculty and staff in the department assisted with the contest. Needless to say, organizing the contest involves an extraordinary amount of work, which is all done via volunteering. As a reward, volunteers get to interact with the best students in the region (and the world) and show them what a great place RIT is.

The department is happy to report that the contest went very well: not very surprisingly, MIT won, followed by Harvard, both of which will represent our region at the World Finals this year. Each team consists of three students, who for five hours work together on a single computer to solve a set of challenging algorithmic problems. RIT was represented by Ayana Adylova, Steven Landau, and Andrew Searns, with coach Alex Ororbia.
UNDERGRADUATE STUDIES

First Year Computer Science

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.

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. A three-tiered approach is used to enable students to learn these concepts in a fast-paced environment, with the focus being on creating a small problem to solve each week that can be solved by applying the week’s teachings.

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.

Students develop solutions by working in small teams of 3 to 4 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. TAs provide weekly recitations so that students can get additional reinforcement of the material after the 2-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 they may be struggling with.

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 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 of English. 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 this 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.

I have always considered myself extremely privileged that I was able to pursue a field that I was truly passionate about; for me, computer science always seemed like the perfect blend of creativity and puzzle-solving. A refreshing aspect of our major is how common it is to meet someone of the same major with a completely different set of skills. For me, I was able to pursue a minor in linguistics with a heavy-focus on natural and spoken language processing.

As a CS major, I have worked as a Student Lab Instructor for the past three years, guiding younger students through conceptual problem-solving and understanding the fundamentals of our field. Outside of computer science, I have held executive board positions in clubs such as TEDxRIT and RIT Club Football. Professionally, I have worked as a researcher here at RIT with the Computational Linguistics and Speech Processing (CLASP) lab, as well as a software engineer in NYC for a company called DigitalOcean (where I will be working full-time after graduation).

The proudest moment for me here at RIT was the honor of being chosen to speak at my college’s graduation. As the college’s undergraduate delegate, I look forward to sharing my message with the rest of the students here at RIT, a message that I hope will empower and encourage RIT students to be catalysts for change in the workforce.
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.
Honors & Awards

**ECI Systems & Engineering Scholarship**
- Kesavan Kushalnagar
- Douglas Stanish
- Emily Wesson

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 1973-1976. 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**
- Ezekiel Miller

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**
- Lauren Egts

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 demonstrates academic achievement (at least a 3.0 GPA overall and a 3.2 GPA in Computer Science courses) and who combines academic accomplishments with a willingness to help and mentor fellow students.

**Outstanding First Year Student Scholarship**
- Robin Avenoso

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 better.
Outstanding Fifth Year Student Award

- Jiaqi Gu

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 has made significant contributions to the department. The award is given annually to a student who has maintained a 3.0 GPA or better average during his or her five years of study.

Alumni Scholarship

- Konce Quispe

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 have made significant contributions to the Department. The award is made possible by generous donations from Computer Science alumni.

STUDENT SPOTLIGHT

Parag Shrikrishna Mali

All the technology giants like Google, Microsoft, and Apple have solved many problems that we used to face. These companies have only one thing in common, computer science. If you want to make a big impact on people’s lives, you need to know the fundamentals of computer science. A computer scientist has opportunities for true creativity and innovation. As a CS major, I can say that CS is not just programming, it is a way of living life. If applied correctly, all major CS principles can be used to solve many problems in life.

As a CS student, I joined the Document and Pattern Recognition Lab (DPRL) in my second semester. While at DPRL, I worked with lab director Dr. Zanibbi and other lab members on many state-of-the-art projects including math search engines, handwriting recognition, and math detection.

As a summer intern at Apple HQ in Cupertino, I got a chance to meet and work with extraordinarily talented people who I never thought I would be working with. I am very proud of my contributions towards making the best products that people from all over the world benefit from.

In my dream job, I would love to work on products which will simplify human life by providing elegant solutions to complex problems. This job should challenge me on every step and should force me to be creative and innovative.
Class of 2018 (BS)

Adylova, Dana
Ali, Shareef
Allan, Stephen William
Allen, Elliot P
Aman, Mitchell Ryan
Andaloro, Thomas Robert
Aulakh, Ranbir
Babalola, Olufunmilola Serwa
Bartelmo, Joseph Francis
Bauer, Andrew
Bauer, Jeff Carl
Billen, Connor R
Bland, Bruce
Boa, Nick Stewart Dixon
Brenner, Matthew Davis
Brown, Benjamin Eli
Bynoe, Kamil Emilio
Carlos, Stacy Jequel
Cavaliere, Alexander R
Cecchini, Bernard Peter
Chu, Zachary David
Clark, Alexander Robert Lamont
Cote, Isaiah Young
Cumbo, Joseph W
Dell, Brennan Michael
Dennehy, Ryan Michael
DiNardi, Robert James
Dimaio, Connor T
Edwards, Garrett Thomas
Femia, Frank
France, Kathryn Linda
Frey, Zachary P
Froling, Rebecca V
Fuchs, Joseph James
Fujimoto Wakabayashi, Osamu Alex
Glassner, Zachary William
Gottlieb, Drew Alexander
Gottshall, Justin Mikeal
Green, Jayme Jayme
Grimaldi, Stefani
Grosh, John Anthony
Gu, Jiaqi
Gundlach, Dylan C
Ha, Brandon
Hansen, Sarathi Jeffrey
Haskins, Harlan Bushfield
Hollenbach, Andrew Nash
Hooover, Alexander Stephen
Jackman, Ryan Taylor
Jenkins, Andrew C
Johnston, David T
Johnston, William Booth
Kane, Lilly Madeline
Kanis, Eric R
Kelly, Dylan
Kim, Dong Kyu
King, John Squires
Kirnes, Julien Miles-Alexander
Kneipshield, Hunter Hunter
Kubiniec, Robert Thomas
Lah, Michael
Launt, Samuel T
Lauzon, Zachary Richard
Lee, Douglas K
Lewis, Holden Parker
Lewis, Isaiah Deivaun
Li, Brandon
Lippe, Zachary
Lipson, Mychal
Longwell, Harry Warren
Maeder, Jesse E
Maitland, Benjamin Hartley
Mansfield, Brian Mihalov
Martin, Dustin
Mattis, Nicholas
May, Douglas A
Mazzietill, Joseph
Mc Sherry, Jamie Covell
McMullen, Jason Joseph
Meddin, Alexandre Nicolas Simon
Migliorini, Zachary McAlister
Mingus, Zachary Andrew
Morgan, Tucker Bull
Morken, Nicole A
Moyer, Douglas Daryl
Nier, Hayden M
Nutulapati, Siddhartha
O Neill, Griffin Scott
Pastoressa, Joseph
Patterson, Jacob
Perry, Cody
Philip, Arun
Philip, Mark S
Picciotti, Robert Anthony
Portela Kupiec, Piotr Paolo
Portocarrero, Ryan L
Quinn, Jeremy Patrick
Rader, Seth Daniel
Raza, Yawar Syed
Reilly, James Michael
Reynolds, Benjamin B
Rollet, Timothy Michael
Root, Michael Andrew
Rozvora, Pavel
Sardelli, Victoria Lauren Millare
Schreppler, James Everett
Scialla, Andrew
Scicali, Alberto Francesco
Shuey, Alexander James
Simmons-Roy, Wyatt
Singh, Joshua
Smith, Michael D
Soules, Benjamin Langhus
Stauffer, Garrison Keat
Stokowski, Nicholas K
Studin, David Alexander
Suarez, Martin
Sulkava, Pietari Olavi
Terracciano, Michael John
Thatcher, Colin Montgomery
Thomas, Tom Jose
Tompkins, Ryan Jacob
Tucker, Keelan Patrick
Twyman, Carl L
Viets, Taylor Austin
Vogel, Jesse Benjamin
Waldron, Joseph Jugeau
Walton, Benjamin Matthew
Weir, Shannon Todd
Wicks, Christopher Robert
Williams, Dakota Raine
Yeaw, Coleman Carpenter
Zhao, Kerry
Zuber, Jacob A
Cohen, Chad Hunter
GRADUATE STUDIES

Areas of Study

Master’s students are required to complete a set of core classes covering programming and CS theory. After those courses are completed, students select a specialization area or cluster for their remaining courses, and for their project or thesis. The combination of coursework and research found in our program provides students with the skills to both engineer and advance modern computing systems.

Clusters

**Artificial Intelligence** - Algorithms and architectures needed to make decisions in complex environments, focusing on computer vision, robotics, sensor networks, data mining, document recognition, and theoretical foundations.

**Computer Graphics and Visualization** - Foundations in computer graphics, including graphics programming, computer animation, virtual reality, data visualization, and image synthesis.

**Data Sciences** - Data management and data discovery, focusing on design, analysis and organization of data in enterprise, multimedia, active, and secure databases.

**Distributed Systems** - The interaction of systems formed by cooperating computers, including the design and implementation of network protocols and security.

**Programming Languages and Tools** - The development of computer languages and the tools used to develop those languages, including compiler design, language development, and emerging languages.

**Security** - Topics range from cryptography to secure databases, including encryption techniques for data and networking in both theoretical and applied knowledge.

**Theory** - The fundamentals of computing, studying the power and limitations of computation, including design of efficient algorithms, proofs of computational intractability, and the design and study of communication and cryptographic protocols.
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 course (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 2018 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 (2018)
Each semester at the Master’s Project Poster Session, up to three posters are selected for the Best Poster Award. In addition, one report was selected for the Best Report Award in Spring 2018. All award recipients traditionally receive a gift card and book by Prof. Bischof, the master’s program coordinator.

**Spring 2018**

**Best MS Project Report Award**
- **Ameya Shringi**: Fair Division of Indivisible Goods
  Advisor: Dr. Hadi Hosseini

**Best MS Project Poster Award**
- **1st Place Poster**: Ameya Shringi: Fair Division of Indivisible Goods
  Advisor: Dr. Hadi Hosseini

- **2nd Place Poster**: Maria Jose Cepeda Garcia: A Synthetic Query-Aware Database Generator
  Advisor: Prof. Jeremy Brown

- **3rd Place Poster**: Ramprasad Tamilselvan: Distributed Two-way Trees for File Replication on Demand
  Advisor: Dr. Minseok Kwon

**Summer 2018**

**Best MS Project Poster Award**
- **1st Place Poster**: Thshar Sharma: Symbolic Understanding of Anime with Deep Learning
  Advisor: Dr. Ifeoma Nwogu

**Fall 2018**

**Best MS Project Poster Award**
- **1st Place Poster**: Orens Xhagoll: Visual Tracking for Corobots
  Advisor: Dr. Zack Butler

- **2nd Place Poster**: Richard Eugene Munson: Correctly Rounded Floating-point Binary-to-Decimal and Decimal-to-Binary Conversion Routines for Standard ML
  Advisor: Dr. Matthew Fluet

- **3rd Place Poster**: Tanvi Milind Raut: Multiple camera array for dynamic real-time facial motion capture
  Advisor: Dr. Joe Geigel
STUDENT SPOTLIGHT

Theodora Bendlin

When I was in high school, I decided to go into Computer Science, but I was worried when I first came to RIT that I was going to be behind because I didn’t grow up working on computers, as a matter of fact, my sister has a degree in music therapy. RIT didn’t make the transition difficult, as the curriculum is geared toward a non-programmer. The professors and students are likewise very helpful and supportive when trying to understand new concepts.

When I was a senior in high school, my sister was about to graduate from college with a degree in music therapy. Her entry into the workforce helped me focus on what I wanted out of my own career. I wanted to be creative, and to make something new, and to never stop learning. Most of all, I wanted to choose a major that would let me make an impact on someone else. Since I demonstrated a knack for writing code, I decided to go into Computer Science. Technology is integrated into almost every aspect of our lives, and I knew that it was my ticket to getting the career I wanted.

When I first came to RIT, I thought I was going to be very behind because I didn’t grow up building computers on the weekend. Thankfully, that wasn’t the case—RIT’s curriculum is very good at getting everyone on the same page. More than that, the professors and students are very supportive; I have never had trouble finding someone to help me with an assignment or understand a difficult concept.

Despite the stereotypes that say otherwise, my favorite part about CS has been meeting different people, students and professionals alike. Some of the most passionate people I have met were just talking about how a piece of technology works, or how they solved a difficult problem. Their excitement about their work is positively contagious.

Yes, I am one of the Computer Science Department’s student ambassadors. Mainly, this means that I get to interact with prospective students during open houses and scheduled visits, and help the department during various events throughout the semester. I love giving tours to prospective students—not only does it help me brush up on my communication skills, but it’s nice to be able to give them advice based on my own experiences as an overwhelmed high school senior.

I’m part of Women in Computing (WiC), which is an organization here on campus that is dedicated to promoting the success and advancement of women in school and the workplace. We are split into a bunch of fun committees that oversee different aspects of our group. I’m mostly active in the Outreach committee, which organizes different events targeted towards younger girls to help develop and support an early interest in STEM. It’s really exciting to get a bunch of girls ranging from elementary school to high school interested in tech, especially when I personally didn’t know about programming until my last couple years in high school.

While I was on co-op over the summer, I was the lead developer for an Android POC within my company. The project had a lot of factors that made its execution complicated: the team consisted of me and two other interns, it required integrating with a 3rd party device, and it was supposed to start and end within a month. I essentially designed the app myself, and had to learn how to integrate an app with a Bluetooth device, which was something I had never done before. Despite all of this, I was able to finish the project on time and everyone was very impressed.
Honors & Awards

Outstanding Graduate Student Award

- Naman Kothari

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.

Alumni Scholarship

- Darryl Cyprian Pinto

The Alumni Scholarship recognizes a Computer Science MS 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.

Class of 2018 (MS)

Aalipour, Ghodratollah  
Agrawal, Lokesh  
Alluri, Mounika  
Awghate, Vaibhavi Nilkant  
Badave, Mandar Ravindranath  
Bahirwani, Hema Ghanshyam  
Balasubramanian, Prasanna  
Bauer, Jeff Carl  
Bedi, Vishal Girish  
Bhandari, Shravya shama  
Bhanushali, Nisha Narendra  
Bharde, Manasi Sunil  
Bhaskar, Milan  
Bhaskar, Rohit  
Bhat, Pavan Prabhakar Prabhakar  
Boa, Nick Stewart Dixon  
Bohari, Imran Iqubal  
Buddhadev, Manan Chetan  
Burbulis, Rolandas  
Cepeda Garcia, Maria Jose  
Chandrashekhara Arodi, Suchith  
Chatterjee, Saurabh  
Chitnis, Prasad G  
Cortes, Maria C.  
Dashora, Rahul  
Dedhia, Niraj Jitendra  
Deorukhkar, Onkar Anil  
Desai, Aishwarya Pradeep  
Deshpande, Amruta Shirish  
Dhaigude, Ajinkya Abhimanu  
Dhruv, Jinesh Abhaykumar  
Dhuliya, Arjun Madan  
Dua, Aviral  
Dudhat, Gayatri  
Edwankar, Amey V  
Elangovan, Dhanasekar  
Fernandes, Vanessa Luella  
Gandhele, Saurabh Madhukar  
Gandhi, Palash B  
Gangadhara, Shashank  
Garg, Shobhit  
Garg, Vishal  
Gawade, Gaurav Dashrath  
Godge, Supriya Prakash
Gorade, Aarti Hanumant
Govindankutty, Lijitha
Green, Jayme Jayme
Gudi, Dinesh
Hansen, Sarathi Jeffrey
Heyman, Andrew John
Hollenbach, Andrew Nash
Huang, Shih-Ting
Iyer, Swetha Kannan
Jain, Yash
Jaitley, Abhishek
Jayachandiran, Kowsic
Jhumkhawala, Prajesh Atul
Joshi, Ritvik
Joshi, Shreya Anand
Joshi, Shrinivas Arun
Kamat, Swapnil Nitin
Kamath, Ankita Ramchandra Ramchandra
Kambam, Nithin Reddy
Kamble, Chaitali Sudam Sudam
Kanagaraj, Pratith
Karandikar, Asavari Vinayak
Kataria, Deep R
Kawanpure, Ankush Arun
Kelly, Dylan
Khan, Alimuddin Atiullah
Khandhadia, Harsh Rajiv
Kharade, Supriya Sanjay
Killawala, Akhil
Kolhe, Ajinkya
Konduru, Praful
Kotha, Sai Venkat
Kothari, Payal Ajit
Koutu, Palash Kumar
Kshirsagar, Nikhilesh Manohar
Ku, Wei-Yao
Kular, Chirag Narendra
Kulkarni, Chinmay
Kulkarni, Pratik Shirish
Kumari, Pooja
Kurra, Sree Lakshmi
Kutt, Brody J
Ladage, Chinmay Kirit
Li, Brandon
Li, Jingyang
Mae, Daichi
Mahendran, Sabari Girish
Malik, Anurag
Marali, Vinayak K
Marathe, Surabhi Rajeev
Mohite, Hitesh
Murthy, Aditya S
Nadig, Southam
Nagumantri, Ujwal Bharat
Nainani, Dipesh
Nallabothula, Bhanuprakash
Pabbaraju, Mansa Ramdas
Pachpute, Anjali Vijay
Palackas, Richard
Pandey, Soni
Pandit, Rudresh M
Paradkar, Harshad Narayan
Parakkal, Sai Ashwin
Parekh, Saurabh Bharat
Patil, Jidnyasa
Patil, Nihar Ramakant
Petkar, Atir
Poriya, Anil Rajendra
Prabhu, Akshai Gopalakrishnan
Pramanik, Aishwary
Pulekar, Aditya Chandrashekhar
Qi, Ruiji
Raghuram, Sameer
Raja, Yeshwanth
Ranganathan, Hari Prashanth
Raza, Yawar Syed
Renavikar, Akshay Sham
Rodrigues, Rynah Caroline
Rohra, Krish Sunil
Roy, Pankhuri
Sah, Kumari Preeti Chhabi Kant
Sahni, Kritka
Sajan, Richie
Sajnani, Pratik Ashok
Sawant, Parth Subodh
Scicali, Alberto Francesco
Segave, Laura Bates
Seralathan, Yogeesh
Shah, Amit Vijay
Shah, Harshit Rajeshkumar
Shah, Niyati Lalit
Shah, Pooja Ketan
Shah, Rinkesh Pradipkumar
Shankar, Deepak Ravi
Shenoy, Amrut Ashok
Shringi, Ameya
Silva, Rachel Elizabeth
Singh, Alankar Dingsh D
Singh, Ashwini Rajesh
Singh, Vatsala
Sinha, Navneet
Subramanian, Siddharth

Sureja, Shreyas R
Tamilselvan, Ramprasad
Tarey, Siddharth
Thakkar, Shweta Suresh
Trimukhe, Ketki Gorakhnath
Unde, Pragati Balasaheb
Vajpayee, Shailesh
Valant, Christopher J
Vanjara, Nihar Ishwar
Vartak, Rushik Anil
Venkatachalam, Akash
Venugopala Pillai, Rahul
Vijayaragavan, Pragash
Vyas, Khyati
Wani, Akash Prakash
Wani, Saurabh Anant
Wicks, Christopher Robert
Yakkali, Shweta
Yegorov, Maksim Eduardovich
Zhang, Xiaoxuan
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 70. Our PhDs 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.

Recently our PhD program was ranked #68 nationally in the Computer Science category by US News. This is a remarkable achievement for a PhD program less than a dozen years old!

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 College of the Holy Cross, postdoctoral positions (e.g., at University at Buffalo), and senior positions at corporations including Google and Appnexus.

STUDENT SPOTLIGHT

David Naváez

My name is David E. Naváez and I am from Panama. My undergraduate degree is in Computer Systems Engineering from the Universidad Tecnológica de Panamá. I came to RIT to pursue my Masters in Computer Science through a Fulbright scholarship. I then stayed to pursue a PhD in Computing and Information Systems.

My main research interest is in theoretical computer sciences. I am a founding member of the Fulbright scholar’s association, a club at RIT, and I currently advise the executive board of that club. Besides my academics, I spend a lot of time volunteering for free and open source software projects.

I worked in industry for several years as a software developer before joining RIT and I can say, without a doubt, that the code I have written as part of my research while at RIT is by far the most involved code I have ever written and I am very proud of it. My research has also led me to master several specialized packages for graph theory, constraint programming and parallel computing that I would have otherwise not come across.

I am very proud of my home country. Panama’s weather, landscape and cost of living make it a really nice place to live. Panamanians are very warm and welcoming (although I am not particularly known for being any of that) so it is a great destination for tourism.
PhD Students Advised by CS Faculty

Asma Alnemari
Cybersecurity and Privacy
Advisors: Rajendra Raj and Carol Romanowski

Asma Aloufi
Information Security and Applied Cryptography
Advisor: Peizhao Hu

Angel Cambero
Graph Mining, Classification and Information Extraction
Advisor: Carlos Rivero

Kwon-Young Choi
(INSRennes, France)
Optical Music Recognition
Advisors: Bertrand Couasnon, Yann Ricquebourg, Richard Zannibi

Tharindu Cyril Weerasooriya
Machine Learning on Social Data, Label Distribution Learning
Advisor: Christopher M. Homan

Garegin Grigoryan
Computer Networking, Routing Scalability and Programmable Data Planes
Advisor: Minseok Kwon

Sahil Gupta
Securing the Internet of Things Networks
Advisor: Minseok Kwon

Igor Khokhlov
Data Quality and Security, Artificial Intelligence, Android OS
Advisor: Leon Reznik
Tong Liu
Crowdsourcing and Human Computation, Natural Language Processing and Machine Learning
Advisor: Christopher M. Homan

Mahshad Madhavi
(Imaging Science) Recognizing Handwritten and Typeset Math Formulas
Advisor: Richard Zanibbi

Behrooz Mansouri
Information Retrieval, Machine Learning
Advisor: Richard Zanibbi

Victor Marin
Data Management and Analytics; Artificial Intelligence / Pattern Recognition
Advisor: Carlos Rivero

David E. Narváez
Constraint Satisfaction Techniques for Combinatorial Problems
Advisors: Edith Hemaspaandra and Stanislaw P. Radziszowski

Nibesh Shreshta
Fault Tolerant Systems and Blockchain
Advisor: Mohan Kumar

Wenbo Sun
Design and Theoretical Analysis of Randomized and Approximation Algorithm
Advisor: Ivona Bezáková

Zhizhuo (George) Yang
Eye Tracking, VR/AR, Machine Learning, Applied Perception
Advisor: Reynold Bailey

Timothy Zee
Interpretable AI
Advisor: Ifeoma Nwogu

Wei Zhong
Math Information Retrieval
Advisor: Richard Zanibbi
Sagar Barbhaya

I graduated from the Department of Computer Science in 2015 and joined Intuit Inc. Since then, I have been a part of this organization. Having done my Co-op, internship, and full-time job here, I have had the opportunity to contribute to a wide variety of projects owned by different teams. The one that has been special to me is my journey from helping a product at Intuit become accessible (easy to use for persons with a disability), to becoming the lead for accessibility automation and desktop products at Intuit. Working on accessibility has given me some unforgettable moments, one of them being a tweet from a visually impaired customer talking about how our products are empowering him in his life. As a software engineer, this is one of the biggest rewards for me, when a customer expresses his/her satisfaction and happiness with my work. Thank you to RIT for establishing a solid foundation that helped me go further in my career. Last but not the least, when I look back at my journey, one thing I would like to say is:
"When It Seems Like Things Are Really Falling Apart, They're Actually Just Falling Into Place."
#GoTigers !!

Zack Miller

Zack is a software developer who works on the development and support of the TASSEL package and other systems used by the Buckler Lab for Maize Genetics and Diversity at Cornell University. He grew up in a small town in rural Central New York (near Ithaca). He has been interested in computers and computer programming for as long as he can remember.

Zack received a BS in Computer Science and Mathematics from Houghton College. While there, Professor Dr. Wei Hu asked him to do research on top of his studies. Dr. Hu’s interests were in finding new ways to apply Data Mining and Machine Learning algorithms to real life problems. Over three years, Zack worked on projects ranging from the Flu, Network Intrusion Detection Systems, Gender Prediction using Text, and Spam Account Detection on Twitter. Although the projects were interesting, he found that he was more interested in the
techniques used for analysis. At the end of his time at Houghton College, he still was not sure exactly what he wanted to do.

So - he went to grad school at the Rochester Institute of Technology. There he worked to gain his MS degree in Computer Science with a focus on Artificial Intelligence. Based on his research experience and coursework, Dr. Richard Zanibbi asked him to join the Document and Pattern Recognition Lab (dprl) while working on his Masters Project. His project focused on yet another interesting application, detecting spoken keywords in the audio channel of math lecture videos. This work was later extended by other students, leading to a publication in the journal *Pattern Recognition Letters* in 2016; an online demonstration of the word-spotting system is also available.

After college, Zack moved back home to the Ithaca area, and joined the Buckler Lab at Cornell a couple of months later. He enjoys constantly learning new things, and being able to contribute to the lab’s work despite having no Biology or Genetics background.

After graduation I began working at Google as a "Site Reliability Engineer - Software Engineer." The type of stuff I work on is availability / scalability / reliability of Google systems. There's a great deal of systems engineering, distributed systems, networking, data integrity, etc. For a couple of years I worked on the Cloud SQL team, but recently changed to Persistent Disk (Cloud block storage device). I've also participated in some other programs at Google like Google In Residence (Hampton University Fall 2016) and I organize SRE training and ramp-up for approximately half of new SREs globally.

There's a bunch of ways that CS@RIT (and RIT in general) has prepared me for my career:

- First year sequence was a big deal. The topics covered during CS 1-3 (under the quarter system) made it extremely easy to get my first Google co-op, which then led to where I am now. Learning CS fundamentals so early still helps me regularly as I have a deeper understanding of things from a base level. Although I haven't worked anywhere other than Google since graduating, I have still interviewed at some places to stay fresh on that. I think the skills learned from the early classes, in particular lab sessions and homework assignments, are the biggest reason for why I continue to be successful during interviews.
• Practical/career focus in classes is also excellent. I've taken skills learned from some classes (Systems Programming, language seminar classes) and applied them directly in my current role.

• When I was a student, it was a great help to be able to talk to current students or alumni about their co-ops and jobs. I do campus recruiting now (so I still come to RIT fairly regularly) and the alumni relations with the CS department are still phenomenal. I'm able to easily connect with past professors, so they can see what Google is doing, I can see what the department is doing, and we can both incorporate that feedback into what we do. This has been extremely helpful whenever I am doing campus recruiting.

• Taking multiple CS courses at a time really helped force me to be better at managing multiple concurrent tasks. There were some semesters where I was taking multiple programming-heavy courses. Having gone through that, I now have an easier time at work juggling multiple projects.

• One thing that RIT did that is a bit less tangible is give me a good sense of humility. I think this stems from some classes being pretty brutal but professors (in general) offering plenty of judgment-free support and assistance.

Andy Pavlo

Andy Pavlo is an Assistant Professor of Databaseology in the Computer Science Department at Carnegie Mellon University. He completed his Ph.D. at Brown University in 2013. He has received several teaching and research awards, including the Sloan Research Fellowship (2018) and the Jim Gray SIGMOD Doctoral Dissertation Award (2014).

Andy is an alum of RIT’s Computer Science Dept (BS’05, MS’06) where he worked with Prof. Chris Homan. Chris provided Andy with stern but necessary guidance early in his research career that set him on the path towards a life dedicated to science.

While a student at RIT, Andy lived in the famed 52 Colony Manor (52colony.com) apartment for five years. He met his wife (Kristin Britanik ’07) at this apartment during a semi-legal punk rock basement show.
FACULTY AND STAFF

Dr. Reynold Bailey
Professor and Undergraduate Program Coordinator

Dr. Ivona Bezáková
Professor

Dr. Hans-Peter Bischof
Professor and Graduate Program Director

T.J. Borrelli
Senior Lecturer

Jeremy Brown
Lecturer

Dr. Zack Butler
Associate Chair, Professor and Associate Graduate Coordinator

Warren R. Carithers
Associate Professor

Dr. Taejoong "Tijay" Chung
Assistant Professor

Dr. Aaron Deever
Senior Lecturer and Associate Undergraduate Program Coordinator

Dr. Matthew Fluet
Associate Professor

Dr. Joe Geigel
Professor

Dr. James Heliotis
Professor
Jordan Gates  
Sr. Staff Assistant

Jason Harrison  
Staff Assistant

Rebecca O’Connor  
Academic Advisor

Mina Pulcini  
Senior Academic Advisor

Susan Quatro  
Manager of Student Services

Christina Rohr  
Senior Academic Advisor

Mark Stamer  
Technician

Arnela Stupac-Catello  
Systems Administration

Sam Waters  
System Administrator

Cindy Wolfer  
Academic Advisor

**Adjunct Professors**

William Childs  
Tony Dal Santo  
Timothy Fossum

Samuel Fryer  
Dr. Fereydoun Kazemian  
Susan Haller

Matthew Hosking  
Michael Kurdziel
Research Areas

Below is an alphabetical list of research areas that our faculty engage in, along with the specific faculty that 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.

- Prof. Zack Butler
- Prof. T.J. Borrelli
- Prof. Edith Hemaspaandra
- Prof. Hadi Hosseini
- Prof. Chris Homan
- Prof. Thomas Kinsman
- Prof. Ifeoma Nwogu
- Prof. Alex Ororbia
- Prof. Leon Reznik
- Prof. Linwei Wang
- Prof. Richard Zanibbi

**Computer Graphics and Visualization**


- Prof. Joe Geigel
- Prof. Reynold Bailey
- Prof. Hans-Peter Bischof
- Prof. Warren Carithers
- Prof. Ifeoma Nwogu
- Prof. 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.

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

Data Sciences

Data Sciences 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.

- Prof. Xumin Liu
- Prof. Jeremy Brown
- Prof. Scott Johnson
- Prof. Thomas Kinsman
- Prof. Michael Mior
- Prof. M. Mustafa Rafique
- Prof. Rajendra Raj
- Prof Carlos Rivero
- Prof Carol Romanowski
- Prof. 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.

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

Languages and Tools

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

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

STAFF SPOTLIGHT

Sam Waters

Sam began working at RIT as a System Administrator in 2000, after weathering the Y2K leadup while at Kodak. He was brought in initially to design a future Windows lab, with additional responsibility for faculty and staff desktop support. Over the years, his role has evolved, and he now spends most of his time doing research support, maintaining CS’s virtual environment, and purchasing equipment, as well as continuing to provide desktop support for faculty and staff, managing the Windows and Mac labs, and providing secondary support for Linux and BSD systems. His technical interests are in the intersection of security and usability, particularly how usability affects every day users’ ability to secure their data. He holds an MS degree from RIT, where his graduate thesis examined the security of social media based single sign-on, as well as an MA from Columbia University, where he studied Mesoamerican Archaeology. He is a member of the Q Center Advisory Team, and has participated in many events and committees on campus as an advocate for the LGBT community. Sam lives in the city with his wife, his three off-the-wall dogs, and his two more dignified cats, when he’s not active in political campaigns.
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.

- Prof. Hans-Peter Bischof
- Prof. T.J. Borrelli
- Prof. Warren R. Carithers
- Prof. Taejoong Chung
- Prof. Chris Homan
- Prof. Peizhou Hu
- Prof. Alan Kaminsky
- Prof. James Minseok Kwon
- Prof. Monika Polak
- Prof. Stanisław P. Radziszowski
- Prof. Rajendra K. Raj
- Prof. Leon Reznik

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.

- Prof. Edith Hemaspaandra
- Prof. Ivona Bezáková
- Prof. T.J. Borrelli
- Prof. Chris Homan
- Prof. Hadi Hosseini
- Prof. Stanisław P. Radziszowski
New Faculty

Taejoong Chung

Taejoong (Tijay) Chung is an Assistant Professor in the Computer Science Department in the B. Thomas Golisano College of Computing and Information Sciences at the Rochester Institute of Technology. He earned his PhD in Computer Science from Seoul National University and spent 2.5 years at Northeastern University as a researcher before joining RIT. Tijay’s research focuses on Internet security with a focus on PKI and Internet privacy. Particularly, there have been many security incidents related to SSL/PKI, including SSL certificates being compromised. They are also currently misused, for example, through the use of invalid certificates. He expects to find some valuable insights through looking at the weakness of the current PKI. Tijay hopes to be a good researcher who is eager to find and solve interesting problems, which are not limited to a specific domain.

Peizhao Hu

Peizhao Hu is an Assistant Professor in the Department of Computer Science at RIT. He completed his Ph.D. in Computer Science at the University of Queensland, Australia. Before joining RIT, Peizhao was senior research engineer at NICTA (Australia’s centre of research excellence). Peizhao obtained his Bachelor of Computer Science from the University of Wales, Swansea, United Kingdom. His current research interests include applied cryptographic techniques (such as homomorphic encryption, secure multiparty computation, zero-knowledge) for privacy-preserving computations, mobile and pervasive computing, wireless networking. He is developing an open-source framework (called SparkFHE) that bring the capability of homomorphic encryption into Apache Spark to support efficient data analytics while user privacy is protected.

Hadi Hosseini

Hadi Hosseini is an Assistant Professor in the Department of Computer Science at Rochester Institute of Technology. His research interest lies at the interface of artificial intelligence, computer science, and economics. More specifically, most of his research is on algorithmic economics, mechanism design, game theory, matching theory, social choice, and computational fair division. Beside his work in multiagent systems, he studies novel teaching approaches in higher education pedagogy. Hadi was a postdoctoral research fellow at Carnegie Mellon University. Prior to that, he received his Ph.D. in computer science from the University of Waterloo, where he also worked as an instructional developer at the Centre for Teaching Excellence. He was a recipient of the
government of Canada’s NSERC fellowship as well as UW’s Exceptional Teaching award. Hadi serves as a program committee and reviewer in several venues including AAAI, IJCAI, AAMAS, JAIR, TEAC, JAAMAS, and AIJ.

Michael Mior

Michael Mior joined RIT this past August after completing his PhD at the University of Waterloo after working his way southwest across Ontario from Bobcaygeon, a tiny town a couple hours north of Toronto. In-between those two points, Michael had the chance to spend a few years at a (failed) tech startup in Montréal, Québec. When he is not doing research, he enjoys cooking, reading, and playing the drums. Michael’s research focus is on schema design and management for NoSQL databases. Michael’s goal is to improve usability and performance of these systems and ultimately make the data they store more useful by non-expert users.

Alex Ororbia

Alex Ororbia is an Assistant Professor in Computer Science at the Rochester Institute of Technology. He received the Bachelor of Science degree in Computer Science & Engineering at Bucknell University, minoring in Philosophy and Mathematics, in 2013. In 2018, he acquired a Ph.D. in Information Sciences & Technology at The Pennsylvania State University, minoring in Social Data Analytics.

His research interests span from representation learning with artificial neural networks to generative models to nature-inspired optimization and metaheuristics. Alex's work synthesizes key aspects of models of cognition and biological neuro-circuitry, as well as theories of mind and brain functionality. The mission is to construct new learning algorithms and architectures that generalize better to unseen data, of multiple modalities, and continually adapt to novel situations.

Recently, Alex has started The Neural Adaptive Computing (NAC) Laboratory at RIT, where he, his students, and his collaborators focus on the problem of lifelong machine learning, where an intelligent system must learn how to extract, aggregate, and operationalize knowledge across a stream of multiple, varied tasks.

Adam Purtee

Adam joined the CS department in the Fall of 2016 as a lecturer. Originally from Arkansas, he moved to Rochester in 2010, where he later received a PhD in Computer Science from the
University of Rochester with an emphasis on common sense reasoning from natural language. Before working at RIT, Adam spent two summers working at Google Research on massively parallel semi-supervised learning models for speech recognition and semantic parsing. He is interested in numerical computing, machine learning, and symbolic logic – among many other great areas of computer science! When he’s not preparing lectures, he enjoys hiking local parks and trails with his dog, and playing computer simulation and strategy games.

M. Mustafa Rafique

Dr. M. Mustafa Rafique is an Assistant Professor in the Department of Computer Science at Rochester Institute of Technology (RIT). He has more than fifteen years of professional and research experience developing practical solutions for large-scale enterprise applications, and creating innovative solutions for massively parallel, distributed and high-performance computing systems for a variety of application domains. Dr. Rafique’s research interests lie broadly in experimental computer systems, encompassing distributed platforms for cloud and high-performance computing, Internet of Things (IoT), and emerging data analytics frameworks for machine learning, smarter cities, and cognitive systems. Prior to joining RIT, Dr. Rafique was a staff member in the High-Performance Systems Group at IBM Research in Dublin (Ireland). He has also worked at NEC Labs (Princeton) and the Qatar Computing Research Institute (QCRI) on designing innovative solutions for adaptive and efficient resource management in massively parallel computing systems. Dr. Rafique earned his MS and Ph.D. degrees in Computer Science from Virginia Tech in 2010 and 2011, respectively. He is a Senior Member of the IEEE. In his spare time, Dr. Rafique loves to play badminton, tennis, bridge and chess.

Carlos Rivero

Carlos Rivero was born and raised in Seville, Spain. As it is customary in his country, he earned his BS, MS and PhD from the same university: University of Seville. Before earning his MS degree, he worked as a software engineer for several companies and managed several teams of developers. During his PhD, Carlos was a visiting researcher at Roma Tre University, Italy, and Free University of Berlin, Germany. Before starting at RIT in 2015, he was a postdoc researcher at the University of Idaho. Carlos is passionate about databases and their applications, and his research interests focus on graph databases and algorithms, and their applications. Carlos really enjoys eating (not cooking) and weird movies like Memento or The Thing.
Interview with Alan Kaminsky

Professor Alan Kaminsky retires this year after a wide-ranging career spanning Bell Laboratories, The Harris Corporation, and two stints at RIT. Associate Professor Christopher Homan talks with Professor Kaminsky on the frustrations of computing, professional triumphs, and just how personally you should take it if he doesn’t get into your car. [This interview was edited for clarity and continuity.]

Chris: Why did you decide to become a computer scientist?

Alan: Well actually, originally, I was going to be an electrical engineer. Back in 1973 when I went to Lehigh University, that was before computer science programs really existed. And I was doing electronic sorts of things as a hobby, so I figured I’d study that, electrical engineering, in college.

When I got to college, some of the professors were starting to offer courses related to computer programming and computer science. There was one course on operating systems, another course on Pascal programming, which was brand new back then. So, I took those courses.

And then when it came time to graduate I got a job at Bell Laboratories writing software for their Electronic Switching System (ESS), which was one of the very first large-scale embedded computers. This was back in the sixties when ESS was developed, and here I am in 1977 working on this 1960s computer writing software. And I just continued that. I went from Bell Laboratories to Harris Corporation here in Rochester and was writing software for their radios. I worked at Xerox for a little while, again doing software around printers, and along the way I taught some courses here at RIT as an adjunct and I came on the faculty. So, I come out of these EE roots and got into computer science based on my industrial experience.

C: What frustrates you the most about the field?

A: There are two big things that frustrate me. Number one is that, it seems to me, most of the work in computer science now is just putting minor tweaks on something that’s already been invented. There doesn’t seem to be—or I should say it’s very rare for—something really new coming along and upending things. For example, take hardware. We’re still using the Von Neumann architecture that was invented back in the 1940s. All of our computers nowadays are using that architecture and every paper you read about hardware architectures is just some little variation. But now we’re
starting to see a new idea come out: neuromorphic computing, which is completely non Von Neumann. It’s organized much more like the brain is organized. So, there’s a brand-new idea, and we computer scientists should jump on it. Another example: There hasn’t really been a whole lot new in cryptography. There was one brand new idea about six years ago, a new way of doing encryption called the sponge construction, and now there are thousands of papers on variations of that. All these things are kind of frustrating. It seems like most people are just taking the safe way out—here’s something that’s been done and I can add a tiny little bit of knowledge to that. I wish there were more bold thinkers, more brand-new ideas in the field. So that’s the first frustration.

The second one is I think there needs to be a lot more consciousness and emphasis on improving the lot of humanity with computing. You should ask, “Is the thing I’m researching going to improve the life of the homeless guy in the street?” Or is it going to help—like some of your work, Chris—help underserved marginalized populations, with medical issues or whatever? Is what I’m doing going have some kind of impact beyond the walls of academia? Or is it just going to be, “I write papers on some incremental thing that’s already been done”? I really get frustrated when I see hundreds of abstracts every day and not a one of them has anything to say about impact outside of academia.

C: What accomplishments are you most proud of?

A: Harris Corporation has funded myself and my colleagues Staszek Radziszowski and Peter Bajorski, who is in mathematics, and Marcin Lukowiak, who is in computer engineering. I added it up recently. We received over $250,000 from them over seven years or so. Each individual grant has only been $20,000, $30,000, or something like that, but that’s good to support one or two students for a year to work on some interesting project of interest to Harris.

One of the projects, which lasted three or four years, was to develop a new encryption algorithm that Harris is going to be putting into their military radios. Myself and my three other colleagues took some things that hadn’t really been done before. One of Staszek’s students did a master’s thesis about a 16-bit substitution box, which is twice as big as S-boxes that are typically found in other algorithms. But large S-boxes have advantages, especially when you implement them in hardware. We took that idea and we took the sponge construction that I mentioned—a new idea at that time—and a few ideas from the Advanced Encryption Standard (AES), put it all together, and came up with this new algorithm for authenticated encryption. So that was good for Harris, they’ve got something new to offer their customers. That was good for us because we got some research
funding. We also got four or five conference papers published on this work, and there are two patents out there for this work.

Another accomplishment: Nan Schaller, who is now a retired professor, back in the early part of the 2000s, was the one who taught parallel computing courses. But then she retired and this was something that interested me. It was not something I’d done a lot of work with, but I agreed to pick up those courses and teach parallel computing. What I found very quickly is that the software libraries out there for parallel computing—at least at that time—were very difficult to teach with. Besides just being difficult in general, those libraries did not support Java, which was the language that we were teaching our students. So I said I could take the ideas from those existing libraries and write my own library in Java, for making it easier to teach parallel computing, and I did that. I called it Parallel Java. A few years later I did a major revision, Parallel Java 2. I just recently put out a second edition of my textbook *Big CPU, Big Data*. I’ve used that book the past two or three years I’ve been teaching the graduate parallel computing course. I’ve been using the first edition of the book and now the second edition, so I’m very proud of that. This is something—I mean it’s not going to change the world, but there are a number of other professors who started using this library to teach parallel computing, and there are a number of researchers who are using it to write parallel programs to support their research. So, in a small way it’s had some impact outside RIT, and I’m proud of that as well.

C: What are you interested in today?

A: Well, my two big areas of interest are parallel computing and cryptography. I’ve just started a new project to develop what I call an “encryption appliance.” If you remember, back in World War II, the Enigma machine? The Germans and their allies used it to encrypt things. We got away from that idea of having that separate box that did the encryption, and now the encryption is all done in software on your computer. Unfortunately, the thing about that is malware can intercept any keystrokes you type, or you can run side channel analysis attacks on these algorithms, so you’ve got a perfectly good encryption algorithm running alongside a piece of malware that’s just seeing everything that happens.

So my idea is if you really want to be secure nowadays, you need a separate box. It’s not part of the computer. It’s not on the network. Put your encryption in that, like the old Enigma machine. Type in some message, the box encrypts it, and then you can put the ciphertext in an email or something out on the network.
I’ve got myself a Raspberry Pi over here (just the other day actually) and I want to program it to be this encryption appliance, where you encrypt on that thing and then just take the encrypted message over to some other computer to send it somewhere.

C: What are your plans for the future?

A: I don’t have any definite plans at the moment. I want to spend my time volunteering. What exact form that takes I’m not sure yet. In the past I’ve done a little bit of volunteering for Habitat for Humanity building houses. I might spend more time doing that. Another thing that I’ve become aware of recently is a new field they’re calling “public interest technology.” This is like public interest law, where lawyers use their legal expertise, not to defend lawsuits or corporations or whatever, but use their expertise to improve the public good, to help underprivileged groups, to work for social justice. Public interest law’s been going on for a long time—since the 1960s really—and now people are starting to use the same idea, but for technology. Technological experts, computer scientists, engineers, and so on: how can they use their expertise to improve the public good and work for social justice? Whether that be serving as a resource for congressmen and women, congressional staff, or any legislator; whether that be working for some advocacy organization that is working for social justice but is not necessarily savvy technologically.

C: The revolving door between industry and academia in our field is, I think, stronger [than in other fields] and you really exemplify that. You started in Bell Labs in industry, you went to Harris and then you came here, and then you left here, and you went . . . did you go back to Harris?

A: I went back to Harris.

C: So, you’ve had an opportunity to let your industry experience influence academics and then the other way around too. Have you noticed or do you feel that there has been some kind of synergy through that?

A: Yes. The industry experience gives me a little different perspective when I’m working with the students, and I can tell them what it’s like out there. I can tell them, look, if your software doesn’t work it’s a big deal! It’s not like you’re going to get one point off your project and still get a good grade on your course. Out there in the industry, you’ve got to make sure that everything is just
That's a lesson I think that students need to learn: “good enough” is not good enough out there, especially so when you think about the Internet of Things.

Okay, the litmus test I ask myself is if my students wrote the software for this self-driving automobile, would I get into that car . . .

I chose computer science because I wanted to study an interesting, challenging field and be able to support myself and my family. CS will also allow me to do work that will impact others’ lives for the better. I know there will always be something new to learn, and I'll always have a new challenge to tackle.

The combination of classroom and experiential learning was a major reason I chose to attend RIT. I completed one co-op and am currently on my second one this spring. Summer 2018 I worked at Microsoft in Seattle, Washington as part of their Explorer internship, and will be returning there summer 2019 as a software engineering intern. Currently, I am working at EagleDream Technologies as a cloud engineering co-op and really enjoying learning about cloud architecture.

I've found my courses at RIT gave me a good foundation for co-op, and I've had some great professors. Many topics covered in classes were valuable to know on co-op and things I learned on co-op were helpful for my classes. RIT has a lot of resources for academic support, especially for introductory CS courses. My favorite courses I've taken include Analysis of Algorithms and Discrete Math.

My first semester, I attended Supplemental Instruction sessions for CS1, and as a result my understanding of fundamental concepts was much stronger. My second semester, I became a Supplemental Instruction Leader for Academic Support Center and have supported both CS1 and CS2. I enjoy helping other students improve and solidify their understanding of core concepts. SI also gives me the opportunity to work with professors I've taken classes with previously, and professors I haven't taken classes with.

I am a member of the in Women in Computing Club and am part of WiC Outreach Committee. Last semester, we hosted three on-campus events introducing students from primary school to high school to tech and programming. This semester, WiC is piloting an initiative to at a few local high schools, providing equipment and student volunteer teachers. We go out to the high schools and run workshops introducing different aspects of tech to the students.

I am proud of returning to college as an adult student and starting a new career path. Previously I worked in retail and insurance, and a few years ago decided I needed to make a change. I started at RIT in January 2017 and will graduate in December 2020. Being an adult student poses some different challenges than the typical student might face, but I think coming back to school later also gives me certain advantages and I bring a different perspective than many of my fellow students.

The first programming course I took was an introductory Java class at Finger Lakes Community College with Professor Jonathan Weissman. This was years before I came to RIT, and this course was one of the reasons I chose computer science. Professor Weissman is one of the most engaging, passionate teachers I've had, and his enthusiasm is inspiring. He also teaches in the Computing Security Department at RIT, and I took Fundamentals of Computing Security with him here as well.

I don't have a specific dream job in mind, but I want to have challenging work and a job where I am always learning new things and growing personally and professionally.
RESEARCH AND SCHOLARSHIP

Publications

Below is a list of publications by faculty and students from the Department of Computer Science that appeared in 2018. 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.

Publications are grouped by type, and then listed alphabetically by first author within each group. In 2018 the Department published 4 Master’s theses and 72 papers, posters, and presentations.

Master’s Theses


Journal Papers


Conference Papers


Hemaspaandra, Edith, Lane A. Hemaspaandra, Holger Spakowski, and Osamu Watanabe. 2018. “The Robustness of LWPP and WPP, with an Application to Graph Reconstruction.” In


Medina, Rebecca, Daniel Carpenter, Joe Geigel, Reynold Bailey, Linwei Wang, and Cecilia Ovedsotter Alm. 2018. “Sensing Behaviors of Students in Online vs. Face-to-Face Lecturing Contexts.” In 2018 IEEE International Conference on Pervasive Computing and Communications Workshops (Percom Workshops), 77-82.


Vora, Ayush, Leon Reznik, and Igor Khokhlov. 2018. “Mobile Road Pothole Classification and Reporting with Data Quality Estimates.” In Mobile and Secure Services (MobiSecServ), 1-6, IEEE.


Technical Reports


Posters and Presentations


Funding

Research and academic grants that were active or newly awarded in 2018 to Computer Science faculty are listed below. The total amount of funds exceeds $8.5 million, with the majority coming from external grants (e.g., from the National Science Foundation and the Alfred P. Sloan Foundation).

<table>
<thead>
<tr>
<th>Investigators</th>
<th>Sponsor</th>
<th>Project Title</th>
<th>Duration</th>
<th>Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bezáková, Ivona</td>
<td>GCCIS</td>
<td>Sampling and Counting Independent Sets in Low Average Degree Graphs</td>
<td>1/2018 - 6/2019</td>
<td>$10,000</td>
</tr>
<tr>
<td>Coüasnon, Bertrand, Yann Ricquebourg, and Richard Zanibbi</td>
<td>FMHE</td>
<td>Interactive Combination of Deep Learning and Syntactical Methods for Contextual Segmentation and Structure Learning in Document Recognition</td>
<td>9/2016 - 8/2019</td>
<td>€90,000</td>
</tr>
<tr>
<td>Geigel, Joe</td>
<td>VUZIX Corporation</td>
<td>Donation of Blade Augmented Reality Glasses. Corporate Gift (in-Kind)</td>
<td>10/2018</td>
<td>$4,647</td>
</tr>
<tr>
<td>Name</td>
<td>Institution</td>
<td>Project Description</td>
<td>Start Date</td>
<td>End Date</td>
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<td>-----------------------</td>
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<td>--------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Geigel, Joe</td>
<td>Viacom / Nickelodeon</td>
<td>Muscular-Driven Facial Tracking. Corporate Gift</td>
<td>5/2018</td>
<td></td>
</tr>
<tr>
<td>Hartpence, Bruce, and</td>
<td>RIT</td>
<td>Applying Active Learning to New Courses on Software Based Networking</td>
<td>1/2018 - 8/2019</td>
<td></td>
</tr>
<tr>
<td>Minseok Kwon</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hemaspaandra, Edith</td>
<td>GCCIS</td>
<td>Constraint Satisfaction Problems in Noninterference</td>
<td>1/2018 - 12/2019</td>
<td></td>
</tr>
<tr>
<td>Hemaspaandra, Edith</td>
<td>ETH-Zürich</td>
<td>Visit Funding</td>
<td>6/2018 - 8/2018</td>
<td></td>
</tr>
<tr>
<td>Hosseini, Hadi</td>
<td>RIT</td>
<td>An Interactive Online Platform for Artificial Intelligence Education</td>
<td>5/2018 - 8/2019</td>
<td></td>
</tr>
<tr>
<td>Hosseini, Hadi</td>
<td>RIT</td>
<td>Modeling Malicious Agents in Cyber Systems</td>
<td>1/2019 - 1/2020</td>
<td></td>
</tr>
<tr>
<td>Joshua Faber, Hans-Peter Bischof, Richard O’Shaughnessy</td>
<td>NSF</td>
<td>NSF REU Grant for a Site on Multi Messenger Astrophysics</td>
<td>9/2016 - 8/2019</td>
<td></td>
</tr>
<tr>
<td>Kwon, Minseok, and</td>
<td>Cisco</td>
<td>End-to-End Traffic Control with Virtual Switches for Containerized Applications</td>
<td>1/2019 - 12/2019</td>
<td></td>
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<tr>
<td>Warren Carithers</td>
<td></td>
<td></td>
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<tr>
<td>Kwon, Minseok, Hossein Hojjat, and Matthew Wright</td>
<td>RIT</td>
<td>Real-Time Validation of BGP Route Updates in Programmable Control Planes</td>
<td>1/2018 - 8/2019</td>
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**FMHE** - The French Ministry of Higher Education; **NSF** - National Science Foundation; **NSA** - National Security Agency; **NIH/UR** - National Institute of Health/University of Rochester Medical Centers; **GCCIS** - RIT Golisano College of Computing and Information Sciences
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