

A MAGAZINE FOR COMPUTER SCIENCE ALUMNI AND FRIENDS

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THE SCIENCE  
**BEHIND THE MAGIC**  
16

2019

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MYRA COHEN  
**BRINGS HER PASSION  
FOR RESEARCH AND TEACHING  
TO IOWA STATE**  
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IOWA STATE UNIVERSITY  
Department of Computer Science

2019

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## CONTACT

### Department of Computer Science

226 Atanasoff Hall

2434 Osborn Dr.

Ames, Iowa 50011-1090

csdept@iastate.edu

cs.iastate.edu

## ATANASOFF TODAY

### WRITERS

Robyn Goldy

Amy Juhnke

Angie Hagerty

Stacey Maifeld

### EDITOR

Amy Juhnke

### ART DIRECTOR

Keo Pierron

### PHOTOGRAPHY

Christopher Gannon

Blake Lanser

Keo Pierron

---

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### JUST A FEW MONTHS AGO I COMPLETED

my five-year term as chair of the Department of Computer Science. When I left the University of California at Riverside to accept this role, I was excited to take on the challenges of leading such a dynamic department. Now I am pleased to recount the department's many accomplishments since then.

The biggest impact on our department has been the steep and steady increase in both undergraduate and graduate enrollment – which brings both excitement and new challenges. Each of the last five academic years, the number of undergraduate, master's and Ph.D. students has increased by approximately 16 percent, resulting in a compounded overall growth of about 100 percent. Doubling the number of students in a short span of five years is almost unheard of in any other discipline.

This growth has been exhilarating for our faculty, as it has given us the opportunity to reach a larger percentage of the Iowa State undergraduate student population, in which an interest in all things computing keeps growing. Our faculty can recruit more undergraduates,

as well as graduate students to work on increasingly diverse research projects, such as theory of algorithms, software development, bioinformatics, data-intensive applications, security and privacy, system safety and verification, robotics, machine learning and artificial intelligence.

This incredible growth has also been challenging with the limited resources facing higher education. Despite the explosive influx of students, we are adapting to minor increases in faculty and space, which translates into larger classes and crowded research labs. We hope to engage more partners and collaborators as we search for new resources.

Fortunately, we have a great resource in our exceptional faculty. Unlike most disciplines, the U.S. computing industry absorbs a huge percentage of graduates with doctorate degrees in computer science, thus creating an extremely tight academic job market, especially in the most recent years. Nevertheless, we have been extremely fortunate to fill all of our advertised positions with very strong hires in the last two years. In fact, recently, we have fortified our research and teaching portfolio with a diverse group of faculty members.

New faculty include: Forrest Sheng Bao (natural language processing, artificial intelligence, medical signal and image processing, embedded systems); Kevin Liu (networking, optimization, machine learning); and the appointment of Jim Lathrop (molecular programming, information theory, human-computer interaction, computer gaming) to a tenure-track position. More recently, we added Ali Jannesari (parallelism and software engineering, program analysis, deep learning); Borzoo Bonakdarpour (dependable distributed systems, information-flow security, verification); and Myra Cohen (software testing, configurable software, software product lines, search-based software engineering), as professor and the Lanh and Oanh Nguyen Endowed Chair of Software Engineering. Each of them has attracted a substantial number

of students to work in their labs, and their contributions have resulted in a healthy surge of grant productivity.

We are still heavily involved with the ACM International Collegiate Programming Contest (ICPC), thanks to the commitment of our senior lecturer Simanta Mitra. Not only has Simanta led our Iowa State team to the World Finals many times in the past, but he also brought the regional qualifying rounds to campus here at Iowa State, hosting for the last two years. Hundreds of K-12 students also continue to attend computational thinking workshops and the annual Spring Computational Thinking Competition right here on campus.

Another exciting development is the change to our undergraduate curriculum. New tracks within the degree programs allow students to take a smaller common core of computer science courses, and then choose a set of more specialized courses in a computer science subdiscipline. Mirroring the fast-paced diversification of applied computer science in industry, implementing this substantial change offers students a wider range of specialization opportunities. This change makes the degree program more attractive for students with specific interests and will also give graduates an edge in the job marketplace.

Finally, I would like to conclude that this is a very important year for our department, as Fall 2019 marks our 50th anniversary. You can read about our planned activities in this issue, and check online for updates. We would love to see you at an event!

As always, I thank you for your support,

**Gianfranco Ciardo**, professor and chair  
Department of Computer Science  
Iowa State University



## K-12 OUTREACH

**GIVEN THE WIDESPREAD** proliferation of technology in our daily lives, it is critical that youth are exposed to opportunities that develop their problem-solving and computer skills. To foster student success, the Department of Computer Science works with the Iowa Department of Education to align our K-12 outreach workshops and activities with current school curriculum standards.

The department partners with Iowa 4-H to extend opportunities for K-12 students, but school officials are also encouraged to host a workshop or take advantage of guided exploration sessions on the Iowa State campus.

Thanks to passionate students and corporate partners like Collins Aerospace and John Deere, hundreds of K-12 students have engaged with technology in meaningful, educational and fun ways. The year's activities culminated with the department's Computational Thinking Fair in April.

*The Department of Computer Science hosted the 9th annual Computational Thinking Competition for K-12 students.*



contributed PHOTOGRAPH

## STUDENT NEWS

**IOWA STATE UNIVERSITY'S** Department of Computer Science was selected as a host site for the Regional Association for Computing Machinery-International Collegiate Programming (ACM-ICP) Competition. Next fall, with the generous support of Kingland Systems and John Deere, teams from ISU, including an all-female team, will compete for a chance at the ACM-ICP world finals. Students can take a problem-solving course during the academic year to earn credits as they hone their critical thinking skills. Teams from Iowa State have qualified for the world finals eight of the past eleven years.

**NEW PROJECT AND RESEARCH-BASED** coursework align with industry expectations through both a senior capstone and undergraduate project-based courses. The undergraduate project-based course includes five demonstrations per month, client-side mobile application development, web sockets and utilizes SCRUM and continuous deployment. The new curriculum improves the quality of students' work and increases their familiarity with code used by future employers.

**JOHN DEERE HELPED STUDENTS** create the Computer Science Female Peer Mentorship program, which pairs females in the field for support and advocacy. The student group partners with LAS Career Services and WiSE (Women in Science and Engineering) on workshops and special events throughout the academic year.

## INDUSTRY AND ALUMNI PARTNERS

**AS TECHNOLOGY** becomes an integral part of nearly all industries, the demand for computer science expertise and knowledge continues to skyrocket. In addition to recruiting our graduates to companies like Google, Microsoft and Amazon, industry expansions within Iowa State University's Research Park are providing several new and exciting opportunities at the local level. The John Deere Technology Innovation Center's first hire was a Ph.D. student from the department and the company developed a course catalog of topics, which reflects specific industry knowledge, available via classroom presentations. Collins Aerospace also opened a new office in the ISU Research Park, which will expand partnership opportunities.

**KINGLAND SYSTEMS**, a long-time friend of the department, continues to support and collaborate with faculty (read about Kingland's formal faculty support on page 5). They also provide critical student support, hiring many graduates and interns, while supporting the department's Association for Computing Machinery (ACM) - International Collegiate Programming Competition teams and the Computer Science Graduate Student Organization's annual poster presentation.

## COMPUTER SCIENCE ALUMNI AWARDS

Congratulations to computer science alumni honored recently by the Iowa State University Alumni Association (ISUAA), the College of Liberal Arts and Sciences (LAS), and the Department of Computer Science.

**Sean R. Stanek** Young Alumnus Award  
**Charlie Hunt** Distinguished Alumnus Award  
**George Strawn** Distinguished Service Award  
**Srinivas Aluru** John Atanasoff Discovery Award  
**William Bock** Distinguished Alumnus Award



L to R: Gianfranco Ciardo, chair of the Department of Computer Science, Sean R. Stanek (computer science '02), Beate Schmittmann, dean of the College of Liberal Arts and Sciences.



L to R: Charlie Hunt (computer science '92), Beate Schmittmann, dean of the College of Liberal Arts and Sciences.

# DONOR SUPPORT STRENGTHENS RESEARCH AND EDUCATION

## *New support from Kingland*

Alumni and friends play an important role in supporting world-class research and learning in the Department of Computer Science. Throughout the years, fellowships, scholarships and other support helped extend access to excellence in learning and scientific pursuit. In recent years, that support has grown.

In 2017, two faculty members were awarded named faculty positions, thanks to a generous donation from Kingland and its owners, David and Deb Kingland.

Hradesh Rajan, professor in the Department of Computer Science, was named Kingland Professor of Data Analytics. Stephen Vardeman, University Professor in the Department of Statistics and the Department of Industrial and Manufacturing Systems Engineering, was named Kingland Data Analytics Faculty Fellow.

Rajan is the director of the Laboratory for Software Design in the Department of Computer Science and the Professor-in-Charge of the Data Science program at Iowa State. Through invention and refinement of shared cyberinfrastructures for data-driven sciences, Rajan's research on the Boa project, a software language and infrastructure that makes data mining easier, is decreasing the barriers to entry in data-driven science. He founded the Midwest Big Data Summer School to deliver broadly accessible data science curricula and serves as a steering committee member for the Midwest Big Data Hub (MBDH).

The funds support his research in investigating shared infrastructures for data-driven science, giving researchers easy access to big data analysis that would otherwise require specialized computation expertise, datasets and infrastructure to which they may not have access.

The awards are part of a \$1.5 million donation to the College of Liberal Arts and Sciences, the College of Business and the College of Engineering by Kingland, a global leader in data quality control, development and risk management, and a personal donation from David and Deb Kingland to support several areas in data science. The donation also established the Kingland

*Hradesh Rajan, professor in the Department of Computer Science, was named Kingland Professor of Data Analytics.*



photograph by CHRIS GANNON

Data Analytics Scholarship Fund, which will help attract top students and increase the affordability and accessibility for students who hope to pursue a data-related degree.

## COHEN SELECTED FOR DISTINGUISHED AWARD

In 2018, Myra Cohen was selected as the newest recipient of the Lanh and Oanh Nguyen Chair in Software Engineering. Cohen's research is focused on the testing of highly-configurable, or customizable software. Her research enables end users to experience software with fewer glitches and bugs by vastly improving software-testing processes. Cohen's expertise has enabled customizable software products and product lines, or those with graphical interfaces, to be tested with increased speed and efficiency.

The award was established by Dr. Long Nguyen (Ph.D. computer science '75) and

Kimmy Nguyen, to provide support and to ensure the future success of the computer science program. The award was created in 2008 to recruit world-class faculty members who significantly enhance the Department of Computer Science and Iowa State University.

Cohen joined the department in 2018 and is highly regarded for her research in both software engineering and computer science. She is nationally recognized for her research and expertise in the field of software testing. She is an Association for Computing Machinery Distinguished Member; and she also received two distinguished paper awards from the same

organization. In addition, she was honored with a National Science Foundation CAREER Award. Cohen received a coveted Air Force Office of Scientific Research Young Investigator Award, an exceptional honor given to researchers who demonstrate outstanding ability and promise in conducting basic research.

*Read more about Cohen's research on page 10.*

# A FULL PLATE FOR THIS COMPUTER SCIENCE STUDENT

*Benjamin Escobar fills his ISU adventure with academics, involvement and research*

by **ANGIE HAGERTY**

photographs by **KEO PIERRON**

**[T]** **HREADED THROUGH EVERY STAGE** of Benjamin Escobar's ('20 computer science) life is an insatiable appetite for computers, science and technology.

Whether he was exploring computers in elementary school, marveling at the double-helix structure of DNA molecules in high school biology class or analyzing handwriting forensics in college—Escobar has always been driven to satisfy his hunger for scientific and technical knowledge.

"Some students are motivated by grades and a desire to perform. Others are motivated by the longer-term reward of a good career," said Jeremy Sheaffer, lecturer in the Department of Computer Science. "Ben is one of those rare students who is motivated by a desire to learn."

"I think I was born this way," said Escobar. "I've been tinkering with computers since I was seven years old and programming since I was twelve years old."

Escobar recounts a childhood surrounded by LEGOs and educational toys, as well as nurturing caregivers who fueled his curiosity and sparked an early interest in computers and technology.

He was only in third grade—still memorizing multiplication tables, learning playground etiquette and drinking juice boxes—when his stepfather approached him with an unusual challenge.

"He handed me a nonworking computer and said, 'If you can fix it, you can have it,'" said Escobar. "He knew what he was doing. He understood that I wanted to use that computer and he was challenging me to look at the components, figure out the problem and devise a way to fix the hardware. This moment ignited a lifetime passion for computers, programming and technology."

Escobar remembers examining the mess of wires and connections and almost innately understanding and making sense of the technology. Ultimately, he fixed the computer's display and claimed the computer as his own.

"Since that moment, I was hooked on solving technical problems and computers," he said. "It's accurate to say that computers have been eternal in my life. It feels as if they've always been there."

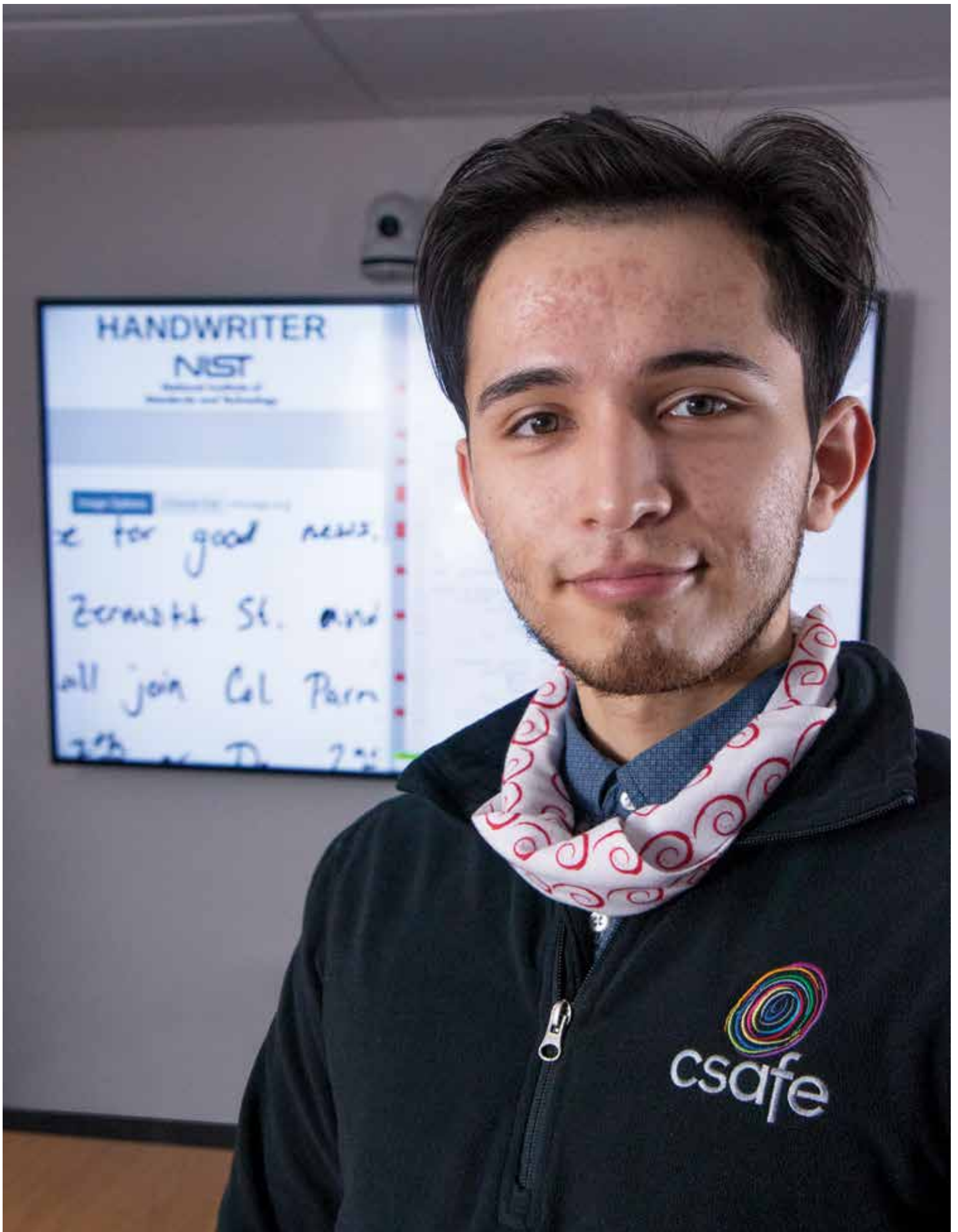
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**"Some students are motivated by grades and a desire to perform. Others are motivated by the long-term reward of a good career. Ben is one of those rare students who is motivated by a desire to learn."**

—Jeremy Sheaffer  
lecturer in the Department of Computer Science

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*The code and algorithms that Escobar develops for CSAFE are part of a growing body of research that will help forensic scientists and detectives solve crimes.*






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**“...opportunities practically fly  
at you on this campus.”**

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## **EXCEEDING RECOMMENDED DAILY REQUIREMENTS**

Awake before sunrise and cramming for a genetics quiz, Escobar downs a cup of hot green tea, leaves his apartment and dashes to his statistics lecture. After taking diligent notes in computer science class, he heads over to his office in CSAFE (Center for Statistics and Applications in Forensic Evidence), where he uses computational analysis to research handwriting forensics. After work, Escobar leaves for Linux Club—a 50-member student organization that he founded with friend and fellow student Jacob Moody ('20 computer engineering).

“There are so many opportunities for computer science students at Iowa State, both inside and outside of the classroom,” said Escobar. “I’ve always loaded up my plate with experiences, jobs and academic challenges because these opportunities practically fly at you on this campus.”

## **STARTING FROM SCRATCH**

In 2017, when Escobar wanted to join Iowa State’s Linux club, there was a slight problem—Iowa State didn’t have a Linux club.

“Linux makes an appearance everywhere,” said Escobar. “It’s important to understand this operating system and to know how to use it. The best way to do that is by sharing ideas with and learning from other Linux fans. That’s why I was so driven to start this organization.”

Escobar started the official Iowa State student organization for those who want to share information, promote Linux and learn more about the operating system. He jumped through the hoops; crafting a plan, filling out paperwork, making a presentation to university officials and even doing some legal research.

Today, the ISU GNU/Linux Club meets every week, has upwards of 50 members and has been going strong since 2018, when it was formally recognized by the Student Activities Center as a university-sanctioned student club. Escobar is listed as its president and founder.

Most recently, the club was awarded the 2018-19 Newcomer of the Year Award, by the Student Engagement Committee from Engineers’ Week. Escobar accepted the honor at the Engineers’ Week Banquet on February 22.

“The goal of starting this club was to unify the Iowa State Linux community, and I think we succeeded,” said Escobar. “We’ve also sparked interest in Linux to those who are in non-computing fields as well. We’ve formed a community, we have fun and we’re learning from each other.”

## **THE ART AND SCIENCE OF HANDWRITING ANALYSIS**

Nestled in the Durham Center, The Center for Statistics and Applications in Forensic Evidence (CSAFE) operates one of its four national research

centers on the Iowa State campus. Conducting research and analysis for forensic scientists, investigators and legal experts, employees at CSAFE’s Iowa State site create statistical analyses and interpretations that are focused on the forensic sciences.

It is here at CSAFE where Escobar builds intricate algorithms and code that help forensic investigators analyze handwriting and ultimately, solve crimes. He also develops interfaces that enable investigators to use software that is user-friendly, easily navigable and intuitive.

“I work on a team that helps detectives, crime experts, document examiners and forensic scientists add data and science to the art of handwriting analysis,” said Escobar.

Escobar is thrilled to work on research that creates real-world impact for forensics investigators and detectives who attempt to solve crimes and unravel mysteries.


“There is a signature uniqueness to a person’s handwriting,” said Escobar. “The space between the letters, how long the pen remains on the paper while letters are written, the shape of the letters and the space between letters—all of these ratios and metrics, and more, are calculated within our program.”

## **BLENDING FLAVORS**

A unique fusion of bioinformatics, computer science and statistics expertise provides a powerful blend of talent and knowledge that is used to develop forensic tools in the CSAFE lab.


“Working at CSAFE, with so many experts in a variety of fields, is the ultimate in mind sharing,” said Escobar. “A computer science researcher thinks differently than a statistics expert, and we bring different strengths and viewpoints to our job. It’s amazing.”

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"Ben approaches challenges in a very sophisticated way and he exhibits a contagious enthusiasm for his work and for the expertise of those who work with him," said Amy Crawford ('20 Ph.D. statistics), one of the four members of Escobar's research team. "We would not be as advanced in our research without his coding talents and communication skills."

Escobar believes that strong communication skills lie at the heart of most interdisciplinary efforts. "When you bring your expertise to the table with other experts, it's essential to be a good listener as well as a good communicator, as you advocate from your vantage point and learn from others."

Crawford commends Escobar for this creativity and enthusiasm. "Ben came to us with an idea to create a web page that would make our work more accessible and understandable to the public," she said. "He created this beautiful web application that is a great publicity tool for CSAFE."



*"Escobar explains how activities, work and memorable experiences add personal and professional value to an ISU degree."*

For his exemplary efforts as a productive, innovative and dedicated student researcher, Escobar was nominated by CSAFE staff for ISU Student Employee of the Year.

"Ben goes above and beyond what is required of him," said Crawford. "He provides great solutions very quickly and he shows incredible initiative."

### FILL YOUR PLATE

Escobar notes that interdisciplinary research is critical in professional settings like CSAFE, and important in the classroom as well.

"I'm a computer science major who is also studying bioinformatics," he said. "From both a business and academic standpoint, it's important to learn about other fields and to engage with others who are outside of your field of study. The process deepens your knowledge base and expands your thinking."

Escobar credits his interdisciplinary endeavors at Iowa State, in both research and academics, with strengthening his interpersonal-leadership skills and enhancing his overall college experience.

"I've been able to have so many incredible experiences at Iowa State," said Escobar. "It's so important to get involved. Load up your plate, and fill it up with an array of diverse opportunities. Make sure that your college experience is like a well-balanced diet, with many different items."

Escobar's future plans entail combining his computer science programming skills and interest in bioinformatics, to develop specialized computer programs that solve biological- and forensics-based problems.

With his full plate of experiences, academic explorations and research opportunities, Escobar illustrates that an Iowa State education can help build meaningful personal connections, robust careers and a feast of great college memories. @

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# MYRA COHEN BRINGS SOFTWARE TESTING RESEARCH AND EXPERTISE TO IOWA STATE

by **ANGIE HAGERTY**  
photographs by **KEO PIERRON**

**[A]FTER FIRING UP YOUR LAPTOP AND LAUNCHING** your web browser, you click your way through several tasks—ordering concert tickets, researching the value of your car and tracking down the perfect chili recipe.

Although you thoroughly understand technology, you're not currently thinking about the underlying code, algorithms or thousands of CPU cycles that are dedicated to automatically testing your browser as you peruse the internet.

You didn't have to focus on those underlying functions because researchers like Myra Cohen—the Lanh and Oanh Nguyen Endowed Chair of Software Engineering and a professor in the Department of Computer Science—have dedicated their careers to software testing research that keeps your web browser running seamlessly and smoothly.

Cohen has spent twenty years working as a dedicated educator, respected academic mentor and award-winning researcher.

Her software testing research enables highly configurable software—such as web browsers, phones and search engines—to work with optimal speed and efficiency.

"In Firefox alone, there are 2,000 customizable settings that an end user can perform and each of those operations must be tested," said Cohen. "From a software testing perspective, there are more testing possibilities than atoms in the universe."

Effective software testing allows end users to experience programs with minimal defects, ensuring the quick purchase of symphony tickets and the effortless exchange of text messages.


However, Cohen explains how highly customized software targeted toward end users presents a unique set of challenges for software testing researchers such as herself.

"There are an infinite number of problems that can arise within software that provides end users with so many choices and functions," she said. "Our job as testers is to minimize what has to be tested. We develop code that simplifies the testing processes, allows devices to remain functional if there is a bug and heals those glitches in real-time."



**"In Firefox alone, there are 2,000 customizable settings that an end user can perform and each of those operations must be tested.**

**From a software testing perspective, there are more testing possibilities than atoms in the universe."**



*Cohen leads a team of six undergraduate and graduate students who conduct cutting-edge research in the area of software testing.*

## "I FELL INTO COMPUTER SCIENCE"

Most researchers are curious by nature. They love the rigor of the scientific process—as they ask tough questions, test hypotheses and discover inventive solutions to complex problems. A complicated labyrinth of challenges will often energize researchers.

Cohen is no exception.

"I love having a brick wall in front of me and figuring out how to go around it or take it apart to get through it," she said. "Growing up, I was always very curious and I loved problem solving and working on puzzles."

Cohen earned a Bachelor of Science in the natural sciences from Cornell University in New York. After securing a job as a data analyst for a hospital, she discovered her love for software.

Charged with managing complex hospital processes while improving efficiencies and patient care, Cohen used software to streamline and automate several aspects of the job. Immediately intrigued by the software, and wanting to learn more, she began working on her master's degree in computer science at the University of Vermont.

This inaugural introduction to using complex software for business was the springboard from which Cohen would launch an extraordinary career as an academic, a professor and a researcher in the computer-science field.

"I fell into computer science," said Cohen. "I didn't start out studying it, instead I was drawn into it."

Cohen would go on to earn her Ph.D. in computer science from the University of Auckland in New Zealand, but not before discovering her love for teaching, mentoring and explaining technical information.

## "I REALIZED THAT I LOVED TO TEACH"

Two concurrent opportunities exposed Cohen to teaching and changed the trajectory of her career, steering her into academia.

"While I was working at the hospital, I was charged with giving presentations and I really liked teaching others and helping people understand technical information," said Cohen. "At the same time, while earning my master's degree, I became a teaching assistant for a software engineering class."

She excelled at teaching and several months later, she was hired as a lecturer for undergraduate computer science classes.

Cohen's love for teaching was the catalyst that sparked her to move overseas, continue her education and earn a Ph.D. at the University of Auckland in New Zealand. "I just knew I wanted to be an academic and I knew that I wanted to guide, support and advise undergraduate and graduate students."

Described as the "most meaningful and rewarding" aspects of her career, Cohen highlights that there is nothing more important than being able to ignite student interest in research and computer science in general.



*Cohen, who arrived on the ISU campus in August of 2018, loves teaching students and inspiring them to pursue scientific research.*

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**“We are working on the edge of multiple domains. In our research we look to nature and we ask how we can mimic the natural world in our software programming and code development.”**



She currently teaches advanced software engineering topics to undergraduate and graduate students in computer science. She also leads and mentors a team of six research students.

“It’s amazing watching the lights go on for students as they analyze data, learn new information and solve problems,” said Cohen. “I love the one-on-one interaction and watching students grow.”

Mikaela Cashman (’20 Ph.D. computer science) credits Cohen with shaping her successful academic and career paths. “I wouldn’t be working in research if it wasn’t for her. I am so grateful for Myra and the research opportunities that she has provided me.”

In 2017, Cashman was a student at the University of Nebraska–Lincoln, working on her master’s degree in computer science and conducting software testing research with Cohen. When Cohen accepted a faculty position at Iowa State, Cashman followed.

“I wanted to continue working with Myra, and that’s what brought me to Iowa State,” said Cashman. “Her ability to creatively connect computer science to other disciplinary areas, such as biological systems, is special.”

Cohen’s interdisciplinary work in melding computer science with other academic arenas has not only inspired students, but has also advanced research in the software-testing sphere.

## **COMPUTER PROGRAMS MIMIC THE NATURAL AND PHYSICAL SCIENCES**

Although Cohen is firmly planted in the computer science world, the natural sciences have clearly impacted her award-winning and nationally-recognized research in the field of software testing.

Cohen uses colorful synergies between the natural sciences and computer science—as a way to creatively brainstorm, visualize and problem solve as she designs software testing algorithms and code.

“We are working on the edge of multiple domains,” she said. “In our research we look to nature and we ask how we can mimic the natural world in our software programming and code development.”

As Cohen explores, analyzes and breaks through difficult software testing problems, she views these challenges through the lens of those who work in biology, chemistry, genetics and even animal science. These adopted mindsets help her to reason about the software testing solutions that she is developing.

“When a surgeon performs an organ transplant, it is critical for that surgeon to monitor the impact on the surrounding veins, arteries and larger systems,” said Cohen. “When software testers place a new algorithm into an existing software program, we are also transplanting new functionality into a complex and delicate system that must operate seamlessly after changes are made.”

Ultimately, Cohen’s research in software testing reduces time-to-market for product developers and allows engineers to focus on product innovation, instead of hours of painstaking system reconfigurations due to bugs and glitches. When software testing is efficient and fast, everybody in the development chain wins.

“Myra is really unique and so is her ability to unite all of these different disciplines with software testing research,” said Cashman.

In addition to the natural sciences, Cohen also borrows from the physical sciences. Although she doesn’t work with molten alloys, she channels the same slow-stage, iterative processes that are used to soften metals.

When metallurgists turn hard metals into pliable metals, they do so by heating and cooling them. “It is essential that the metals slowly cool, or they break,” she said. “This slow process happens in a series of stages, until the metal achieves the desired malleability.”

“When we build test suites to find the proper configurations, we develop them in stages and we ask questions and evaluate at each stage,” she said. “Then we move to the next stage, but only after stability is achieved at earlier stages.”

## "I WAS HUMBLLED THAT THEY NAMED THE DEPARTMENT AFTER ME"

Throughout her career, Cohen's research has earned numerous awards and honors, as well as special recognition for her accomplishments in software testing research.

Her research has garnered attention from the National Science Foundation, earning her an NSF CAREER award. At Iowa State, and previously at the University of Nebraska–Lincoln, Cohen was awarded named professorships.

In addition, the Faculty of Science at the University of Auckland temporarily renamed their computer science department in her honor. For one week, the department became "The Myra Cohen Computer Science Department" to celebrate her exemplary achievements and research advancements in the computer science field.

As part of commemorating women's voting rights in New Zealand, the university named all university science departments after notable female alumni. "I was honored and humbled to be selected as the computer science graduate who was recognized," said Cohen.


Cohen was also named an Association for Computing Machinery Distinguished Member for her accomplishments in the computing field. She received an Air Force Office of Scientific Research Young Investigator Award, a prestigious honor given to researchers who make significant contributions to their field.

## "COMPUTER SCIENCE REALLY IS FUN AND EXCITING"

With a long list of accomplishments and rewards in her rear-view mirror, Cohen looks forward to helping Iowa State undergraduate and graduate students pursue their own adventures.

"There is nothing more rewarding than impacting the lives of students as they learn, grow and carve out their academic and career goals," she said. "I hope that I can spark in them the same love for scientific research that I discovered when I was a student."

Cohen is also committed to increasing the number of women who enter the computer science field and work in scientific research.

"There is an artistic side to computer science. It isn't boring and sedate," said Cohen. "At times, you are like a novelist, because you have to effectively write about your research, explain it to the public and sell your ideas. We need to show women in particular the dynamic and fun sides of computer science and research, so they understand how inventive and creative it truly is." 

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**"There is nothing more rewarding than impacting the lives of students as they learn, grow and carve out their academic and career goals.**

**I hope that I can spark in them the same love for scientific research that I discovered when I was a student."**

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*Cohen's software-testing research focuses on ensuring that your web browser, phone and search engine are operating with optimal speed and efficiency. "Many software engineering challenges can be re-modeled as optimization problems," said Cohen.*

1969

5  
YEARS

2019

[ 50<sup>th</sup> ANNIVERSARY ]IOWA STATE UNIVERSITY  
Department of Computer Science

# CELEBRATING THE PAST, INNOVATING THE FUTURE

by ROBYN GOLDY

This year, the Department of Computer Science at Iowa State University will commemorate its 50th anniversary with a series of events throughout the year that will culminate in the fall with a multi-day symposium and reunion celebration. We invite all of our 5,000+ alumni, along with friends, faculty, staff, current students, and industry partners to join us in the festivities, which will take place on campus on **September 26–28, 2019**. The theme for the anniversary is “celebrating the past, innovating the future.”



John Vincent Atanasoff  
joins Iowa State's faculty.

And we certainly do have a proud and rich past to celebrate. Dr. George Strawn (Ph.D. '69 mathematics), is a member of the external advisory board for the Department of Computer Science and is also on the planning committee for the 50th anniversary celebration. Strawn, a former professor and department chair of Computer Science, fondly remembers the department's early days: “I started teaching in the computer science program as a graduate student in 1966 and was a charter member of the new department of computer science in 1969, the same year I received my Ph.D. Reflecting on the past fifty years of progress in our department and in computer science as a discipline, my first thought is that it's been a great ride and I'm lucky to have been a part of it!”

Iowa State also proudly claims that the first electronic digital computer prototype was constructed here in 1939 by assistant professor of mathematics and physics John Vincent Atanasoff, and his student, Clifford Berry.

A reconstruction of the Atanasoff Berry Computer (ABC) is currently on loan at the Computer History Museum in Mountain View, Calif. As part of the year-long celebration, we are planning an event at the Computer History Museum, to include a viewing of the replica ABC. We hope alumni in the region can join us for that event—stay tuned for details.

We are also looking to the future and are so excited to see what the next 50 years of innovation the department will bring.



Clifford Berry, along with Atanasoff, construct the first electronic computer, the Atanasoff-Berry Computer (ABC).



John L. Gustafson with the working replica of the Atanasoff-Berry Computer.

“I’m jealous of the youngsters among us who will be around for our hundredth anniversary. I predict that the changes between 50 and 100 will be even greater than those we’ve already seen,” says Strawn. The 50th anniversary celebration in September will include lectures from current faculty as well as student poster presentations to showcase some of the innovative research currently being conducted in the field of computer science at Iowa State.

Visit the Department of Computer Science's 50th anniversary website at <https://50.cs.iastate.edu> to view a complete schedule of events and a timeline of the department's history. You can also share memories of your time in the department, or what you've been up to since you graduated.

# THE SCIENCE BEHIND THE MAGIC



by **STACEY MAIFELD**  
contributed **PHOTOGRAPHS**

**[W]**HEN “DUMBO” SOARED INTO MOVIE THEATERS in March, Iowa State alumna Feifei Wang played a small part in its flight.

Wang (MS ’14 computer science, Ph.D. ’17 computer science and applied mathematics) helps The Walt Disney Co. make important business decisions through the innovative field of decision science. Thanks to the skills she perfected at Iowa State, one of the world’s most magical brands is now backed by a little Cyclone spirit.

“My job is a combination of scientist and business consultant,” Wang said. “It’s a relatively new area to me, but because of my Ph.D. training, I had the foundation.”

## DATA-DRIVEN DREAMS

After completing her doctorate at Iowa State in 2017, Wang immediately joined Disney’s decision science team, a group of more than 40 scientists supporting Disney’s diverse business segments. The team also has Cyclone power—it includes four Iowa State alumni.

“It was a dream come true because I really liked Disney even since I was a child,” said Wang, whose favorite childhood film was the animated classic “Beauty and the Beast.”

Based in Florida, Wang and her colleagues are involved with projects ranging from the algorithms used to enhance guest experience at Disney Parks attractions to the mathematical models that analyze the seasonality in the motion picture industry.

Wang directly supports The Walt Disney Studios, whose business holdings include Disney Theatrical Group, Pixar Animation Studios, Lucasfilm Ltd and Marvel Studios, among others. Her statistical and mathematical models create predictions and optimizations for business tools such as media spending models and forecasting.

“When I joined I first had to learn about the previous forecasting model and also look for any variables or new factors that we could add to the current model to improve the performance. There are always more data and better methods.”

Wang said she enjoys the balance of working independently while also collaborating with Disney colleagues.

“We communicate directly with the management and science integration team, and then they make presentations to the distribution team, media team or others,” she said.

*The day after Wang successfully defended her Ph.D. dissertation in Ames, she flew to Orlando for her Disney job interview.*





"Every day, besides meetings and business conversations, I do coding in Python and other languages to develop science tools that we can provide to the client."

For example, Wang's tools can help provide recommendations for allocating a marketing budget for digital advertising.

Working at Disney, which even hosts its own annual data analytics conference, makes data even more exciting, Wang said.

"We look at so many interesting things. Looking at movie data is so much more fun than other types of data analytics," she joked.

### NEW SOLUTIONS FOR FAMILIAR QUESTIONS

Wang, who grew up in Beijing, China, always excelled at mathematics. As an undergraduate at the University of Science and Technology in China, she accepted an offer from ISU's Department of Mathematics applied mathematics graduate program.

Then she found a second research passion when Professor of Computer Science Yan-bin Jia visited her campus, also his undergraduate alma mater, during her senior year in 2011.

"Through that talk I learned more about his research field," Wang said. "After I came to Iowa State, I scheduled a meeting with him and wanted to know more about robotics and computer science."

Wang ended up pursuing a co-major Ph.D. program in applied mathematics and computer science. Her research focused on the physics and dynamic mechanic equations used in robotics. Wang was a highly motivated student, always up for the challenge of learning new things not even in her domain, Jia said.

"We had a scanner in our lab that could take many hours to generate a full 3D model of an object," he recalled. "To keep up with her schedule, Feifei would work on it overnight to scan objects that were used in some robot experiments."

Still, Wang found time outside of the lab to make an impact at Iowa State, including reinstating the Computer Science Graduate Student Organization. As president, Wang helped organize game nights, poster presentations and a 5K campus run for "programmers to get out of their offices." She even took ballet classes at Iowa State with Jia's support.

"Dr. Jia also cares about students for your daily life," Wang said.

Today, Wang's robotics background is the most unique on her Disney team, she said, but success in her new field still relies on a solid foundation in computer science and mathematics.

"Everything is connected," Wang said. "For example, in the robotics project we tried to grasp deformable objects from a table. We purely used a lot of math and mechanics theory behind it. But another way to view that project could be that I could also use machine learning algorithms to learn and change the parameters without knowing too much of the true physics behind it."

Because of her understanding of mathematical theory and the programming skills she gained at ISU, Wang has adapted quickly to the fast-paced and deadline-driven world of decision science.

"Working on new areas broadens my horizons," she said. "It's the same type of questions, but solving them with different types of solutions."

**"Working on new areas broadens my horizons.**

**It's the same type of questions,  
but solving them with different types of solutions."**

### CYCLONE CONNECTIONS

As a graduate student in co-major Ph.D. programs, Wang didn't have time to watch many movies. Now she's in showbiz.

"I'm more sensitive to what movies are coming out, how did they do, what the competitor's movies are and so on," Wang said. "Now when I see a movie I think more behind it — is this a good movie that this audience seems interested in? Did the movie do enough advertisements? Do I see them in social media networks? Everything together is so important to finally present the movie to audiences."

So, if you were eagerly awaiting "The Lion King" or "Captain Marvel" know that your every click connects you to a fellow Cyclone. @



*Wang poses with Disney characters Rafiki and Timon from "The Lion King." Her work involves supporting Disney Theatrical Studios and its stage productions.*



# New **DATA SCIENCE** program prepares a **NEW KIND OF SCIENTIST**

by AMY JUHNKE

## *It's not just Facebook that wants your data.*

Organizations big and small constantly gather mountains of data. Apple or Fitbit may have detailed data about your cardiac health or your sleeping habits. Your energy provider knows the warmest minutes in your house. Artificial intelligence and machine learning have expanded the amount of data that can be gathered, but what do we do with all of it?

Thanks to the new data science degree program at Iowa State University, students are learning to visualize, interpret and communicate data output, and how to leverage data to make ethical, informed decisions and projections. The new program offers a major, minor and certificate options, all of which can significantly boost job prospects for students in any stage of their career.

In January 2019, for the fourth consecutive year, Glassdoor, one of the world's largest online recruitment sites, named data scientist as the best job in America. The company estimates a \$117,000 average salary for data scientists, and cites a current shortage of one million qualified professionals.

## **FEEDING THE DEMAND**

Data science permeates all industries, from helping farmers maximize their harvest to informing the design of medical equipment or creating a clean water delivery system for developing countries. Graduates of the program will help individuals and organizations in virtually any field turn data into solutions and data-informed planning. Data scientists can make significant impacts on research breakthroughs, successful business operations and the ways in which vital

information is communicated to the world.

"Whether it's daily news, food, energy, transportation, healthcare, banking, shopping, entertainment, air quality, housing—or virtually any industry—nearly every aspect of modern society is influenced by data-driven decisions," said Hridesh Rajan, Kingland Professor of Data Analytics and professor in the Department of Computer Science. "Our students with data science skills will be well poised to provide the technical knowledge to inform those decisions."

The broad impact of a degree in data science from Iowa State, is enhanced by the diversity of colleges involved in the multi-disciplinary program. Led by Rajan, the program includes faculty from Iowa State's computer

science, statistics, mathematics departments; as well as the engineering, business and design colleges. Students will emerge from the program with well-rounded knowledge of the computational, communications and scientific and ethical aspects of data science.

The new major was approved by the Iowa Board of Regents in 2018, just a few months after students were first able to officially declare the minor and certificate.

The data science minor is available to students enrolled in a baccalaureate degree program at Iowa State, while the certificate is available to students enrolled in a baccalaureate degree program or to those who have earned a baccalaureate degree.

# IOWA STATE UNIVERSITY

## Department of Computer Science

226 Atanasoff Hall

2434 Osborn Drive

Ames, Iowa 50011

csdept@iastate.edu

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