2023

IOWA STATE UNIVERSITY

Department of Computer Science

ATANASOFF
TODAY

LETTER FROM THE CHAIR

Greetings, alumni and friends! As I reach out through this note, I'm eager to not only share the latest progress within your department but also to personally invite you to connect with me on LinkedIn. Your journey is part of our story, and no news is too small; I would love to hear about all your endeavors. It's also with great pleasure that I bring to you the latest accomplishments and advancements of your department. We're celebrating a remarkable improvement in our rankings—making a noteworthy ascent to #60 in the US News and World Report, and climbing from #82 to #73 on CSrankings.org. There couldn't be a better way to begin my second term as the department chair.

Academically, your department is on an upward trajectory. The student community in your department is flourishing like never before, with current enrollments standing at 938 undergraduates and 240 graduate students in Computer Science, plus 662 undergraduate students in Software Engineering. We've initiated a new MS enrollment agreement aimed at welcoming an additional 100 MS students. We've proudly launched a B.A. in Computer Science, and new AI minors are set to be integrated pending university approval.

We have firmly focused on student success, introducing measures like the CS Help Room, peer mentoring, learning communities, and new scholarship opportunities. These steps demonstrate the excellence of our programs and the dedication of our faculty and staff. While these developments are encouraging, much more remains to be done. With our student numbers on the rise, the need for scholarships has never been more important. Please join me in expressing gratitude to Konrad and Linda Marie Schmidt for establishing the Kobs-Schmidt endowment. Their generosity has already begun to transform the educational experience for our students. These scholarships change students' lives, allowing them to focus on their studies and well-being without financial stress.

Let's celebrate our faculty achievements—congratulations are in order for Jin Tian, who has been deservedly promoted to Full Professor. We've also warmly welcomed five new tenure-track faculty members: Liyi Li, Yang Li, Clay Stevens, Bowen Weng, and Lin Yang. Liyi Li, with his specialization in quantum computing, opens new opportunities for our research and teaching. I'm also proud to mention that four of our faculty members—Hongyang Gao, Qi Li, Chris Quinn, and Nok Wongpiromsarn—have passed their third-year reviews, a clear sign of our commitment to academic excellence.

In recognition of her commitment to student guidance, Deb Holmes has been honored with the 2023 ISU Award for Academic Advising Impact. Additionally, Matthew Tan Creti's involvement in the Provost's term faculty learning community is another example of our investment in faculty development. Congratulations to Karthik Balakrishnan and Kathy Hahn-Davidson for their Distinguished Alumni awards and on their appointment on the Computer Science External Advisory Council (EAC). We are thrilled to announce that John Paule will be taking on the role of EAC chair for the coming two years, and we look forward to the direction he will provide. I would also like to extend our heartfelt thanks to George Strawn for his exceptional leadership of the EAC during a transformative time for our department.

On the research front, your department has made headlines. Qi Li was granted the distinguished National Science Foundation CAREER award, Myra Cohen was honored with a BSS Fellowship, and Pavan Aduri was invited to Simons Institute. I am constantly humbled by the excellence of our faculty. Furthermore, we've refined academic policies and set new publication standards for our Ph.D. candidates, strengthening the academic rigor of your department.

We've also been in the spotlight within the university, with visits from the President, the Provost, and the ISU Foundation's Board of Governors highlighting the significant role our department plays at ISU. Institutional support has empowered us to secure several strategic faculty positions, and the search continues for two more assistant professors. With an eye on the future, we're evaluating the potential of a new MS in Financial Technology.

I hope you find inspiration in the stories of opportunity and success from your department. The past year's achievements are just the start of what we can do together. Your continued support means the world to us—thank you.
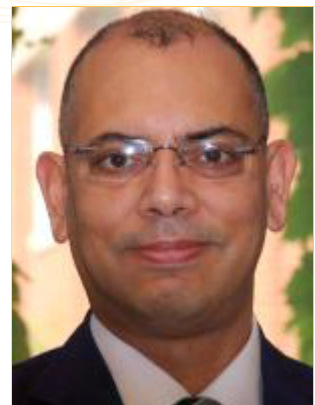
HRIDESH RAJAN
Kingland Professor and
Chair, Department of
Computer Science

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@ISUComSci: ISU Department of Computer Science

LinkedIn
ISU Department of Computer Science

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STUDENT SCHOLARSHIP IMPACT

With the rise in student enrollment, our alumni are stepping up to maintain the scholarship-to-student ratio, ensuring that scholarships continue to have an increasingly significant impact.

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STUDENT RESEARCH

A showcase of the exceptional research excellence demonstrated by our faculty and students, highlighting impactful findings that have been published at the most competitive venues in computing.

IOWA STATE UNIVERSITY
Department of Computer Science

DEPARTMENTAL OVERVIEW

1,600 *
undergraduate students

*938 Computer Science, 662 Software Engineering

240 *
graduate students

*50 M.S. in CS, 20 M.S. in AI, 170 Ph.D.

307 *
female students

*51 M.S. & Ph.D. 139 Undergraduates 117 Software Engineering

5-YEAR GROWTH TRENDS

44%
increase in undergraduate student enrollment

57%
increase in female enrollment

37%
increase in grant funding

MULTIPLE NEW DEGREE PROGRAMS

- M.S. in AI
- B.A. in Computer Science
- B.S. in Data Science

2022-2032 STRATEGIC PLAN

We are thrilled to share with you the strategic plan for the next ten years, which acts as a compass for our department; guiding us into the next decade toward a brighter future. The Strategic Plan was the culmination of planning and development accomplished by the Strategic Plan Committee

FULL STRATEGIC PLAN

NSF CAREER AWARD RECIPIENTS

This award is given to promising early-career faculty members who demonstrate the potential to become influential academic role models in both research and education.

MYRA COHEN

YAN-BIN JIA

WEI LE

2023 AWARDEE
QI LI

ANDREW MINER

HRIDESH RAJAN

WALLAPAK TAVANAPONG

JIN TIAN

2022 AWARDEE
NOK WONGPIROMSARN

NEW FACULTY SINCE FALL 2022

MENGDI HUAI
Assistant Professor
Data Mining and Machine Learning
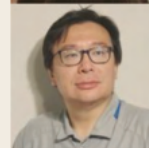
LIYI LI
Assistant Professor
Quantum Computation and Software Engineering

YANG LI
Assistant Professor
Computer Architecture and Computer Systems

CHENGLIN MIAO
Assistant Professor
Internet of Things, Security and Privacy

MEISAM MOHAMMADY
Assistant Professor
Differential Privacy and Responsible AI

CLAY STEVENS
Assistant Professor
Machine Learning and Probabilistic Models

ABRAHAM ALDACO
Assistant Teaching Professor
Machine Learning and Data Science

MATTHEW HOLMAN
Assistant Teaching Professor
Programming Languages

SHAKIL AHMED
Lecturer
Wireless Communications and Networking

RESEARCH CLUSTERS

- AI, machine learning, and data science
- Bioinformatics and computational biology
- Human computer interaction
- Robotics and autonomous systems
- Software engineering and programming languages
- Systems and networking
- Theoretical foundations

SCHOLARSHIP IMPACT

Scholarships have an important role in our department, helping students obtain an education they would not have access to otherwise. Hear why our scholarship recipients are thankful for the assistance:

Growing up, I've always lived in a lower income household. My parents did their best to keep us from realizing it, but looking back it was evident. I always knew that if I decided to go to college, they would not be able to financially assist me. So I've always had to split my time in college between studying, sleeping, and working. When one becomes too much, sleeping was often what I had to sacrifice. If I don't work, I can't afford rent or food or tuition. Thanks to you, I have to worry a lot less about working to get by and stay in school. Your donation will allow me to take time off work when assignments pile up or exams and deadlines creep too close instead of sacrificing my sleep or study time. You make my college career possible.

Benjamin Niklasen, Kobs-Schmidt Scholarship recipient

Pictured above: Computer Science Professors Myra Cohen (left) and Gianfranco Ciardo (right), along with senior Computer Science students Logan Ellsworth (middle) and Pradyumna Dahal (second to the left) met with Konrad Schmidt, (second to right), donor to the Kobs-Schmidt scholarship.

This scholarship is allowing me to focus on my studies, as well as my extracurriculars. Without help and support like yours, my goals would be near unreachable. I am inspired by your success, and I hope one day I can give back to Iowa State students like you are.

Grace Iversen, Innovation Maven Scholarship for Women in Computer Science recipient

As a second-generation immigrant, I have seen my parents struggle with finances to get me where I am today and I want to be able to lift that burden off their shoulders and start giving back to them as soon as possible. This scholarship helps me get closer to reaching that goal, and for that, I want to express my sincerest gratitude.

Vicky Lee, Charlie and Barb Hunt Scholarship in Computer Science recipient

Scholarships allow me to attend college without taking out massive loans, which would burden me in the future.

Caleb Moe, David and Rebecca Nation Scholarship for Computer Science recipient

The scholarship will play an important role in my financial support. It will remove the extra burden of working to pay my educational expenses, so I can focus on my studies. Thank you again for the support and generosity.

Paige Rolling, Bian Li Women in Computer Science Scholarship recipient

My first and main goal is to establish myself professionally to enable myself to give back to the wonderful people who invested in me: my family, my teachers, and my community. Secondly, I hope to continue my education and learning in both computer science and mathematics–both on my own and hopefully formally–eventually using what I learned to contribute to academia or to teach. I'd like to thank you for investing in me and my future.

Issac Lo, Mark Giese Scholarship recipient

CELEBRATING EXCELLENCE IN COMPUTER SCIENCE: THE LASTING IMPACT OF LONG NGUYEN

Dr. Long Nguyen's contributions have left an indelible mark on the field of computer science at Iowa State University. These programs underscore Dr. Long Nguyen's commitment to advancing knowledge, supporting faculty, and cultivating a new wave of computing leaders. His approach ensures that the legacy of excellence he has cultivated will continue to resonate and inspire within the halls of Iowa State University for generations to come as we continue our innovative research.

Pragmatics Graduate Fellowship in Computer Science

Established in 2012, the Pragmatics Graduate Fellowship in Computer Science has been awarded to 12 outstanding graduate students in the Department of Computer Science.

This year, the recipients are Siddhant Grover, Samrajya Thapa, and Yididiya Nadew.

"I have been passionate about problem-solving as far as I can remember. Studying and researching the field of computer science enables me to work toward that passion. In the future, I hope to get my doctorate and become an independent researcher in this field. I would like to personally thank you. This scholarship enabled my development as a researcher and has given me the confidence to work toward independent research. It has been crucial to my first conference-accepted paper. Thank you for all the support."

Siddhant Grover

"I envision my future very tied to academia. Specifically, I'm interested in contributing to interdisciplinary research projects at intersections between machine learning and neuroscience. I wouldn't be where I am today without the support I had growing up. Through teaching, I hope to provide mentorship and guidance to students who may not have access to the resources and support that I did. Giving is one of the most noble things one can do. Your contributions not only reflect this virtue, but also help push the bounds of science, making it even more impactful. I am immensely thankful for your generosity."

Yididiya Nadew

Dr. Robert Stewart Early Research Recognition Awards

Established in conjunction with the Dr. Robert Stewart Distinguished Lectureship, this award recognizes Computer Science graduate students who study a research subject with very high risk. Since its inception, 26 students have conducted research through this award.

Recognizing the outstanding research contributions of graduate students, the Robert Stewart Early Research Recognition Award provides seed funding for research proposals within the department.

The award winners for this year are Chenzu Zhao (Advisor: Mengdi Huai), Quazi Ishtiaque Mahmud (Advisor: Ali Jannesari), Xiangyang Xu (Advisor: Hongyang Gao), and Zihao Liu (Advisor: Chenglin Miao). The award winners, and their advisors, are pictured above (absent: Ali Jannesari) along with Myra Cohen.

This initiative fosters a culture of innovation and excellence among graduate students, contributing to the continued success of the Computer Science program at ISU.

Dr. Robert Stewart Distinguished Lectureship

Established in 2003, the Dr. Robert Stewart Distinguished Lectureship is held in honor of Robert Stewart, the first Department Chair in Computer Science at Iowa State University.

The Robert Stewart Distinguished Lectureship has featured renowned speakers, including Joseph Sifakis from Verimag Laboratory, discussing the challenges of self-driving cars in 2022; Martian Hellman from Stanford University, exploring the technological imperative for ethical evolution in 2019; and Leslie Valiant from Harvard University, delving into what needs to be added to machine learning in 2018. These lectures provide a unique opportunity for attendees to learn from some of the contemporary computing world's greatest minds.

Lanh and Oanh Nguyen Chair in Software Engineering

In collaboration with Kimmy Duong, Dr. Long Nguyen established the Lanh and Oanh Nguyen Chair in Software Engineering. This award, initiated in 2008, aims to support and ensure the future success of the Computer Science program at ISU. It plays a crucial role in recruiting world-class faculty members who significantly enhance the Department of Computer Science and the university as a whole.

Since 2018, Dr. Myra Cohen, a Professor and Associate Chair for Research in the Department of Computer Science, has held the position. Dr. Myra Cohen has demonstrated exceptional performance in securing and managing research funding, initiating new research directions, building productive collaborations, and investing in relationships with brand new funding agencies.

TACKLING THE CHALLENGES OF DEEP LEARNING IN SOFTWARE ASSURANCE

Deep learning has showcased remarkable potential in effectively tackling various software engineering tasks. However, its capabilities are limited when it comes to challenging yet crucial software assurance tasks such as bug detection, debugging, test input generation, and test suite prioritization. These tasks prove difficult to formulate as learning problems, primarily due to the intricate nature of program semantics.

"To the best of [our] knowledge," said Wei Le, an Associate Professor of Computer Science at Iowa State University, "even state-of-the-art deep learning models have an insufficient understanding of program semantics. As a result, the models fail to achieve sufficient precision and recall to be more widely deployed."

Additionally, these models struggle to generalize effectively to unseen projects and are highly sensitive to minor perturbations in the source code. Also, training these models requires substantial computational resources and extensive datasets.

The impact of these limitations calls for exploring alternative approaches and combining deep learning techniques with other methods in software assurance. Le and her team are going to be able to work on addressing these challenges to enhance the capabilities of deep learning models and improve their effectiveness in crucial software engineering tasks.

Le and her team intend to leverage the insights gained from this research to organize workshops, fostering a stronger and more vibrant research community focused on deep learning for code. Their goal is to facilitate stronger collaboration among researchers, experts in the field of deep learning, and software engineering professionals to accelerate advancements in applying deep learning to software assurance. This collaborative environment enables the sharing of datasets, benchmarks, and evaluation methodologies, which play a crucial role in validating and comparing the performance of deep learning models in software assurance.

The collective effort to curate high-quality datasets and establish standardized evaluation practices is of utmost importance. By doing so, benchmarks can be established, and fair comparisons between different models and techniques can be facilitated. This process contributes to improved software quality, enhanced productivity, reduced maintenance costs, and an overall enhanced user experience.

The ultimate beneficiaries of this collaborative effort are developers and users alike. Developers can leverage the advancements in deep learning to create more reliable and secure software, while users can benefit from improved software quality, increased productivity, and a better user experience.

DEMOCRATIZING LANGUAGE MODELS

Large language models such as ChatGPT are becoming more relevant in the workforce as a tool to increase work efficiency. In the several months since becoming publicly accessible, ChatGPT has become the hot tool in corporate America. ChatGPT can be used to automate various writing tasks such as social media posts, emails, and even code. Helping users quickly get the data they need, so far, ChatGPT has revolutionized how work gets done in the office.

However, as discovered by researchers, several accessibility issues make it a non-ideal tool for the average academic researcher or proprietor of a small business. Commercial language models like ChatGPT cannot be locally deployed or used for sensitive, private data. The training costs for language models that can be locally deployed or used for confidential information are also in the millions. This creates serious accessibility issues akin to the digital divide, which Iowa State researchers are working to solve.

Qi Li, Assistant Professor of Computer Science, is working on an approach to automatically find high-quality prompts using moderately sized pre-trained language models such as BERT that can be locally deployed and used for sensitive, private data. Li wants to use her research to tackle the accessibility gap, allowing academic researchers and small business practitioners to obtain high-quality annotations with minimal cost without additional privacy concerns, thus democratizing language models. Li has been honored with a Faculty Early Career Development (CAREER) Award for her outstanding research on information extraction from scientific documents. This esteemed accolade is bestowed upon promising early-career faculty members who demonstrate the potential to become influential academic role models in both research and education.

"The [research] tackles a variety of problems drawn from different information extraction settings, which will lead to new principles, methods, and technologies for machine learning, data mining, and natural language processing," says Li. "The information extraction results will benefit many domains, specifically life science domains such as biomedicine, animal science, and agronomy, all of which involve processing massive unlabeled textual data. The project will speed up literature understanding and the curation process and promote new scientific discoveries."

PROVIDING SAFER SKIES FOR DRONE FLIGHT

MYRA COHEN

ROBYN LUTZ

Industries worldwide are increasingly using drone technology to enhance the efficiency of their business practices. However, the growing number of drones also brings concerns regarding congestion and safety in a limited airspace. To address these challenges, government agencies and researchers are collaborating to build new automated techniques that can ensure the safety of our skies.

To enable safe skies while continuing to advance the use of drone technology, Myra Cohen and Robyn Lutz, Professors in the Department of Computer Science at Iowa State University, and their students, are working with a multi-institution research team dedicated to finding novel solutions for this problem.

With 3 years of funding from NASA, the team, headed by Jane Cleland-Huang, Frank M. Freimann Professor of Computer Science and Engineering at Notre Dame University, are pursuing research that they hope will eventually lead to safer skies. Their primary focus will be on developing an automated decision-making system to evaluate whether individual small drones can safely enter a congested airspace, complementing NASA's existing drone traffic management system. This advanced system aims to replace the current process, which was not built to handle the increase in the volume of drone traffic that is expected to be seen in the future.

"We are excited to be part of this multi-institution, multi-million-dollar initiative. We believe our combined expertise in safety and testing brings a unique set of skills to the team, and we look forward to working on this project," said Cohen, the principal investigator at ISU.

Notre Dame's receipt of a $5.3 million grant from NASA is one of four NASA University Leadership Initiative grants awarded this year. These grants provide university faculty and students with opportunities to support NASA's research goals by addressing the key challenges of air travel while offering students invaluable hands-on research experience. The research team includes experts from Notre Dame, Iowa State University, Saint Louis University, the University of Texas in El Paso, DePaul University, and the DroneResponders Public Safety Alliance.

PROTECTING OUR INTERNET SECURITY

Today, people can turn on the lights, order groceries, and change the channel on the television using only their voices. Cars can automatically stop and slow down to adjust to traffic flow. Companies are starting to utilize data and innovative technology to transport patient care in the healthcare industry. This is being done thanks to researchers such as Chenglin Miao, Assistant Professor of Computer Science, who is working on building secure connections between humans and the physical world using artificial intelligence (AI) techniques and the Internet of Things (IoT).

IoT is a new networking model that connects humans and the physical world using ubiquitous sensing, computing, and communicating devices. With IoT having various civilian and military applications, countries and companies worldwide are utilizing research to transform industries and daily life. The result is that the devices collect a large amount of data and make smart decisions.

Researchers have started developing various intelligent Internet of Things systems using IoT devices, such as autonomous driving systems using artificial intelligence techniques. However, with a large amount of data being collected come security challenges. This is the focus of Miao's research. How can we find the security vulnerabilities of AI techniques when applied to real-world IoT systems, and how can we address them? What countermeasures can we utilize?

For Miao, the crust of his research is to develop practical and easy-to-use attack methods for analyzing the security vulnerabilities of AI-enabled IoT systems. The better systems we have to analyze the attack methods, the better tools we can use to develop effective countermeasures against malicious attacks.

This research has its challenges. The performance of AI-enabled systems can easily be affected by many uncertain factors, such as environmental noise and interference from surrounding objects. Many AI models can easily be fooled by attackers in the physical world. With autonomous driving systems, Miao's recent work has demonstrated that attackers can easily fool the autonomous vehicle relying on AI techniques by slightly changing the driving environment, such as placing simple objects such as advertising boards at a few specific locations in the physical space. The result will be the autonomous system failing to see a car in front of it, thus creating a dangerous environment for the passengers.

Miao hopes that his research can be used as a key enabler for developing and deploying safe IoT systems for future human life. Additionally, he believes his research findings may benefit other research areas related to AI, such as robotics and human-computer interaction. Through research such as this, we can become a safer, more protected technological society in many growing aspects of our lives, from work to homes.

RESEARCH EXCELLENCE

Research in the Department of Computer Science covers a comprehensive range of computing aspects, from theoretical foundations to practical applications in artificial intelligence, robotics, and software engineering. Our faculty, alongside graduate and undergraduate students, are advancing both the science and practical applications of computing. They achieve this through interdisciplinary collaborations within Iowa State and by partnering with leading computer science experts globally.

24 papers accepted to 11 top-tier conferences:

4 papers at **The 37th Conference on Neural Information Processing Systems (NeurIPS 2023)**

4 papers at **The 45th International Conference on Software Engineering (ICSE 2023)**

3 papers at **The 46th International Conference on Software Engineering (ICSE 2024)**

3 papers at the **2023 Conference on Empirical Methods in Natural Language Processing (EMNLP 2023)**

2 papers at **The 40th International Conference on Machine Learning (ICML 2024)**

2 papers at **The 31st ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE 2023)**

2 papers at the **2023 IEEE International Conference on Robotics and Automation (ICRA 2023)**

1 paper at the **32nd International Symposium on High-Performance Parallel and Distributed Computing (HPDC 2023)**

1 paper at the **61st Annual Meeting of the Association for Computational Linguistics (ACL 2023)**

1 paper at the **2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2023)**

1 paper at the **Thirty-Seventh AAAI Conference on Artificial Intelligence (AAAI 2023)**

9 grants awarded

A COMMUNITY FOR CONFIGURABILITY OPEN RESEARCH AND DEVELOPMENT (ACCORD)

Myra Cohen

BETTER SCIENTIFIC SOFTWARE FELLOWSHIP PROGRAM

Myra Cohen

ALGORITHMS TO IDENTIFY NOVEL INFLUENZA A VIRUSES IN GENOMIC SURVEILLANCE DATA

Oliver Eulenstein

DEVELOPMENT AND VALIDATION OF OXFORD NANOPORE TECHNOLOGIES (ONT) SEQUENCING AS A MOLECULAR POINT-OF-CARE DIAGNOSTIC (POCD) ASSAY

Oliver Eulenstein

USE OF DIAGNOSTIC DATA TO RAPIDLY DETECT AND RAISE STAKEHOLDER AWARENESS OF EMERGING BIOLOGICAL ANIMAL HEALTH AND PRODUCTION THREATS

Oliver Eulenstein

ENABLING AI-BASED COMPILER OPTIMIZATION ON INTEL HARDWARE

Ali Jannesari

A PHYSICS-INFORMED FLOOD EARLY WARNING SYSTEM FOR AGRICULTURAL WATERSHEDS WITH EXPLAINABLE DEEP LEARNING AND PROCESS-BASED MODELING

Ali Jannesari

ACHIEVING QUALITY INFORMATION EXTRACTION FROM SCIENTIFIC DOCUMENTS WITH HETEROGENEOUS WEAK SUPERVISIONS

Qi Li

LEARNING SEMANTICS OF CODE TO AUTOMATE SOFTWARE ASSURANCE TASKS

Wei Le

SUMMER INTERNSHIPS

Hear about some of the amazing internship adventures our Computer Science students went on this summer, what motivated them, and how they benefited from the opportunity to expand their education beyond the classroom:

Apple had a number of intern event, the one I enjoyed the most is the intern mixer event where we get to meet interns of different departments. Outside of the company, I met lots of great friends, and joined one of the biggest badminton tournaments in the Bay Area, Super Smash 2023, which I enjoyed a lot. Blissfully, all employees in Apple are extremely friendly, patient and always ready to help. I am blessed that I have gotten a ton of help throughout the boarding and working process. I want to give a shoutout to Frank, who is very patient when I bombard him with load of questions.

Yee Chuen Teo, Apple

I worked as an R&D intern at Musco with the ET group where we worked on exciting projects in the sports field that incorporate AI and Computer Vision solutions. Musco organized many intern socials and intern/full time team building events outside of work which helped us learn more about the team and get to know the team outside of work too. We did escape rooms, dinners, arcade at smash park, headquarters tour at Oskaloosa IA.

Samrajya Thapa, Musco Lighting - Emerging Technologies Group

For the first week of my internship, the company made all the interns visit the headquarter in Atlanta, so it was a fun experience to visit the office and network with the other interns. I would like to acknowledge both my mentor San He Wu (Lead Data Scientist, The Home Depot), my manager Po Yen Wu (Manager, The Home Depot), and all my team members for their support, valuable feedback, and guidance throughout the internship.

Mohna Chakraborty, Home Depot

YEE CHUEN TEO

SAMRAJYA THAPA

MOHNA CHAKRABORTY

HANIYEH FEKRMANDI

AISHWARYA SARKAR

LICHUAN DENG

MINGHAO SUN

GE LOU

Salin 247 specializes in the development of autonomous agricultural robots, and I have been fortunate to work closely with their talented team. My work spans the domains of machine learning, computer vision, and robotics. One of the most engaging and enjoyable aspects of my internship has been developing a visual surveying algorithm that assists with precise robot navigation between crop rows in the post-emerge stage of crops. This project was both intellectually stimulating and rewarding, as it aimed to enhance the functionality and reliability of our machines in complex agricultural environments. It is also a very unique application and has not been implemented for large-scale farming fields where the robot navigates itself through the already-planted field and avoids running over crops at high speeds (e.g. 5 mph).

Haniyeh Fekrmandi, Salin 247

One of the most memorable experiences during my internship was been the opportunity to delve into a new research topic. At the outset, I was a bit nervous, knowing that there would be much to learn. My mentors, Dr. Sayan Ghosh and Dr. Nathan Tallent have been an incredible support. Their guidance not only helped me to find my footing in this new area but has also instilled in me a newfound confidence. I felt well-prepared and excited to continue exploring this fascinating subject. My internship was filled with exciting challenges and learning opportunities that made every day engaging and rewarding. I was also thrilled to virtually explore various lab facilities at the Pacific Northwest National Laboratory. These engaging tours provided a fun peek into various cutting-edge technologies and research.

Aishwarya Sarkar, Pacific Northwest National Laboratory

Thanks to Taren Reker, the manager of Collins Aerospace Ames site, for organizing a remarkable tour of the Collins factory in Cedar Rapids. We attended a road show showcasing their latest products. During this event, I had the pleasure of exploring a variety of intriguing avionics-related equipment and had the unique experience of trying on the cutting-edge pilot helmet. The trip also afforded me the chance to connect with many fascinating individuals. Engaging in meaningful conversations and making new acquaintances was truly enriching. Moreover, I had lunch with my manager, where we engaged in insightful discussions on a wide range of captivating subjects.

Lichuan Deng, Collins Aerospace

My internship was at Amazon in Seattle. I was applied scientist. We had lots of team events which were fun. My manager gave me lots of advice and help. She always gave me the best advice and led the team on the right track.

Minghao Sun, Amazon

My work was about fine-tuning large language model for enhancing the Bixby voice assistant. I would like to recognize my colleague intern Taahaa Kazi for helping me getting on board and having discussion with me on the project.

Ge Lou, Samsung Research America

FROM COM S 192 TO THE NATIONAL CONFERENCE ON UNDERGRADUATE RESEARCH: A TALE OF TWO STUDENTS

One of the biggest pieces of advice our alumni have for our current undergraduate students is to network with your professors and take advantage of undergraduate research opportunities. For Iowa State University Department of Computer Science undergraduate students Roba Abbajabal and Maxim Popov taking COM S 192 provided the launching pad to do just that.

COM S 192: Launching Pad for Research

COM S 192 is a one-credit course that explores research opportunities for undergraduate students in Computer Science and teaches students the development of writing, presentation, and data reporting skills. The course had two primary aspects. The first aspect was demonstrating to students what research could be like. The second aspect was having professors come in and present their research. It allowed students to meet with different professors and help find mentors to help guide them in their careers. The course allowed students to develop a strong foundation to begin doing undergraduate research, such as for Abbajabal and Popov.

> **I LOVED THE CLASS, I WOULD HIGHLY RECOMMEND IT FOR COMPUTER SCIENCE STUDENTS WHO HAVE AN INTEREST IN RESEARCH**

"In COM S 192, I got the opportunity to learn what research is from a variety of lectures from faculty and graduate students. Near the end of the course, I got to experience writing a practice research paper with my peers over a technology called Teachable Machine," recalled Abbajabal. "I loved the class, I would highly recommend it for computer science students who have an interest in research."

Faculty Mentors: Guiding Students' Research Careers

Roba Abbajabal and Maxim Popov credit their faculty mentors, Ying Cai and Wallapak Tavanapong, for the invaluable support and guidence they recieved throughout their journeys.

"My mentor, Ying Cai, has been a great mentor, helping me through the project when I needed help but allowing me to still do the important work myself. He has given advice and assistance in the process of research, applications, presentations, paper writing, and general academic topics," stated Popov. Popov works with Cai, a Professor of Computer Science, to improve the performance of a particular data structure designed to process queries on rank-aware data. His research interests lie in artificial intelligence and machine learning.

Abbajabal has had a similar experience with his mentor, Wallapak Tavanapong, a Professor of Computer Science, researching using machine learning to quantify the number of hippocampal progenitor cells in a medical image dataset. "My mentor, Dr. Tavanapong, has had a huge impact on me in both my academics and my career goals. She taught me a lot about her area of research and provided me with many resources for learning the subject. I learned a lot through being her mentee, and I am really grateful for the impact and inspiration that she has had on my life."

Presenting Research at the National Conference on Undergraduate Research

Because of their research experience, Abbajabal and Popov had the opportunity to present their research at the National Conference on Undergraduate Research. The National Conference on Undergraduate Research is an annual conference where undergraduate students present their research and learn more about other researchers such as themselves. The department was happy to help sponsor the students' opportunity to attend the conference and hope more students follow in their footsteps.
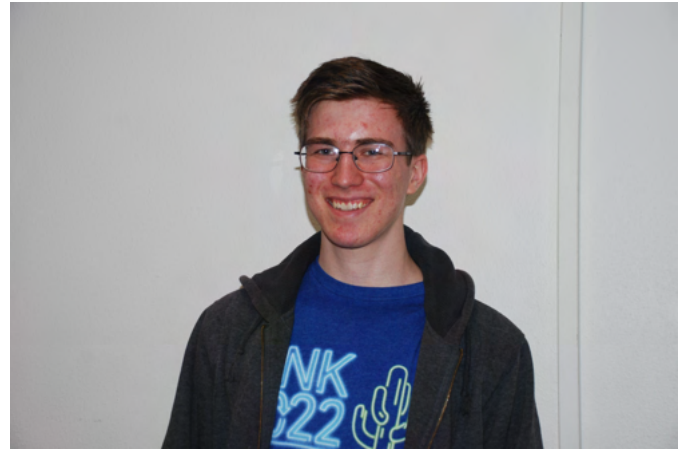
"Getting funding was not particularly difficult as both my mentor and the department were able to help out," said Popov.

Both Abbajabal and Popov enjoyed their experiences at the conference. They presented their own research, networked with other students, and learned about new research being done.

"I had an amazing experience when attending the conference. During my presentation, I got to experience and grow in how to explain my research to attendees with varying levels of knowledge about my discipline. Outside of my own presentation, I got the chance to see many other presentations that were similar to my research, where they used machine learning for other tasks," said Abbajabal. "What stood out the most to me was seeing a large number of students from many universities and fields of study that were eager to talk about their research experiences."

"I enjoyed the conference; there were a lot of interesting people and projects there," said Popov. "I went to other presentations and poster sessions, which were cool. I think the biggest thing was all the people there, all fascinating and with interesting projects."

MAXIM POPOV

UNDERGRADUATE RESEARCH PLAYS A PIVOTAL ROLE IN SHAPING THE FUTURE OF OUR FIELD, FOSTERING A CULTURE OF INNOVATION AND EMPOWERING STUDENTS TO MAKE SIGNIFICANT CONTRIBUTIONS

ROBA ABBAJABAL

"In our Computer Science department, we highly value undergraduate research as a vital and high-impact activity. It not only provides students with valuable opportunities to explore innovative ideas and technologies, but also cultivates essential skills such as critical thinking, problem-solving, and collaboration. We recognize that undergraduate research plays a pivotal role in shaping the future of our field, fostering a culture of innovation and empowering students to make significant contributions to the ever-evolving world of Computer Science," said Dr. Hridesh Rajan, Professor and Department Chair of Computer Science.

STATS THAT TRACK

Henry Shires and Pradyumna Dahal didn't play high school sports. When it comes to entrepreneurship, however, Henry and Pradyumna definitely have game.

Pradyumna, a senior in Computer Science, and Henry, now a senior in Computer Engineering, are co-founders of Casmium, a mobile app that provides youth and high school sports teams with a user-friendly statistics collection and analytics tool.

"Many digital solutions help teams collect stats, but coaches still have to record numbers in spreadsheets and deal with clunky apps," Henry says. "Casmium's intuitive mobile app enables coaches to involve their players in the collection process, removing the need for paper, pencil, and spreadsheets. We incorporate custom features teams want but that may not exist in generalized apps."

Casmium started when Pradyumna and Henry were Valley High School students in West Des Moines. Valley's varsity baseball coach needed an easy digital approach to statistics collection and analysis and turned to computer science students.

"We knew how create an app but needed to learn every aspect of baseball to meet Valley's needs. All features and ideas came from Valley, and our design was influenced by our knowledge of computer science," Henry says. "We've learned so much about baseball, though."

As first-year students at Iowa State, Henry and Pradyumna placed first in the ISU Pappajohn Center for Entrepreneurship's Fall Startup Pitch Competition. They further developed Casmium in CYstarters, the immersive entrepreneurial experience offered through the Pappajohn Center. It's one of several programs that make up the university's "Start Something" network, aimed at empowering students to pursue entrepreneurship and innovation.

"When I came to Iowa State, I didn't expect so many resources. There's so much out there that can help you to advance your ideas," Pradyumna says. "The biggest advantage has been having a wide array of mentors who each have their own expertise."

While Pradyumna has moved on to other projects, the other Casmium co-founders, including computer engineering senior Abhushan Pradhan, are focused on building the company, with a website and Apple Store app.

The experience has come with powerful lessons, says Abhushan. "…I've learned, while working on this project, it doesn't really matter what I do as long as what I am doing is meaningful to other people … and it's something I love doing," he says. "As long as that is true, I feel I'll be able to pick any career."

To learn more, go to http://movewhatmatters.com/move-toward/stats-that-track/

WOMEN IN COMPUTER SCIENCE

Hear why our current female students in Computer Science are getting involved across campus, why they've chosen Computer Science, and what they plan to do with their degree.

GIVE YOURSELF TIME TO LEARN!

Hi, my name is **Paige Rolling** and I am a senior Computer Science student. After my first semester at Iowa State, I knew that Computer Science was for me because I loved the first class. So far, while at Iowa State, I've had the opportunity to be a TA, a Peer Mentor, a member of the Student Advisory Council for Computer Science, an intern at Cisco, and a research assistant for Dr. Mohammady, where I worked with differential privacy, a technique to improve the privacy of machine learning models.

My biggest advice is to not count yourself out too early. Everyone comes to college with different experiences, and a class that might be easy for other people might not be easy for you. Remember that you're here to learn and that it should be hard! Give yourself time to learn!

DON'T LET YOURSELF BE DEFINED BY THE STEREOTYPE OF WHAT YOU THINK COMPUTER SCIENCE IS!

Hi, my name is **Hannah Ashley** and I am a senior Computer Science student. I took a very unconventional route to choosing Computer Science as my major. My freshman year, my major changed from undecided, to Criminal Justice, to Biology. When the Spring 2020 semester rolled around, I decided to take COM S 207 to fill some elective credits. Although I had no interest in anything computer-related at this time, I kept going to class because it started to become really interesting to me.

Thanks to Gurpur Prabhu, who patiently taught the material in such an understandable way, COM S 207 quickly became my favorite class to attend. Don't let yourself be defined by the stereotype of what you think Computer Science is! I have witnessed so many intelligent and persevering woman going before me in this field, and I hope my story can be another reminder to any incoming female students that you are fully capable of finding a home in the field of Computer Science!

Hi, my name is **Alexis Pachonpha**i and I am a sophomore Computer Science student. My mom is in IT, and she influenced me to take my first comp sci class in high school. I really enjoyed the problem-solving and mathematical concepts, so I decided to pursue it as a major in college. I chose Iowa State because of its computer science program, knowledgeable faculty, and its beautiful campus. My advice to incoming computer science students is to not be afraid to ask for help with your classes. There are plenty of great resources offered at Iowa State, one of them being the Comp Sci help room.

GRACE HOPPER CONFERENCE FOR WOMEN IN COMPUTING

One of the many ways our department invests in women in science is by sending them to the Grace Hopper Conference each year. The conference gives our students a chance to network with leading women in technology and see the potential their computer science degree can have.

The Grace Hopper Celebration is designed to bring the research and career interests of women in computing to the forefront. History shows that attending Grace Hopper is a great and motivating experience for our students and helps them complete their computer science degree. If you are interested in supporting this effort, contact csdept@iastate.edu.

Hear from our students on how they benefited from attending the conference:

"Grace Hopper was an empowering experience that I could bring back to Iowa State's campus and help other women see their full potential." - Madeline Moses

"I benefitted from GHC by being able to network with researchers from underrepresented groups. I was able to learn from them and consider improvements for my own tech-presentations." - Sanchayani Pal

"GHC is a great opportunity to meet like-minded women who share a passion for computer science. I grew my network and learned how to be a female leader in a male-dominated industry." - Hannah Ashley

REACHING OUT TO YOUNG STUDENTS: SCIENCE BOUND SATURDAY

If you asked members of our faculty in the Department of Computer Science at Iowa State University what their favorite part of working with young students is, one of the things you would hear is their enthusiasm and love of computer science.

"High school students have so much energy, creativity, and capacity to learn," said Nok Wongpiromsarn, Assistant Professor of Computer Science.

Seeing that energy and creativity in person is one of the reasons why partnering with programs such as Science Bound is so special to the department. Science Bound focuses on reaching out to students across Iowa who are members of underrepresented groups in agriculture and STEM to increase their involvement from middle school through their graduation from Iowa State University. Our faculty enjoy working with the students and seeing them engage with our research.

Science Bound is one of our department's many activities related to broadening participation in computing (BPC). Our department is deeply committed to BPC activities in our outreach, teaching, and research, wanting to expand opportunities to people underrepresented in computing, such as women and members of ethnic or racial groups, including American Indian or Alaskan Native, Black, Native Hawaiian or Pacific Islander, and Hispanic/Latinx. Our department's BPC plan includes activities such as outreach to Science Bound because they allow us to get a chance to work with young students and to encourage students who may have more difficult pathways to also succeed in computer science.

This year, eight high school seniors participated in our department's activities. Pak Tavanapong, Professor of Computer Science, shared with the students the impact of computer science in daily life and that computer science is more than coding. Cai discussed the binary number system computers use for computation, storage, and networking. Students then visited our Autonomous Systems lab run by Wongpiromsarn. There, students learned about machine learning, saw a demonstration of robots led by two undergraduate research assistants, and then got a chance to drive the robots themselves.

The students enjoyed seeing the applications of research and hearing about all the possible career opportunities in computer science. We hope that by engaging in activities such as these, young students will get more involved in computer science and join the field in the future.

"When I was in high school, I had no idea what computer science is beyond coding. I hope this event will help them get a better understanding of what computer science is and how it can benefit the world," added Wongpiromsarn.

WELCOME NEW FACULTY

SHAKIL AHMED – LECTURER obtained his Ph.D. in Electrical Engineering from Iowa State University. His research endeavors encompass a range of captivating domains, including the exploration of 5G/6G technologies, the intricacies of edge networks, the world of vehicle-to-everything communication, the intricacies of edge caching and computing, the synergy between machine learning and wireless networks, as well as the integration of wireless networks for distributed and on-device machine learning.

LIYI LI – ASSISTANT PROFESSOR received his Ph.D. in Computer Science from the University of Illinois at Urbana-Champaign in 2020. He was a Victor Basili Postdoc at the Computer Science Department at the University of Maryland, College Park from 2021-2023. His Postdoc advisors were Dr. Michael Hicks and Dr. Xiaodi Wu. His research focuses on using formal method and programming language tools to improve the security, reliability, and availability of software. During his career, he has published many refereed conference and journal papers. He also likes to interact with talented students and mentors PhD students towards successful PhD careers.
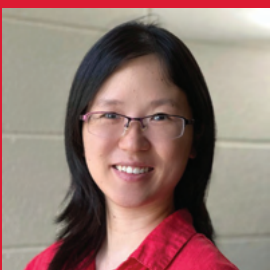
YANG LI – ASSISTANT PROFESSOR received his Ph.D. and Master's degrees from Carnegie Mellon University in 2020 (advisor: Professor José M. F. Moura), a Master's degree from The University of Texas at Austin in 2013, and his Bachelor's degree from Tsinghua University in 2011. Before joining Iowa State University, he was a research scientist at Meta and a researcher at Microsoft.

CLAY STEVENS – ASSISTANT PROFESSOR received his Ph.D. in Computer Science at the University of Nebraska-Lincoln, with an emphasis in software engineering. Prior to starting his Ph.D., Clay spent more than 13 years in industry as a professional software engineer and architect. His research aims are to scientifically study how software engineers and architects work in practice and to improve the scalability of rigorous formal analysis tools to enable their use on large-scale, real-world problems.

BOWEN WENG – ASSISTANT PROFESSOR received his Ph.D. from The Ohio State University. Prior to joining the department, he worked as a research scientist at Transportation Research Center (TRC) Inc. on assignment to the National Highway Traffic Safety Administration (NHTSA), where he led the research and technical development of projects related to safety testing and performance evaluation of Automated Driving Systems (ADS). His research interests center around safety testing and safe autonomy, with applications to intelligent vehicles, legged robots, and multi-agent systems.

LIN YAN - ASSISTANT PROFESSOR received her Ph.D. in computer science from the University of Utah. She was a postdoctoral fellow at the Environmental Science & Mathematics and Computer Science Division at Argonne National Laboratory prior to joining the department. Her research interests include topological data analysis and visualization. Her recent work focuses on problems involving large and complex forms of data by combining topological, statistical data analysis, machine learning, and visualization techniques.

FACULTY AND STAFF AWARDS

PAVAN ADURI was invited to join the Simons Institute for the Theory of Computing Program on Meta Complexity. His paper "Model Counting Meets Distinct Elements" was invited to the CACM Research highlights and appeared in the September 2023 issue of CACM.

ABRAHAM ALDACO received the 2022-2023 Departmental Excellence Award in Teaching.

MYRA COHEN was selected as a 2023 Better Scientific Software Fellow. She also became a member of Center for Wireless Communication.

DEB HOLMES received the 2023 ISU Award for Academic Advising Impact.

ALI JANNESARI received 2023 Dean's Emerging Faculty Leaders Award from the College of Liberal Arts and Sciences at Iowa State University. He also received an Intel Research Award.

QI LI received a National Science Foundation CAREER award, the highest honor awarded to junior faculty.

JACK LUTZ was invited to present at the NSF-CBMS Regional Reserach Conference at Drake University, where he will give a series of ten lectures on algorithmic fractal dimensions.

ROBYN LUTZ was awarded the 2023 Best Industrial Innovation Paper Award at the 31st IEEE International Reqruiements Engineering Conference for her research in variability constraints. She also received the Departmental Excellence Award in Teaching.

KATE SHARMA received an ISU Spot Award.

JEREMY SHEAFFER received the 2022-2023 Departmental Excellence Award in Teaching.

JIN TIAN was promoted to Full Professor. He also became an editor to the Journal for Causal Inference.

LIESE VANDERBROEK received the 2022-2023 Departmental Excellence Award in Support.

HRIDESH RAJAN gave an invited talk at the SEMLA Symposium. He was also awarded the ACM Distinguished Paper Award.

MATTHEW TAN CRETI was invited to join the Provost's term faculty learning community. He also received the 2022-2023 Departmental Excellence Award in Teaching.

EXTERNAL ADVISORY COUNCIL NEW MEMBERS

THE EXTERNAL ADVISORY COUNCIL was formed in 2010 to assist the department in the following ways: gain insight and offer input into the mission, programs and activites of the department, facilitate the department in establishing mutually beneficial partnerships with individuals and corporations, actively participate in department fundraising efforts, assist in identifying and prioritizing resource needs of the department, participate in online discussions and attend annual on-campus meetings, represent the department to the ISU community at large as well as to external organizations.

Karthik Balakrishnan, Ph.D. in Computer Science from Iowa State University, boasts 25 years of experience in AI, with leadership roles at Verisk, Allstate Insurance, and Fireman's Fund/Allianz Insurance Company. As Verisk's senior vice president, he oversaw the IoT/Telematics business, managing P&L, sales, product development, technology, data science, and data management. With over 40 publications and a novel on Intelligent Agents from MIT Press, Balakrishnan is currently the global Chief Data and Analytics Officer at Principal Financial Group, driving modernization in data/analytics strategy, culture, and execution since 2021. He also chairs the External Advisory Committee for Software Engineering and received the Department's 2023 Distinguished Alumni Award, as seen in the photos on the left receiving the award from Dean Beate Schmittmann.

Kathy Hahn-Davidson, a 1973 Iowa State Computer Science graduate, began her career at Hewlett Packard (HP) as an R&D software engineer. Simultaneously pursuing a Computer Engineering graduate degree from Stanford, she spent nearly 30 years at HP, holding various R&D and management roles. Notably, she directed HP/Agilent Technology's Year 2000 Product Program, overseeing Y2K product efforts across 187 lines. Her contributions extended to innovative product development, including operating systems and networking for HP 1000, 3000, and 9000 systems. Post-HP, she served as senior director of operating systems engineering at Network Appliance, later consulting for startups. Retiring in 2003, Davidson's impact continued through her role on Iowa State's External Advisory Council, which resumed this year, and contributions to HP-related initiatives and scholarships. She is the recipient of the Department's 2021 Distinguished Alumni Award.

ALUMNI SPOTLIGHT: AL ARNOLD

Al Arnold smiles as he remembers an encounter with a group of middle school students while leading a Villages Honor Flight full of veterans at the National Mall in Washington, D.C.

"You could see their teacher leaning over to tell them who these veterans, were and what they had done," Arnold recalls. "These students were shaking the veterans' hands, saying 'Thank you for your service.' There is hope for our nation, you know!"

Arnold ('72 Computer Science) has seen much. Early on in his service, Arnold utilized his degree from Iowa State as he worked up the ranks to supervise teams for the Army's Computer Systems Command of Europe. Within his decades-long military career, he traveled the world and distinguished himself by serving as a technical warfare planner for NATO headquarters in Brussels, Belgium, and as a Pentagon project manager designing a first-of-its-kind defense travel system utilized by the entire Department of Defense. Arnold utilized his computer science degree to oversee many information technology firsts for the department.

His service didn't stop at retirement, and his work with The Villages Honor Flight is a testament to that fact. First introduced to the non-profit while greeting vets at Dulles Airport in 2010, Al would go on to serve as a guardian – someone who accompanies a veteran for their day of honor at the National Mall – and for several years held the office of president of The Villages Honor Flight of north central Florida, where he retired with his wife Phyllis.

"We expect our guardians here to be lifelong friends with their veterans and establish that kind of relationship," he says. "A lot of veterans that have seen combat duty are reluctant to share their stories, even with their family. So this is a time for them to get together to reflect and share their stories and their emotions that they may have held for decades."

Arnold's most cherished moments were from the time he spent as a guardian, and one memory in particular stands out.

"No doubt, the most memorable mission I was on was the one where I was a guardian for a Korean War U.S. Army lieutenant colonel," Arnold says. "He and I just clicked. Not only was it expected that we maintain our friendship, but he and his wife and my wife and I are very close and frequently socialize. In fact, we just helped them celebrate their 92nd and 93rd birthdays."

Throughout his life, Arnold has always come back to service. In addition to volunteering with The Villages Honor Flight, he also volunteers with the Military Retiree Activity Office assisting veterans with anything from retired pay to medical issues. In his community, as the president of the Helping Hands program, he works to get medical and mobility equipment into the hands of fellow residents through free temporary loans. Last year this project helped more than 8,400 residents.

After all of this giving, he has the most heartwarming stories to tell.

"Almost to the person, every veteran who goes on an Honor Flight mission says it was the best day of their life," Arnold says. "The entire day, everyone the veterans meet thanks them for their service. Honor Flight provides recognition and heartfelt thanks for their sacrifice from a grateful nation. Veterans have tears in their eyes at the end of the day."

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