

**UB** University at Buffalo The State University of New York

# COMPUTER SCIENCE AND ENGINEERING

—→  
GATEWAY TO GREATNESS







**A**T THE UNIVERSITY AT BUFFALO, COMMONLY REFERRED TO AS UB, WE ARE CONSTANTLY CREATING GATEWAYS.

These gateways – between faculty and students, across the wider university, and among our many alumni and friends – foster a dynamic, outward-leaning environment that leads to high-impact research and learning.

As a result, our student body, faculty membership and research funding are all substantially increasing.

This growth is fueled by our shared belief that computer science and computer engineering can make the world a smarter, safer and more prosperous place. That's why our faculty and students are conducting groundbreaking, interdisciplinary work to find innovative, cost-effective and reliable solutions to society's most pressing problems. That's why they're constantly probing the limits of what computing can accomplish.

It's all happening at our new state-of-the-art home, Davis Hall, which serves as the heart of UB's School of Engineering and Applied Sciences.



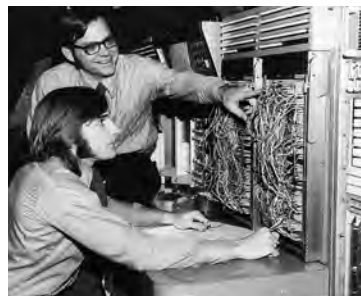
**Chunming Qiao**, PhD, IEEE Fellow, Professor and Chair

FIVE DECADES OF COMPUTER SCIENCE AT UB...

**CSE50**  
1967-2017

WE ARE CELEBRATING 50 YEARS OF INNOVATION AND INVENTION IN COMPUTER SCIENCE AND ENGINEERING AT UB.

When university leaders created the department, in 1967, computers were an oddity. The department's home wasn't even on campus. The five founding faculty members included chair Anthony Ralston, a math whiz and computing pioneer, and Patricia James Eberlein, who previously worked on Princeton University's Electronic Computer Project.



Much has changed.

From the new medical campus downtown to the historic South Campus and bustling North Campus, computers touch every facet of UB. Meanwhile, CSE's ranks have increased to 50-plus professors. Even our president, Satish K. Tripathi, is a computer scientist.

To ensure we remain one of the nation's best computer science and engineering departments, we continuously recruit topflight faculty and students; invest in facilities; and focus on research that makes positive impacts on society and helps us better understand the possibilities and limits of computing.

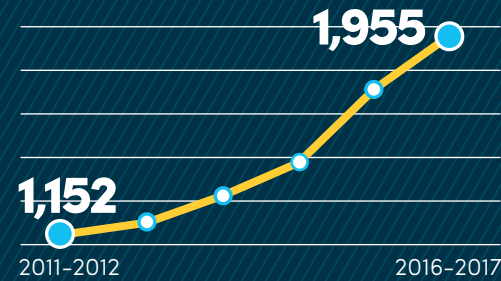
On Sept. 28, 29, 30 and Oct. 1 in 2017, we are hosting a 50th anniversary celebration to honor our world-class faculty, staff, students, alumni and friends, as well as reflect on the pioneers who created the department and the visionaries who continue to enhance it.

For more information, please visit: [cse.buffalo.edu/alumni](http://cse.buffalo.edu/alumni)

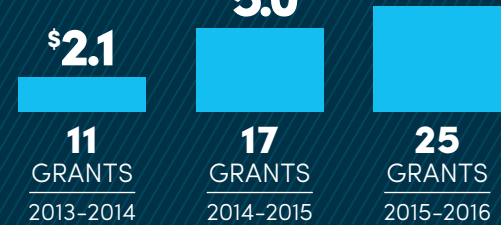
...AND STILL GROWING

With enrollment skyrocketing, research funding up, and exciting new faculty members joining our ranks, these are exciting times on the third floor of Davis Hall.

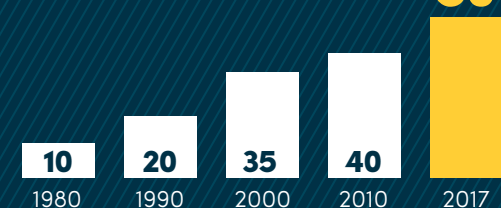
COMPUTER SCIENCE STUDENTS  
(undergraduate majors and graduate students)



RESEARCH FUNDING  
(in millions)



FACULTY MEMBERS



With an exterior of glass and copper-colored panels, Davis Hall brings to mind a printed circuit board. That's not a coincidence. The \$75 million eco-friendly building is, after all, our home.

Opened in 2012, the building is a hive of activity containing state-of-the-art offices, classrooms and laboratories. With open staircases and dynamic learning environments, Davis Hall is designed to promote interaction among faculty, students and staff. It's the type of environment where ideas are born over late-night coding sessions; where professors park their bicycles next to those of students; where coffee is consumed and drones fly.

In short, Davis Hall is one of the most exciting places to be on UB's North Campus, and it's the home of UB's School of Engineering and Applied Sciences.





# DRIVING OUR FUTURE

CSE RESEARCHERS LEAD PIONEERING SELF-DRIVING AND CONNECTED CAR RESEARCH FACILITY

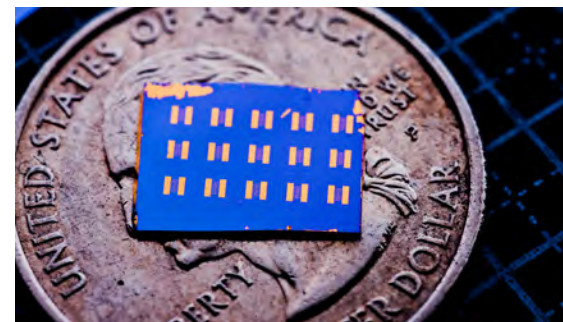
**We have created a dynamic testing facility where students, faculty, information technology companies, automakers and other industries can evaluate and validate their products and ideas."**

CHUNMING QIAO, principal investigator

Despite much progress bringing self-driving cars to the masses, questions remain regarding safety, efficiency, environmental impact and other issues.

To address these matters, UB computer scientists lead a unique research platform dubbed iCAVE2 (short for Instrument for Connected and Autonomous Vehicle Evaluation and Experimentation).

The platform syncs UB's driving, traffic and wireless networking simulators to connected and autonomous vehicles, as well as road sensors, wireless access points and other equipment along roads on UB's North Campus.



## USING ARTIFICIAL INTELLIGENCE TO DISCOVER NEW MATERIALS

It's not easy to discover new materials that we need to build better solar panels, create more powerful computers and bring about other advancements.



In fact, it's very difficult. So why not teach computers to do the job?

That's the idea behind the Materials Data Engineering Laboratory at UB (MaDE @UB), which uses artificial intelligence to collect, interpret and learn from massive datasets on the properties of metals, polymers and other materials.

Drawing upon CSE's expertise in artificial

intelligence, specifically machine learning and pattern recognition, the lab collects and interprets visual data from scientific studies that, until recently, were excluded from big data analysis of materials research.

**"This pioneering approach to advanced materials research will give the scientific community the tools it needs to accelerate the pace of discovery, leading to greater economic security and a wide range of societal benefits."**

venu GOVINDARAJU, principal investigator



**The idea is to help people with diabetes, obesity and other ailments by enabling them to better monitor their food intake."**

WENYAO XU, principal investigator

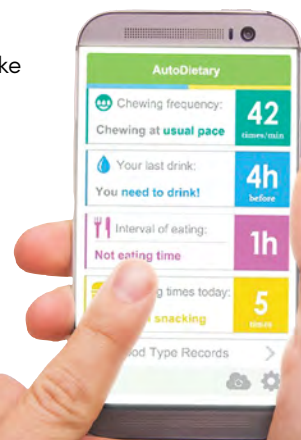
## THIS NECKLACE "HEARS" WHAT YOU EAT

Carrots and apples not only taste different. They make distinct sounds when chewed.

Trivial? Not in the lab of CSE's Wenyao Xu, who is developing a wearable device called AutoDietary that catalogues the unique sounds that foods make as we chew and swallow them.

AutoDietary is like Fitbit, only instead of tracking burned calories, it monitors caloric intake – in other words, what we eat.

It wraps around the back of the neck like a choker necklace. A tiny microphone records the sounds made during eating. That data is sent to a smartphone via Bluetooth, where food types are recognized.



## IN THE COMMUNITY

At UB, we're committed not only to scholarly excellence but also service. Our faculty members visit local schools to show youngsters that STEM (science, technology, engineering and mathematics) subjects are fun and exciting. Our students routinely host K-12 students as they visit Davis Hall and learn about the important work our department does.

It's all part of UB's School of Engineering and Applied Sciences' promotion of STEM in the Buffalo Niagara region and beyond.

### KID'S DAY PROMOTES COMPUTER SCIENCE

Hundreds of local students and their families gather each December for a night of fun and games to promote computer science. The event, Kid's Day, is part of the national Computer Science Education Week. Popular attractions include a Minecraft-style UB map in which kids defeat ghosts, and a challenge where children program robots by drawing "code" on paper. Other demos include a voice-controlled drone that looks like a parrot, an electronic version of the board game Connect 4, and a 3-D printer demo.



### READY. AIM. FIRE!

You can tell kids that computer engineering is cool. Or you can show them. CSE students opt for the latter, bringing a tennis ball shooting-cannon to Alden Middle School, where dozens of youngsters learn basic computer engineering principles in a fun and engaging way. The effort is part of a capstone design course, taught by CSE's Kris Schindler, who heads UB's Center for Socially Relevant Computing.

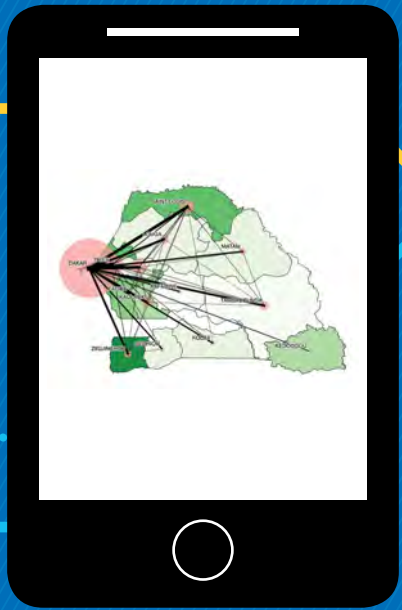


### TEENS DEFEND AGAINST SIMULATED CYBERATTACK

The list of companies, governments and individuals that fall victim to cyberattacks continues to grow. That's why CSE and partners host a free, weeklong summer camp called GenCyber that

introduces dozens of bright teenagers to cybersecurity as a future career option. "There is an ever-growing need to train people with the skills required in cybersecurity," says CSE's Shambhu Upadhyaya. Since 2009, UB has taught thousands of students the basic principles of cybersecurity.





# PINPOINTING POVERTY WITH BIG DATA

CSE DOCTORAL CANDIDATE FIGHTS EXTREME POVERTY IN SENEGAL BY ANALYZING TROVES OF CELLPHONE DATA



The key to ending extreme poverty may reside in cellphone records. Using call data records from millions of people, as well as census and household survey data, CSE doctoral student Neeti Pokhriyal is leading an effort to improve poverty maps in Senegal.

The work, which is sponsored by the Bill and Melinda Gates Foundation and other entities, has enabled Pokhriyal to travel to the African nation, where she is working with the national government and leading telecom provider Sonatel to develop a model to be implemented nationwide.

The maps she is developing provide an unparalleled look at which communities lack access to food, health care, education and other human necessities.

The approach could be replicated in other developing nations. It also could provide aid organizations and government agencies a quick and cost-efficient tool to prescribe policy solutions for millions of people who are often marginalized, such as women or the elderly.

**“The lack of data in underdeveloped countries is a serious concern. It impedes development and disaster-relief, as well as efforts to provide hundreds of millions of people with basic necessities such as education and health care.”**

NEETI POKHRIYAL



## CSE STUDENT DEVELOPS APP FOR EARLY AUTISM DETECTION

An app under development by CSE student Kun Woo Cho could help detect autism spectrum disorder (ASD) in children as young as 2 years old.

The app tracks eye movements of a child looking at pictures of social scenes — for example, those with multiple people.

**“We want to give parents a safe and effective way to assess ASD risk, and ultimately enable them to seek therapy sooner.”**

KUN WOO CHO

are scattered, versus a more focused pattern of children without ASD.

“We speculate that it is due to their lack of ability to interpret and understand the relationship depicted in the social scene,” Cho says.

“Right now it is a prototype. We have to consider if other neurological conditions are included, like ADD, and how that will affect the outcome,” says Cho, who studies under CSE’s Wenya Xu.

Photos of social scenes evoke the most dramatic differences in eye movement between children with and without ASD. The eye tracking patterns of children with ASD looking at the photos

## IN THEIR OWN WORDS

Our graduates work at some of the most exciting businesses, government agencies and universities worldwide. Here is what some have to say about their CSE education.

**STACEY ASKEY** BS/MS '15  
U.S. Department of Justice

*“I’m glad that I attended UB after leaving the military. Thanks to UB, and specifically CSE, I found an exciting and rewarding career that allows me to continue serving my country.”*

**MACKENZIE WARD** BS '15  
Software engineer at Facebook



*“From all-night hackathons to incredible internships, UB CSE is full of opportunities for students to go beyond the classroom.”*

**JASPREET CHAWLA** MS '16  
Data analyst at Amazon



*“The classes I took and the people I met at UB CSE helped sharpen both my hard and soft skills, making it a nearly seamless transition into the dynamic world of Amazon.”*

**HU DING** PhD, 2015  
Assistant professor, computer science and engineering, Michigan State University



*“UB’s CSE department has everything you need to succeed. That includes an engaged and inclusive student body, world-renowned faculty and cutting-edge facilities.”*

**PETER NOEL** PhD, 2009  
Professor, radiology and biomedical physics, Technical University of Munich



*“My education at UB CSE was outstanding! It provided me with the skills, knowledge and experience to succeed in academia.”*





University at Buffalo

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# DID YOU KNOW?

**ROBIN LI**, CO-FOUNDER, CHAIRMAN AND CHIEF EXECUTIVE OFFICER OF **BAIDU** INC., THE **CHINESE LANGUAGE EQUIVALENT TO GOOGLE**, GRADUATED FROM CSE IN 1994 WITH A MASTER'S DEGREE.

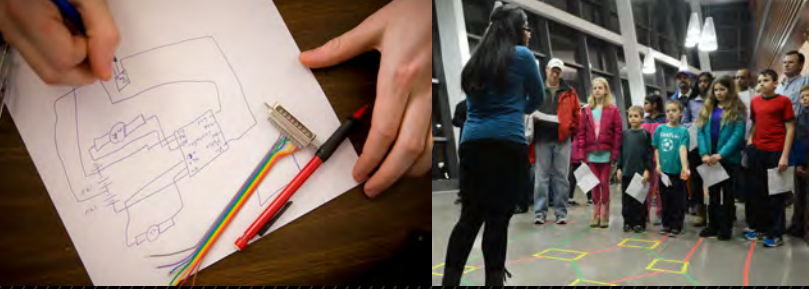


**HANDWRITING ANALYSIS TOOLS** DEVELOPED BY CSE RESEARCHERS HAS ENABLED THE **U.S. POST OFFICE** TO AUTOMATE MUCH OF ITS LETTER SORTING OPERATIONS, **SAVING BILLIONS OF DOLLARS.**

**CARL KESSELMAN**, A LOVELACE MEDAL WINNER WHO IS CREDITED WITH **CO-INVENTING GRID COMPUTING**, RECEIVED COMPUTER SCIENCE AND ELECTRICAL ENGINEERING DEGREES AT UB.



ASSOCIATE PROFESSOR **KEN REGAN** IS A FOREMOST EXPERT IN **DETECTING CHEATING IN CHESS.**



THE LATE **HERBERT HAUPTMAN**, FORMERLY AFFILIATED WITH CSE, WON THE **NOBLE PRIZE** IN CHEMISTRY IN 1985.



UB IS AMONG A SELECT FEW **FEDERALLY DESIGNATED UNIVERSITIES** WHOSE STUDENTS ARE RECRUITED DIRECTLY TO GOVERNMENT AGENCIES THAT **PROTECT THE NATION FROM CYBERATTACKS.**



FROM CLUE, POKER AND DICE TO MINECRAFT, CSE HAS A TRADITION OF **INTEGRATING GAMES** INTO ITS LEARNING ENVIRONMENT.