CSE BYTES

UNIVERSITY OF LOUISVILLE

December 2024

Chair's Message

As I begin my sixth year as Professor and Chair of the CSE Department, it's a good moment to reflect on our department's major achievements over the past five years. CSE has grown to become the largest and fastest-growing department in the Speed School. Let me share some of the key milestones:

Significant Enrollment Growth in Undergraduate and Graduate Programs: From 2019 to 2023, CSE undergraduate enrollment surged by 80% (383 to 690), and graduate enrollment rose 91.2% (114 to 218), **making CSE the largest and most dynamic department for both undergraduates and graduates in the Speed School.**

Research Excellence: **CSE faculty have secured numerous prestigious research grants from NSF, NSA, DoD, and other top organizations.** I am proud to have been awarded four NSF grants as Principal Investigator, bringing in over **$5.3 million** in funding within just the past four impressive years.

New Undergraduate Degree: Launched in Fall 2021 during the COVID-19 pandemic, the BACS program is Speed's first new undergraduate degree in years. **By Fall 2023, it had enrolled 348 students**, with Fall 2024 data pending.

Cybersecurity Leadership: **Kentucky's first and only CyberCorps SFS program** prepares graduate students with advanced knowledge and job-ready skills in cyber defense to join the federal cybersecurity workforce.

Accreditation Achievements: **Our BS in Computer Science and Engineering program earned dual ABET accreditation from EAC and CAC**, with no deficiencies, weaknesses, or concerns—affirming our commitment to excellence in computer engineering and computer science education.

Building Strategic Partnerships: **We have built strong partnerships with JCTC and GEA**, creating clear pathways for their students to advance into undergraduate or graduate programs in CSE, actively fostering enrollment growth and expanding opportunities for future students.

Despite the highest student-to-faculty ratio in Speed School, limited capacity, fierce competition from other institutions, and the rapid emergence of disruptive technologies, we remain steadfast in delivering excellent, innovative, inclusive computer science and engineering education and research while supporting student success.

On behalf of the CSE faculty and staff, thank you for your support, and I wish everyone a joyful and restful holiday season!

Dr. Wei Zhang

Professor and Chair

Computer Science and Engineering

CSE Faculty Secure $700K NSF Grant to Revolutionize Research Computing

LARCC Award to Build Advanced HTC Infrastructure for UofL and Beyond

The Department of Computer Science and Engineering is proud to announce that Dr. Nihat Altiparmak, Associate Professor, has secured a prestigious $700,000 grant from the NSF CC*-Compute program for his project titled **LARCC: Louisville Academic Research Compute Cluster**. This award is a testament to the innovation and leadership of our faculty in advancing computational research.

Dr. Altiparmak leads this initiative as the Principal Investigator (PI), joined by Co-Principal Investigators (Co-PIs) Dr. Sabur Baidya and Dr. Rui Yu, Senior Personnel Dr. Hichem Frigui, along with other Co-PIs and senior personnel outside CSE. Together, they will develop a state-of-the-art High-Throughput Computing (HTC) infrastructure designed to scale seamlessly across more than 150 collaborating institutions within the Open Science Grid (OSG). This transformative platform will address the majority of the University of Louisville's campus-wide scientific computing needs, empowering researchers with cutting-edge capabilities.

The LARCC project builds on the team's earlier success with the **CARDS: Cardinal Academic Research Data Storage** initiative, which received $500,000 from the NSF CC-Storage program last year. The CARDS project is developing a robust 6+ PB Ceph-based distributed data storage platform to support the university's growing data demands. Together, these grants represent a combined $1.2 million investment in enhancing UofL's computational and data storage infrastructure.

Dr. Nihat Altiparmak

Congratulations to Dr. Altiparmak and his team for their outstanding contributions to elevating UofL's research capabilities. These initiatives will not only benefit the university's research community but also contribute significantly to national and international scientific collaborations.

For more details about Dr. Altiparmak's work, visit his website.

Share Your News in CSE BYTES!

Got a project, achievement, or idea to share?
Submit articles, highlights, or announcements for the next issue!

Embracing Generative AI in Education:

Revolutionizing Assignments and Empowering Students in Learning Java Programming

BY NATHAN RUSSELL

Most Java/C++ instructors recall students who struggled to get "Hello World" to compile but suddenly turned in an insightful bit-twiddling hack or lambda expression. They found the same StackExchange recipe as students from previous semesters. The students often had no idea how the recipe worked and gained no insight from the assignment. Code-generating AI, like ChatGPT, could similarly invalidate the educational value of traditional classroom assignments. I decided that unless I encourage all my students to utilize AI there would be a significant imbalance in assignment outcomes. I redesigned my assignments to integrate AI, and it has been a very positive experience.

Frustrated students who used to spend hours debugging a typo are now more confident and willing to engage with challenging concepts. Instead of sending emails filled with frustration, they now engage in conversations about best practices. I encourage students to use Copilot's "explain this" feature. Rather than providing straightforward, basic code examples, I now offer much more advanced ones. For instance, I provide complex lambda expressions as starter code with the expectation that students will ask ChatGPT or Copilot to explain them or provide alternative equivalents they understand. This approach allows students to spend less time on trivial issues and more time exploring advanced representations.

Generative AI also enables me to rapidly create unit tests for grading assignments. These 300+ unit tests cover linting rules for style, numerical output tolerances, structural layout of source files (e.g., packages, interfaces, abstract classes, imports), and string output patterns using regular expressions. Students can run the unit tests using the Maven package manager before submitting their assignments, allowing them to verify accuracy beforehand. This removes the need for partial credit grading or regrading.

Students earn 10 points for accepting the assignment, 20 points for their first commit to their GitHub repository, and the remaining 70 points are awarded only if they pass all unit tests. GitHub workflows and AWS Lambda instances provide daily feedback on student progress with fine detail. Students are encouraged to study the autograding systems, which implement repurposed CI/CD tools commonly encountered in professional careers.

Generative AI is not merely the next iteration of the calculator-versus-precomputed-tables debate; it represents the next leap in education.

CSE Department Celebrates Renewal of NSF-Funded REU Site

Undergraduate Research Experience brings together students and faculty across states to advance computer systems research

In the summer of 2024, the Department of Computer Science and Engineering proudly hosted its NSF-funded Undergraduate Research Experience (REU) Site in Computer Systems. The program, recently renewed by the National Science Foundation, welcomed eight students from six institutions spanning Kentucky, Texas, and California.

The first day of the program was marked by an orientation and campus tour led by the Principal Investigator, Dr. Zhang, and Co-Principal Investigator, Dr. Altiparmak. Several CSE faculty members, including Drs. Baidya, Lauf, Nasraoui, and Yu, contributed as senior personnel or mentors, providing guidance and fostering the students' growth in computer systems research.

The REU site underscores the project team's commitment to engage undergraduate students in research in cutting-edge computing fields. Several REU alumni have become graduate students in CSE or elsewhere.

Chip Camp at UofL:

A Showcase of Innovation and Community Engagement at the Speed School of Engineering

The Department of Computer Science and Engineering (CSE) at the University of Louisville recently inspired future tech leaders through its Chip Design Camp, hosted during JCPS fall break. In collaboration with the Micro/Nano Technology Center (MNTC), this NSF-funded program welcomed 30 high school students eager to explore semiconductor technology and chip design.

Through engaging lectures, hands-on projects using FPGA boards, and a tour of UofL's cutting-edge cleanroom facilities, participants experienced the full lifecycle of chip design. The camp not only showcased UofL's advanced resources but also highlighted the expertise of CSE and MNTC faculty in fostering STEM education and engaging our communities.

This project involves Dr. Zhang (PI), and Dr. Lauf (CSE), and Dr. Morris (MNTC). Built on this success, the team plans to host another camp next summer to benefit even more high school students in our region.

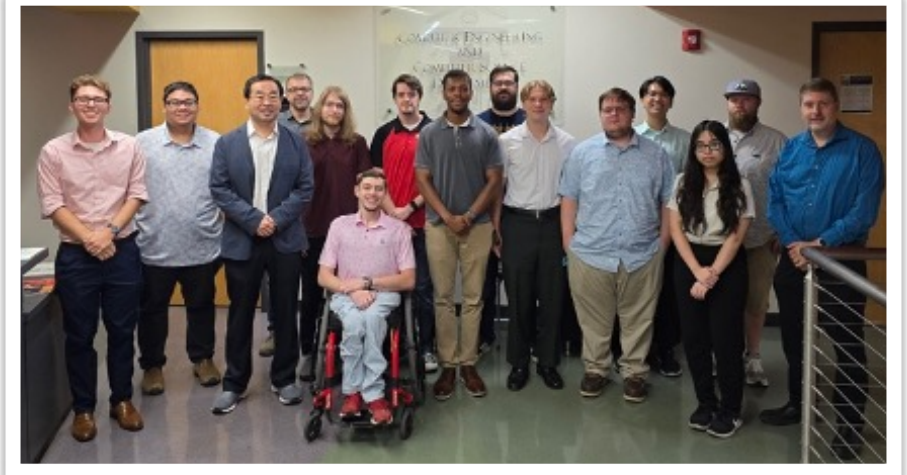
CyberCorps SFS in Kentucky

University of Louisville's NSF-Funded Program Prepares Students for Federal Cybersecurity Careers with Full Scholarships, Stipends, and National Competition Success

The CyberCorps Scholarship for Service (SFS) project, the first of its kind in Kentucky, proudly welcomed its second cohort in Fall 2024. This project, led by Dr. Zhang as the PI, has received more than $2.2 million from NSF, with a total grant of over $3.4 million committed.

The inaugural cohort consists of eight students, showcased in the first photo, while the second cohort, comprising five students, is featured in the group picture. All participating students have committed to serving in federal cybersecurity roles upon completing their master's degrees and graduate certificates in cybersecurity.

The program has already demonstrated remarkable success. Many SFS students have participated in prestigious cybersecurity competitions such as the National Cyber League (NCL), achieving outstanding individual and team results. In Spring 2024, UofL earned a top 16 ranking in the Cyber Skyline Power Ratings of Colleges and Universities across the nation, further cementing its reputation as a leader in cybersecurity education.



The group picture of the CyberCorps SFS program, featuring thirteen students dedicated to advancing cybersecurity and joining federal workforce.

The inaugural cohort of the CyberCorps SFS program, featuring eight pioneering students dedicated to advancing cybersecurity.

Students in the CyberCorps SFS program benefit from comprehensive support, including stipends, professional allowances, and full coverage of tuition and fees. Over the next two years, the program plans to recruit additional cohorts, expanding its impact and furthering its mission to address the nation's growing demand for skilled cybersecurity professionals.

More details about the program can be found at CyberCorps Scholarship for Service.

NSF Workshop Inspires Faculty on STEM Education Proposals

Experts Share Insights on NSF Programs, IRB Processes, and Proposal Strategies at University of Louisville

On December 9th, Drs. Zhang (CSE) and Aqlan (IE) co-hosted an NSF workshop focused on STEM education research proposals. The workshop featured a presentation by Dr. Eleanor Sayre, an NSF program officer in the Division of Undergraduate Education within the Directorate for STEM Education.

Dr. Sayre discussed how to prepare NSF proposal. Her responsibilities at NSF include:

- ★ Improving Undergraduate STEM Education (IUSE: EDU and IUSE Center)
- ★ Building Capacity in STEM Education Research (BCSER)
- ★ Mid-Career Advancement (MCA)
- ★ Scholarships in STEM (S-STEM)
- ★ Future of Semiconductors

In addition to Dr. Sayre's presentation, the workshop included a session on Institutional Review Board (IRB) processes led by Dr. Peter Quesada from Mechanical Engineering. A Principal Investigator (PI) panel, featuring UofL faculty members Drs. Marci DeCaro, Tom Tretter, Jason Saleem, and Campbell Bego, shared valuable insights and experiences related to STEM education research proposals.

Faculty and researchers from diverse departments attentively listen as Dr. Eleanor Sayre shares insights on NSF STEM education programs during the workshop.

Dr. Eleanor Sayre

The event attracted over 30 faculty and researchers. Additionally, Dr. Sayre conducted one-on-one meetings with 10 faculty members or groups from UofL and Bellarmine University to provide personalized feedback and guidance.

Ken Federle Honored as 2024 Alumni Professional Award Recipient in Computer Engineering

From designing Tomahawk Cruise Missile systems to leading global teams at Cummins, Federle's career highlights innovation, leadership, and mentoring future engineers.

Ken Federle has been awarded the 2024 Alumni Professional Award in Computer Engineering. Ken holds a Master of Engineering with a specialty in Computer Science from the University of Louisville J.B. Speed School of Engineering.

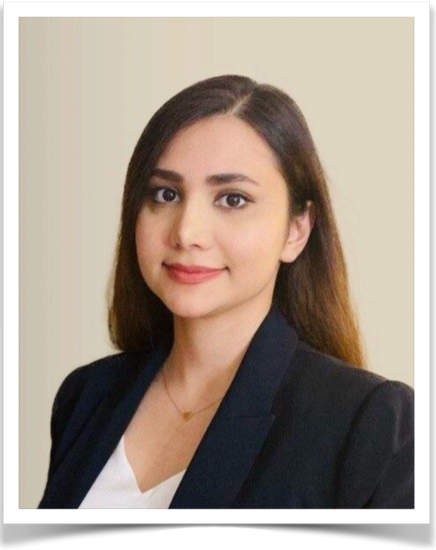
From left to right: Dr. Wei Zhang, Ken Federle, Dr. Emmanuel Collins.

After graduation, Ken spent 10 years working for the Naval Avionics Center in Indianapolis, Indiana. He led the design and development of the guidance and control system for the Tomahawk Cruise Missile program. Ken won the Naval Avionics Center Innovation of the Year award for his work on applying Landsat Satellite images to aid in mission planning for the Tomahawk Cruise Missile system.

Ken then worked for Cummins Incorporated for 30 years. During his career, he led engineering teams in engine controls, diesel engine development, diesel after-treatment systems, and advanced analytics. Ken was the Executive Director of Engineering for Cummins Emission Solution Business. He led a global engineering team of over 500 engineers across the United States, China, India, Europe, Brazil, and the United Kingdom. During his career, Ken was awarded six patents, with several additional patents pending approval.

Ken also led the Cummins recruiting team for the University of Louisville Speed School for seven years. For the past six years, he has been an active member of the Speed School Board of Industry Advisors.

Throughout Ken's career, he has been known for his innovative approach to solving complex engineering problems and his passion for developing engineers to help them achieve their career goals. Speed School provided Ken with a strong foundation to launch his career in engineering.



Dr. Soodeh Atefi

Introducing Dr. Soodeh Atefi, New Assistant Professor in Computer Science and Engineering

Soodeh Atefi has joined the Department of Computer Science and Engineering at the University of Louisville as an assistant professor term. Previously, she served as a postdoctoral fellow in the same department, starting in March 2024. Dr. Atefi earned both her M.S. and Ph.D. in computer science from the University of Houston, successfully defending her Ph.D. thesis in the summer of 2023. She received the Outstanding Ph.D. Dissertation Award for her doctoral research.

Her work focuses on applied artificial intelligence for optimization and decision-making under uncertainty, particularly in the context of cybersecurity. Dr. Atefi's research contributions have been published in prestigious computer science conferences, including the Association for the Advancement of Artificial Intelligence (AAAI) and the International World Wide Web Conference (WWW).

Call for Submissions: Share Your Stories in the Next Issue of CSE BYTES!

Do you have an exciting project, a recent achievement, or a thought-provoking idea to share with the CSE community? We're now accepting submissions for the next issue of *CSE BYTES*!

This is your chance to:

- Showcase innovative research and collaborations.
- Highlight awards, grants, student success, or notable accomplishments.
- Share reflections or insights on your field of expertise.
- Contribute to building a vibrant and connected department.

Submissions can be brief articles, project highlights, announcements, or even personal perspectives related to computer science and engineering.
How to submit: Email your articles to cse.info@louisville.edu or vivien.chao@louisville.edu

Help us make CSE BYTES an inspiring read for all!

“Together, we have built a community of dedication, innovation, and collaboration, and every step of progress is a testament to your hard work and passion. As we celebrate the achievements of this year, let’s take a moment to appreciate how far we’ve come, and the incredible strength we hold as a team. Thank you for your unwavering commitment. Wishing each and every one of you a joyful holiday season filled with peace, happiness, and the well-deserved rest you’ve earned!”