

VOLUME 1, ISSUE 6: JULY 2024

CSE, IIT KANPUR

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
IIT KANPUR**

Our heartiest congratulations to Prof. Manindra Agrawal for adorning the chair of DIRECTOR. Hope the institute reaches its peak of academic excellence with his long-term vision, leadership skills, and pronouncing deeds.



Dr. Adithya Vadapalli has been awarded the prestigious Rajiv & Ritu Batra New Faculty Fellowship for cutting edge research in the field of cyber security to ensure a safer and more secure digital future.

Prof. Pravesh Kothari currently a faculty at Princeton University, has joined the department as an adjunct faculty. Prof. Kothari is an alumnus of IITK and recently received the Young Alumnus Award.



Key Highlights

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Unveiling the Future of
Supercomputing

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Innovating today for a
smarter tomorrow

ACA**Page 15**

Empowering minds and
strengthening connections

Message from the Head



I am happy to present the CSE newsletter after a gap of 5 years. The department has achieved many successes in these years - from the launch of new programs to the establishment of new research centres. From groundbreaking research to impactful initiatives, we continue to make a difference in the field of computer science.

Our faculty members have excelled in diverse areas, including AI, Machine Learning, cyber security, algorithmic design, language technology, STEM education and pedagogy. Their contributions have not only advanced knowledge but also benefited society at large.

Our students remain the heart of our department. With their enthusiasm, curiosity, and dedication, they help us keep pushing boundaries and striving for excellence.

The newsletter is a reflection of the hard work and dedication of our faculty, staff, and students. I hope you enjoy reading about our achievements and activities.

FROM CLASSROOM TO BOARDROOM

AN AWE-INSPIRING JOURNEY

OF PERSEVERANCE AND DEDICATION TO EXCELLENCE

Prof. Manindra Agrawal's journey dates back to 1982 when he first set his foot on the hallowed grounds of IIT Kanpur to begin his undergraduate studies, a journey that has now spanned over four incredible decades. Though the years have passed, he still vividly recalls that first memorable day on campus that led him to this path of greatness.



Prof. Amey Karkare (HOD) felicitating the newly appointed Director did, on this journey from campus to career and beyond thus completing the path from classroom to boardroom.

Through his diligent study and groundbreaking research, Prof. Agrawal started climbing the staircases of success by obtaining his B.Tech and PhD in Computer Science and Engineering from IIT Kanpur. He went on to accept prestigious fellowships, positions and awards from all around the world pushing the boundaries of innovation and achieving milestones one after another, all while maintaining a deep connection to his alma mater. In 1996, he joined as an Assistant Professor in the Department of Computer Science and Engineering at IIT Kanpur. Among his many accomplishments, he co-created the seminal AKS primality test, receiving international recognition for his pivotal work. The private key encryption that he designed for the Indian Navy and Air force are used by the Armed force to secure their communication in today's time.

Now, after a long and peregrinated career devoted to academic pursuits, Prof. Agrawal has completed a full circle, taking the helm as Director of IIT Kanpur. From humble student to leading light among scholars, his journey serves as an inspiration to many. With profound gratitude for those who paved the way, Prof. Agrawal reaffirms that IIT Kanpur is not just a second home, but his first. As the torch is passed to this esteemed leader's steady hand, IIT Kanpur's brightest days are ahead. Under Prof. Agrawal's guidance, the institution will surely achieve new heights and solidify itself to be the undisputed best in the entire world. His vision will empower future generations to follow their dreams, as he once

ADMINISTRATIVE POSITIONS

- Deputy Director, IIT Kanpur, 2017-19.
- Dean of Faculty Affairs, IIT Kanpur, 2013-15.
- Dean of Resource Planning and Generation, IIT Kanpur, 2011-12.
- Head, Department of Computer Science and Engineering, IIT Kanpur, 2006-10.

ACHIEVEMENTS SO FAR...



Awarded Padma Shree by the President of India in 2013

AWARDS AND RECOGNITION

- Goyal Prize, 2017.
- NASI-Reliance Platinum Jubilee Award, 2015.
- ACCS-CDAC Foundation Award, 2014.
- Padma Shri by Government of India, 2013.
- H. K. Firodia Award, 2011.
- TWAS Prize in Mathematics, 2011.
- Rajib Goyal Prize, 2010.
- G. D. Birla Award for Scientific Research, 2009.
- Infosys Mathematics Prize, 2008.
- Fulkerson Prize, 2006.
- Godel Prize, 2006.
- ICTP prize, 2003.
- Fellow, Telangana Academy of Sciences, 2003
- Shanti Swarup Bhatnagar award in Mathematical Sciences, 2003.
- Recipient of Distinguished Alumnus Award, 2003 by IIT Kanpur.

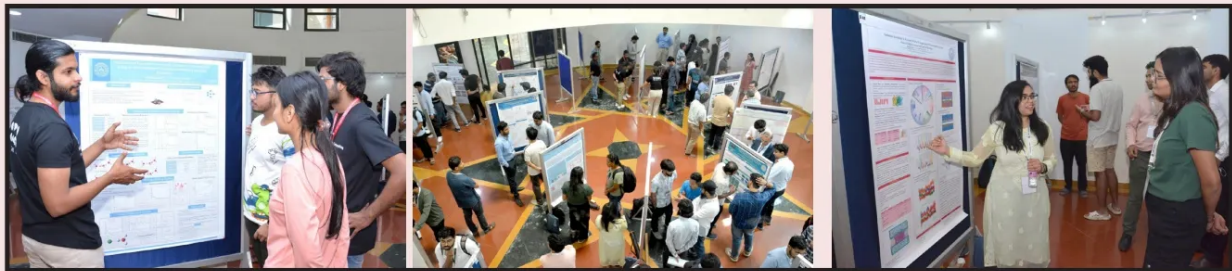
PROFESSIONAL ACTIVITIES

- Vice President, Indian Academy of Sciences, 2016-17.
- Member, Governing Council, Indian National Science Academy, 2016-17.
- Member, National Board of Higher Mathematics, 2015-19.
- Chairperson, INSPIRE Committee for Mathematical Sciences, 2016-20.
- Member, Board of Governors of IISER Bhopal, NISER Bhubaneswar, and IIIT Allahabad.
- Served on Governing Council of INAE and Science and Education Research Board.
- Editor, Computability journal (IOS).
- Editor, Theory of Computing journal (online journal published at university of Chicago).
- Program committee chair for the 20th IEEE Conference on Computational Complexity, July 2006, Prague, Czech Republic.
- Program committee co-chair for the 22nd Foundations of Software Technology and Theoretical Computer Science conference, December 2002, Kanpur.
- Served on the program committees of several conferences: CCC, FOCS, FSTTCS, AsiaCrypt, TAMC etc.

HPC SYMPOSIUM 2024



The HPC Symposium serves as a gathering point for HPC practitioners from diverse scientific and technological fields to showcase their research, exchange innovative concepts, and deliberate on the trajectory of computational science. Since its establishment, IIT Kanpur has been at the forefront of HPC innovation. The institution's HPC journey commenced with the IBM 1620, marking the first deployment of an HPC system within an academic setting in India. In the 1970s, the arrival of the DEC-1090 computer from the Digital Equipment Company became the central computing resource for nearly a decade. IIT Kanpur gained recognition in the top 500 rankings in 2010 and 2013 for its HPC2010 and HPC2013 systems, respectively. IIT Kanpur's new Param Sanganak system, ranking among the top 10 in India, has a peak capacity of 1.6 petaflops. The supercomputers have enabled research activities and publications at IIT Kanpur go a long way.



Poster presentations by the students

HPC SYMPOSIUM 2024 (CONTD.)



Inauguration Ceremony by Prof. Preeti Malakar and Prof. Nishant Nair, DDIA IITK



Speech by Prof. Preeti Malakar



DST Secretary Prof. Abhay Karadikar delivering his insightful vision on the future of supercomputing



Prof. Ashutosh Modi delivering his speech

The HPC Symposium 2024 was an incredible success in bringing together the best and brightest minds in High Performance Computing. The event was inaugurated by Prof. Nishant Nair, Dean, Digital Infrastructure and Automation; and Prof. Preeti Malakar, an esteemed faculty of CSE Department, HPC Coordinator.

The opening ceremony kicked things off with high energy and important guests. DST Secretary Prof. Abhay Karandikar thrilled the crowd with his keynote discussing how HPC is turbocharging science like never before. Students showed off their brilliant projects with engaging posters. The symposium featured enlightening talks from distinguished professors, dynamic poster displays by students, an invigorating brainstorming session about IIT Kanpur's aspirations for exascale computing, and a dialogue on the critical function of the HPC clusters at IIT Kanpur in advancing the institute's research to the leading edge of science and technology, all culminating in an uplifting finale.



RESEARCH SCHOLARS' DAY



Prof. Somnath Biswas presented a memento to the keynote speaker, Prof. Nitin Gupta (BSBE, IITK)

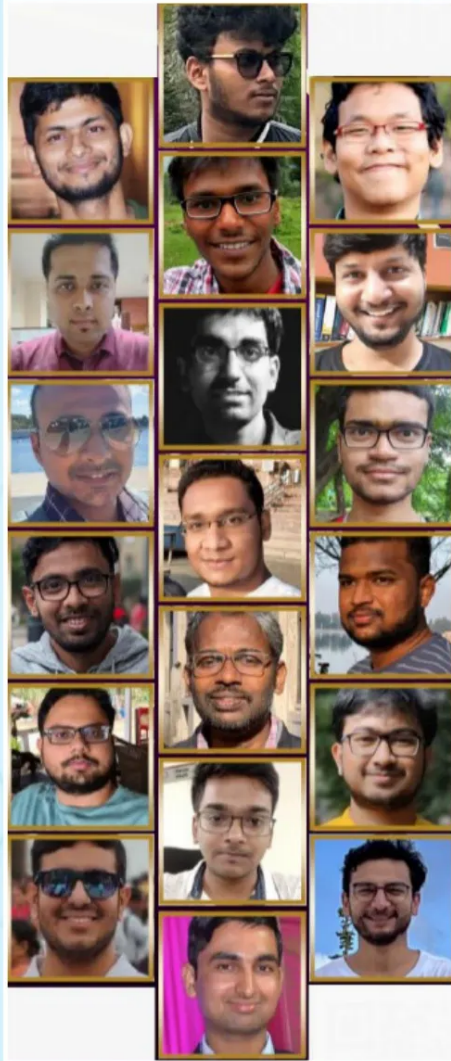
On April 7, 2024, the CSE Department celebrated its Research Scholars' Day in the RM101 Foyer. The objective of the event was to showcase the entire spectrum of student research activities going on in CSE department. The ceremony was officially opened by Professor Amey Karkare, the department's head, alongside student organizers. Both Professor Karkare and a student organizer addressed the attendees at the beginning with their opening speech. Professor Karkare highlighted the significance of the event in fostering peer engagement and enhancing the presentation abilities of the research scholars.

Prof. Nitin Gupta graced the event with his presence as a keynote speaker. He is also a distinguished SwarnaJayanti Fellow. His talk, "Variability and Reliability in Brain Networks," showcased his research findings on the consistency of the insect olfactory system's output and the variability in its connections, as well as his current work on how the brain's structure ensures consistent performance despite these variations.

The Research Scholars came up with 25 oral presentations, focusing on cutting-edge areas such as cybersecurity and cyber-physical systems, artificial intelligence and machine learning, computer systems and theoretical computer science. Following the final session, Prof. Purushottam Kar delivered the closing remarks. The program was entirely organized by CSE department research scholars with assistance from Professor Purushottam Kar, faculty advisor for the event.

RESEARCH SCHOLARS' DAY

25+ Oral Presentations



Student Participants

Cybersecurity and Cyber-physical Systems

Logic Locking,
Privacy Preservation,
Post-Quantum Cryptography,
Machine Learning Attacks,
Leak-resilient Strong PUFs,
Camouflaged Computing,
Fully Homomorphic Encryption

Theoretical Computer Science

Post-quantum Signatures,
Sensitivity Oracles,
Circuit Factorization

Computer Systems

Program Stack Persistence,
Container Live Migration

AI and Machine Learning

Deep Reinforcement Learning,
Automated Cognate Detection,
Human-like Game Playing,
Lifelong Adaptation,
Fairness,
Causal Commonsense
Reasoning,
NLP for Schizophrenia,
Emotion Recognition,
Embodied AI,
LLMs for Legal,
Clinical Apps,
Sign Language

RESEARCH AND DEVELOPMENT INITIATIVES



Prof. Amey Karkare

Funding Agency: Ministry of Education
Project Title: SATHEE Initiatives

Funding Agency: Jisa Soft tech Pvt. Ltd.
Project Title: Optimized Chip Architecture and Rtl Design For Pqc And Cryptographic Algorithms



Prof. Debapriya Basu Roy



Prof. Ashutosh Modi

Funding Agency: Mimansa Pvt. Ltd.
Project Title: Methods for identifying and redacting protected health information in clinical notes

Funding Agency: Microsoft Corporation
Project title: AI for developing Sign language techniques

Funding Agency: Wellcome Trust-DBT India Alliance
Project Title: Disentangling the Role of Spatial Celltype Architecture, Cell-state Transitions, Regulatory Programs, and Cell-Cell Communications in Cancer through Multiomics Analysis - Application in Cervical Cancer.



Prof. Hamim Zafar



Prof. Manindra Agrawal



Prof. Debapriya Basu Roy

Funding Agency: Defence R&D Organisation
Project Title: Implementation and Fault Analysis of Post Quantum Secure lattice and code based Cryptography

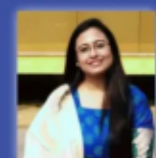


Prof. Soumya Dutta

Funding Agency: SERB
Project Title: Enabling Interactive Big Data Analytics and Visualization at Exascale via In Situ Efficient Statistical Data Modeling



Prof. Subhojit Roy



Prof. Urbi Chatterjee

Funding Agency: Defence R&D Organisation
Project Title: Toolkit for Vulnerability Analysis and Penetration Testing



Prof. Soumya Dutta



Prof. Purushottam Kar

Funding Agency: ISRO
Project Title: An Intelligent Data Analytics and Visualization Framework

MoUs SIGNED IN THE RECENT TIMES

- On January 2023, Microsoft India R&D Pvt. Ltd., Hyderabad signed a MoU with the IIT Kanpur to establish an academic partnership program. This program aims to foster innovation in areas such as earth and cloud computing as well as data-driven content creation. The goal of the partnership is to leverage the expertise of both organizations to advance research and development efforts within these emerging technical domains.
- In April 2023, Wipro GE Healthcare Private Limited, located in Bangalore, entered into a MoU with IIT Kanpur. This partnership aims to collaborate on the advancement of digital forensic technology for medical devices.
- In May 2023, the Information Technology Institute for the Tribes of India at Doon Sanskrit School in Dehradun formalized an agreement with IIT Kanpur. The objective of this MoU is to establish a state-of-the-art Advanced Innovative Integrated Laboratory at the ITITI Doon Sanskrit School premises.
- The IHUB NTIHAC Foundation recently entered into MoU with IIT Kanpur to jointly develop sector-specific Cyber Security Capability Maturity Models for the National Critical Information Infrastructure Protection Center. The models will focus on assessing and advancing the maturity of cyber defenses for different critical sectors covered by NCIIPC. This collaboration aims to help organizations in India's critical information infrastructure strengthen security practices and mitigate cyber risks.
- Intuit Inc, Mountain View, Carolina, USA, has formalized a Memorandum of Understanding with the Indian Institute of Technology Kanpur. The collaboration is focused on the development and generation of a range of semantically equivalent queries and prompts for general question-and-answer systems, as well as the analysis of the model's sensitivity to these varied inputs .
- In January 2023, Mimansa AL Pvt. Ltd., based in Haryana, established a MoU with IIT Kanpur. The collaboration is set to focus on the project entitled "Methods for Identifying and Redacting Protected Health Information in Clinical Notes."
- In September 2023, Intel Technology India Pvt. Ltd., Bengaluru, signed a MoU with IIT Kanpur. The purpose of this collaboration is to establish a Grant Agreement known as the Intel India Research Fellowship Agreement. This agreement aims to provide funding for a candidate to pursue a research project.
- In February 2024, RajCOMP Info Services Ltd (RISL) entered into a MoU with IIT Kanpur. The agreement is aimed at bolstering transparency and security through the use of cutting-edge e-Governance technologies. It includes the development and implementation of blockchain-based solutions to safeguard the integrity of data across various systems such as records management, integrated financial management systems, e-coupons, electronic health records, and the Janadhar residents' data repository.

STUDENTS ACHIEVEMENT

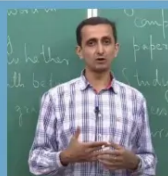
- Anindya Ganguly, PhD student received prestigious TCS scholarship in the year 2023. Professors Nitin Saxena and Angshuman Karmakar are mentoring him.
- Dr. Neeraj Kayal, a distinguished alumnus of the CSE department, has been awarded the prestigious Shanti Swarup Bhatnagar Prize in Mathematical Sciences for the year 2022. Dr. Kayal is presently associated with the Microsoft Research Lab in India. A hearty congratulations on this esteemed recognition!
- The poster paper authored by Akshay Kumar Sharma, an MS-R scholar, along with Depanshu Sahu, a BTech candidate, and Professor Preeti Malakar, has been recognized as the Best Poster Paper during the Student Research Symposium at the IEEE International Conference on High Performance Computing, Data, and Analytics (HiPC) 2023.
- The article 'scDREAMER: Atlas-Level Integration of Single-Cell Datasets via a Deep Generative Model with an Adversarial Classifier,' authored by doctoral candidates Ajita and Krishna, along with Professor Hamim Zafar, has been featured in Nature Communications.
- Pranjal Dutta has been honored with the 2023 ACM India Doctoral Dissertation Award. Under the guidance of Prof. Nitin Saxena, Pranjal's research was a collaborative effort between IIT Kanpur and CMI.
- Nimisha Agarwal, who is pursuing her PhD, along with her fellow authors, has been awarded the Best Paper at the 2023 ACM Global Computing Education Conference (CompEd). Under the mentorship of Prof. Amey Karkare, Nimisha has also been the recipient of the ACM India scholarship presented at CompEd 2023.
- The paper titled "Security Implications of Approximation: A Study of Trojan Attacks on Approximate Adders and Multipliers" by Vishesh Mishra and Prof. Urbi Chatterjee has received the Best Student Paper Award at 37th IEEE Conference of VLSI Design 2024.

A SPOTLIGHT ON THE SUCCESS OF OUR FACULTIES



Name: Prof. Mainak Chaudhuri

Award name: Distinguished teacher Award for UG & PG (2023)



Name: Prof. Raghunath Tewari

Award name: Excellence in Teaching at IITK (2023)



Name: Prof. Purushottam Kar

Award name:

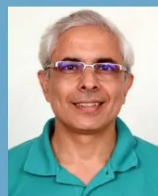
- Recipient of the 1989 Batch Faculty Award, acknowledging his efforts to enhance undergraduate teaching at IITK(2023)
- P K Kelkar Fellowship on May 2024



Name: Prof. Nitin Saxena

Award name:

- IIT Bombay international awards for excellence in research in Engineering and Technology (2023)
- Prestigious J.C. Bose Fellowship from DST/SCRB for his contribution to computational complexity theory, algebra, geometry, and number theory (2023)
- Elected as a fellow of INSA (2024)



Name: Prof. Surender Baswana

Award name: Distinguished teacher award encompassing both undergraduate and post-graduate students (2024)

FOCUS ON FACULTY RESEARCH

PROF. SATYADEV NANDAKUMAR



Our research group focuses on applying computer science ideas to information theory and compression. If Alice wants to transmit 10,000 zeroes to Bob, then the frugal Alice can save some money by instead sending the message “print 10,000 zeroes”. This is shorter than sending the raw data. Bob can then run the program at his end to recreate the data. If, at the other extreme, she wants to transmit 10,000 tosses of a fair coin (with Heads marked as 0, and Tails as 1, say), then she has to send the data as such. Assuming that Bob has an interpreter to run the program, Alice only needs to send the shortest program for any given data. Thus the optimal (lossless) compression of any data is the shortest program to print the data. The length of the shortest program for a string is called the Kolmogorov complexity of that string. The smaller the value, the less random that string is. Incompressible strings may be called random. We can extend this definition in a natural way to study infinite sequences.

We now have a notion of randomness which does not depend on any underlying probability. We then study the properties of such incompressible strings, and whether they satisfy the properties random data as studied in probability. This study involves proving theorems in probability using tools from computer science. Computer scientists and mathematicians also study several variations of this notion by limiting the power of computation. Instead of an arbitrary Turing-complete language, we may restrict ourselves to polynomial-depth circuits, polynomial-time computable programs, finite-state automata etc. This approach towards “resource-bounded” description complexity has directly led to the celebrated Lempel-Ziv algorithm, the basis of the widely used gzip compressor, besides widening our theoretical understanding of pseudo randomness. In addition, finite-state incompressible sequences turned out to be the same as “normal numbers”, well-studied in the mathematical literature for a century.

FOCUS ON FACULTY RESEARCH (CONTD.)

PROF. SATYADEV NANDAKUMAR

Recent studies: Is randomness preserved when we convert from one representation of data to another? For example, can a real number be highly compressible in decimal, but incompressible in binary? Results in the literature showed that changing bases, for example, from binary to ternary or decimal, does not change the compressibility when conversion is done with arbitrary programs, or polynomial-time programs. Finite-state computation paints a different picture: in mathematical literature, it was known that there are numbers normal in base 2 but not in base 3. On the other hand, there are also “absolutely normal” numbers, which are normal in every base. So finite-state incompressibility is preserved for some numbers and violated for others, when we change bases.

Recent achievement 1: This leads to a question: is there a well-known representation of real numbers where the compression ratio is not maintained even when we use full-blown Turing machines? It seemed unlikely. Our group when studying the information characteristics of continued fraction representation (Nandakumar, Vishnoi 2020; Vishnoi 2022) show that, surprisingly, even when you use full-blown Turing machines, for some numbers, continued fractions have a different compressibility ratio than base- b representation (Akhil, Nandakumar, Vishnoi 2023). This is the first “well-known” representation where this violation has been proven.

Recent achievement 2: Quantitatively, the finite-state compressibility of a real number in a particular base is a number between 0 and 1, with 0 corresponding to highly compressible numbers such as rationals, and 1 to the normal numbers in that base. Absolutely normal numbers have finite-state compressibility 1 any base. (The construction of such numbers has engaged such mathematical luminaries as Turing and Sierpinski.) Rationals, on the other hand, have finite-state compressibility 0 in every base. Generalizing this, Lutz and Mayordomo in 2012 asked a broad generalization: is there any real number such that in every base-bits finite-state incompressibility is the same numbers, but s is strictly between 0 and 1? Exhibiting this phenomenon for a single compressibility ratio s was sufficient to settle this question. This question resisted attempts at solution for about a decade. We (Nandakumar, Pulari 2023) answer the open question - we show that for every compressibility ratio s between 0 and 1, there is a single real r such that the expansion of r in any base will have compressibility ratio s in that base. This generalizes the concept of absolutely normal numbers to “absolutely dimensioned numbers”..

Recent achievement 3: The Weyl criterion (1916) is an elegant connection between randomness of sequences of reals and the convergence of a certain exponential sum. This also characterizes normal numbers in terms of exponential sums. Over the course of a century, Weyl’s criterion has proved to be one of the elegant tools connecting analytical number theory and the study of normal numbers. Can we define the compressibility of all numbers, even those which are not normal, generalizing Weyl criterion? This was a difficult question which was attempted by researchers, but without much progress. One of the issues is that for non-normal numbers, the sums may diverge, so it was not clear whether this was even possible. Recently we (Lutz, Nandakumar, Pulari 2023) generalized the Weyl criterion to characterize the finite-state compressibility of any sequence, even when the sums diverge! This connects ideas in Fourier series, weak convergence of probability measures and Renyi dimension. We also apply this to strictly improve several theorems infinite-state compressibility.

INVITED TALKS AND SEMINARS

- Dr. Prafullkumar Tale, a prospective faculty candidate in Computer Science Engineering, presented a seminar titled "Parameterized Complexity of Some Graph Problems" on January 12th, 2023.
- Talk on "Towards effective human-robot collaboration through learning from demonstrations and metacognitive shared autonomous systems" by Dr. Raunak Bhattacharyya is a Postdoctoral Research Associate with the Oxford Robotics Institute, University of Oxford, on 2nd March 2023.
- Invited talk on "Securing 5G and Future Generations of Networks" was given by Prof. DaSilva is internationally recognized for his contributions to wireless communications and network research, on April 12th, 2023.
- Invited talk on "Should Programming Pedagogy and Assessment Change in Response to Advances in Generative AI?" by Dr Viraj Kumar, a Visiting Professor at the Kotak IISc AI ML Centre at IISc Bangalore, on June 30th, 2023.
- Dr. Shreya, a research academic at the Optus-Curtin Center of Excellence in Artificial Intelligence within Curtin University's School of Electrical Engineering, Computing and Mathematical Sciences, was invited to give a talk titled "Computational Modeling of Human Non-verbal Behavior 'in-the-wild'" on July 20, 2023.
- Dr. Prerana Mukherjee presented a faculty candidate seminar on 25th July 2023 entitled "The Impact of Attentional Selection on Intelligent Transport Systems." Dr. Mukherjee is presently serving as an Assistant Professor in the Department of Computer Science at the School of Engineering, JNU.
- Research talk on "Resource Allocation Techniques for extending the performance of Long-Range Network" by Dr. Preti Kumari, a postdoctoral fellow at the National University of Singapore, on August 1st, 2023.
- Seminar on "Deep Internal Learning for image restoration and image synthesis" by Dr. Indra Deep Mastan, LNMIIT Jaipur, on August 10, 2023.
- Dr. Sayantan Sen, a Post doctoral Research fellow at NUS Singapore presented a specialized talk entitled "Testing of Index-Invariant Properties in the Huge Object Model." on August 8th, 2023.
- On August 22nd, 2023, an enlightening session titled "Empowering bright underprivileged students through high quality Computer Science education" was presented by Dr. Amit Singhal, the esteemed founder of both Sitare University and the Sitare Foundation.
- CSE Seminar on "Formal Methods for Software Reliability and Synthesis" by Ashish Mishra, a Postdoctoral Researcher at Purdue University, on 5th October 2023.
- Invited seminar on "Securing Processors against Side-Channel Attacks: CPU Caches, Schedulers, and Beyond!" by Professor Gururaj Saileshwar, University of Toronto, on 18th October 2023.
- Talk on "The Kikuchi Matrix Method: New Spectral Algorithms for Smoothed k-SAT and Applications to Combinatorics" by Dr. Pravesh Kothari, an Assistant Professor of Computer Science at Carnegie Mellon University, on November 1st, 2023.
- Presentation on 'Analyzing the Security of Lattice-based Cryptographic Assumptions' delivered by Dr. Dipayan Das, a Postdoctoral Researcher at CISPA-Helmholtz Center for Information Security within Antoine Joux's team, dated November 24, 2023.

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- Talk on “Graph-searching games with imperfect information” by Dietmar Berwanger CNRS, Laboratoire Méthodes Formelles, ENS Paris-Saclay, on December 12th, 2023.
- A Mentorship Session on “A Look into the Future: Circuits and Systems for a Distributed Network of Wearables and Implants utilizing Human Tissue Conductivity” was delivered by Prof. Mohit Bansal, UNC Chapel Hill, on January 11th, 2024.
- Invited talk on “Multimodal Problems in Computational Social Sciences” by Prof. Rajiv Ratn Shah, an Associate Professor, IIT Delhi in the Department of Computer Science and Engineering (jointly with the Department of Human-centered Design), on February 5th, 2024.
- Talk on “How Indians Won Silicon Valley” was delivered by Prof. Shivanand Kanavi, an alumnus of IITK, on February 12th, 2024.
- A lecture was delivered on Spiking Neural Networks: Techniques for Training and Their Inherent Robustness Against Adversarial Attacks was given by Dr. Bhaskar Mukhoty of MBZUAI, February 13, 2024.
- Dr. Shailja Thakur, a postdoctoral fellow at New York University’s Tandon School of Engineering, gave a talk on “Towards Secure, Interpretable, and Scalable Machine Learning Applications in Cyber-Physical Systems” on February 16th, 2024. The main aim was to discuss efforts to develop machine learning techniques that are secure, interpretable and can scale for use in systems involving both computation and physical processes.
- The presentation titled “Multi-Robot Communication-aware Cooperative Belief Space Planning with Inconsistent Beliefs” was delivered by Tanmoy Kundu, who is conducting postdoctoral research at the Technion - Israel Institute of Technology, on the 15th of March, 2024.
- Prof. Ramesh Karri and Prof. Siddharth Garg, distinguished faculties of the Department of Electrical and Computer Engineering, New York University, presented a talk on two intriguing topics, “High-level Approaches to Hardware and Embedded Security” and “Foundation Models: The Good, the Backdoors and the Ugly”, respectively on 29th May 2024.

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ASSOCIATION FOR COMPUTING ACTIVITIES (ACA)

The Association for Computing Activities (ACA) at IIT Kanpur, established to foster the Computer Science community, aims to spread knowledge about Computer Science and technology among students through workshops, seminars, and educational events. It encourages student involvement in extracurricular engineering projects, provides computing resources and guidance, and promotes student-student and student-teacher interaction. ACA organizes a plethora of departmental activities including Happy Hours, technical workshops, guest lectures and farewell events.

It also offers a dynamic platform for students to delve into diverse realms of computer science through semester projects spanning from foundational topics like Data Structures and Algorithms to cutting-edge fields such as Machine Learning, Artificial Intelligence, and Blockchains. Under the mentorship of seasoned seniors, these projects serve as an avenue for students to immerse themselves in new technologies and tools, expanding their knowledge base and honing their skills in practical problem-solving within the realm of Computer Science.



With ACA Co-ordinator Prof. Sunil Simon



Happy Hour

ACA's Happy Hour is a highly anticipated event, eagerly awaited by students and professors alike. This fun-filled gathering offers a delightful blend of free food, engaging games, and enjoyable activities, providing a perfect opportunity for everyone to unwind and socialize in a laid-back atmosphere. From stimulating puzzles to interactive games, Happy Hour promises an evening brimming with laughter and camaraderie, fostering meaningful connections and creating lasting memories within the vibrant community of the CSE department at IIT Kanpur.



Interaction Sessions

ASSOCIATION FOR COMPUTING ACTIVITIES (CONTD.)

ACA group also organized a farewell, marking the end of the college journey for graduating students. This heartfelt gathering provides a platform to reflect on the experiences shared, express gratitude to mentors and peers, and bid adieu to the campus life that has shaped them over the years. With a blend of nostalgia, laughter, and heartfelt goodbyes it serves as a reminder of the bonds formed and the memories cherished throughout the college years. It holds a special tradition of recognizing excellence in teaching by presentation of the Best Teacher Award. For the academic year 2023-24, it was presented to Prof. Surender Baswana.

ACA also organizes a guidance session for internships, offering invaluable insights, tips, and tricks to excel in the upcoming internship season. Whether it's resume building, interview preparation, or networking strategies, students can expect comprehensive guidance to enhance their internship experience.



Distinguished teacher award to Prof Mainak Chaudhury by 2023 graduating class



Interaction session amongst students

The academic year of 2023-2024 culminated with a heartfelt farewell ceremony dedicated to the graduating class of 2024. Prior to this, there was an one-on-one feedback session where professors engaged with



Feedback session



Distinguished teacher award to Prof. Surender Baswana by the 2024 graduating class

students from the graduating batch. The day concluded with a vibrant and joyous evening filled with laughter and cherished memories.

NEW COURSES CREATED

SECURE COMPUTATION (CS670A)



Prof. Adithya Vadapalli

Secure Computation is an innovative method that enables users to maintain the privacy of their data while still enjoying the advantages of the Internet. There's no doubt that the Internet has transformed our lives by simplifying daily tasks and linking people globally, yet it also brings significant risks. Therefore, this course aims to equip students with the skills to address practical privacy issues, many of which stem from the growth of the Internet. On completion of this course, a student should be able to: (i) articulate the definition of Secure Multiparty Computation (ii) articulate different MPC constructions, prove their security and correctness; (iii) articulate the definitions of Oblivious Random Access; (iv) articulate the construction of different types of Oblivious RAM protocols; (v) build cryptographically secure systems using Secure Computation.

PATENTS GRANTED

SYSTEM AND METHOD FOR MANAGING VIRTUAL LEARNING PROCESS



Prof. Amey Karkare

A system and method for managing virtual learning process in a computing environment (100) is disclosed. The method includes receiving a command from a user to access data representative of learning. The method further includes determining identity of the user based on an ID associated with the user and determining type of user interface to be fetched for accessing the data representative of learning based on the determined identity of the user. Further, the method includes determining type of the received command by parsing the received command and retrieving the data representative of learning associated with the received command and the determined type of user interface from a storage unit (206) based on the determined identity of the user and determined type of the received command. The method includes displaying the retrieved data representative of learning associated with the received command on an electronic device.

SYSTEM AND METHOD FOR KERNEL-LEVEL ACTIVE DARKNET MONITORING IN A COMMUNICATION NETWORK

A system and method for kernel-level active darknet monitoring in a communication network is disclosed. The system receives TCP packets from initiator devices and determines dark internet protocol (IP) addresses in the packets by comparing destination IP address with a plurality of IP addresses stored in a dark IP pool. If the packets are determined to be destined for dark IP addresses, the system modifies flag and type in socket buffer and routing entry associated with packets. The system retrieves outbound interface IP addresses and creates a socket corresponding to the retrieved outbound interface IP addresses, for transmitting a SYN-ACK packet corresponding to the TCP packets. The system is configured to monitor dark IP addresses received through network traffic. Finally, the system outputs the SYN-ACK packet to initiator devices to establish a three-wayhandshake. The system receives an ACK from initiator devices (attackers) to establish a 3-way handshake.



Prof. Sandeep Shukla

EVENTS, ACTIVITIES, AND COLLABORATIONS



In the collaborative venture between IIT Kanpur and Rice University, Professor Amitangshu Pal has been honored with the RICE-IITK Strategic Collaboration Award for the period of 2023-2024. This recognition underscores the productive partnership between IIT Kanpur and Rice University.

Indo- Australia joint workshop on Advanced Innovations in Cryptography and Cloud Technology Privacy (AICCTP)

The Indian Institute of Technology Kanpur recently took part in the AICCTP Workshop at the University of Wollongong, Australia on May 2024.



This workshop was part of a project titled 'Standardisation and Development of Practical Privacy Enhancing Cryptographic Techniques for Cloud Computing' and was funded by DFAT. The initiative is co-led by Prof. Manindra Agrawal, Director of IIT Kanpur, and Prof. Willy Susilo. Among the Indian participants, Dr. Adithya Vadapalli, Dr. Debapriya Basu Roy, and Dr. Urbi Chatterjee from the Department of Computer Science and Engineering at IIT Kanpur were prominent speakers. This two-day event was

a pioneering gathering for both academics and professionals focusing on the latest breakthroughs and standardization efforts in the fields of cryptography and cloud computing privacy.



On the 15th of March, 2024, Prof. Angshuman Karmakar and Prof. Urbi Chatterjee was awarded the esteemed NYU Tandon-IIT Kanpur Joint Research Funding Grant.



The C3i Hub at IIT Kanpur, which serves as a National Technology Innovation Hub for cutting-edge cybersecurity, unveiled its third, fourth, and fifth startup cohorts at the Hyatt Regency in New Delhi on March 2024. This initiative is supported by the Department of Science and Technology as part of the NM-ICPS Mission and introduced 19 emerging companies as part of its Startup Incubation Program. These startups are focused on niche areas of cybersecurity such as Application Security, Integrated SOC Solutions, Cyber Forensics, Blockchain Technology, and Security for Unmanned Aerial Vehicles (UAVs).



In April 2024, Professor Frank Vetere and a team from The University of Melbourne visited the campus. The group, along with notable faculty members, of the CSE dept. engaged in discussions on a range of topics including renewable energy, climate change, and advancements in medical technology. They also reviewed the construction progress of the Gangwal School of Medical Sciences and Technology. This visit opened avenues for future academic collaborations.



A New Chapter Begins with the Inauguration of C3i Hub's New Office Space in IIT Kanpur. Under the leadership of Prof. Sandeep Shukla and Dr. Tanima Hajra this new office space will facilitate C3i Hub's efforts in creating critical security solutions for the country.

VOLUME 1, ISSUE 6: JULY 2024

CSE, IIT KANPUR

List of CSE, IITK Faculty

- | | | |
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- Prateek Jain
- Rajesh Kumar Gupta

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- Snigdha Chaturvedi
- Pravesh Kothari

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