

SMRITI

Department of Computer Science and Engineering

VOLUME : 13 ISSUE : 4

The logo for SSN (Sri Sathya Sai Institute of Higher Learning) is located in the bottom right corner. It consists of the lowercase letters 'ssn' in a bold, blue, sans-serif font. The 's' and 'n' are connected, and the 's' has a distinctive shape with a thick stroke.

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EDITORIAL DESK

The Department of Computer Science and Engineering at Sri Sivasubramaniya Nadar College of Engineering is proud to unveil *Smriti* – Volume 13, Issue 4, a testament to yet another remarkable quarter marked by innovation, academic rigor, collaborative growth, and impactful student achievements. This edition reflects the department's unwavering commitment to excellence across academia, research, industry engagement, and social responsibility.

We extend our heartfelt congratulations to **Dr. Sakali Raghavendra Kumar** and **Dr. Anusha Jayasimhan** for being recognized as Ph.D. Supervisors by Anna University – a significant milestone in their academic journey. It is also commendable that our faculty's collaboration with **Purdue University Northwest** has culminated in a project proposal submission to **DST-Vaibhav**. In addition, the meaningful engagements with the **National Research Centre for Banana** are sincerely appreciated.

Our students have continued to demonstrate their prowess across prestigious platforms. Notably, **Team PlutusAI** emerged as second runners-up in the **SBI Life Hack-AI-Thon**, and **Team NeoC@ts** exhibited outstanding problem-solving skills at the **Caterpillar Tech-a-thon**. At the **Naan Mudhalvan Niral Thiruvizha 2.0 Hackathon**, the AI-powered solution "*Makkal Kural*", a petition management system, secured a position among the top 20 teams and was awarded innovation vouchers for further development. Special congratulations to **Dr. S. Rajalakshmi** and her student team for their achievement.

In a significant step towards inclusivity, the department organized a transformative training program for the **Deaf and Hard of Hearing**, resulting in successful placements at **DHL**. We commend **Dr. T.T. Mirnalinee**, **Dr. B. Prabavathy**, and **Dr. J. Rajeswari** for their dedication to social impact through this initiative. The department also hosted the **X3D Workshop**, led by **Dr. Magesh Chandramouli** from Purdue University, providing students with valuable insights and hands-on experience in interactive 3D web graphics.

Our students gained exposure to advanced technologies through internships at esteemed institutions such as **Goldman Sachs**, **DRDO**, and **NIT Trichy**, delving into areas like **quantum computing** and **multi-agent systems**. Meanwhile, our alumni continue to make a mark – exemplified by the **ValueOneUp** app, which highlights the practical relevance of our educational framework. This edition also features technical articles on **Quantum Computing**, **Explainable AI**, and **Open Source Development**, alongside an **Art Corner** that celebrates the creative spirit of our students.

As we reflect on these collective accomplishments, we remain steadfast in our vision to emerge as a global leader in technology education and research. We express our sincere gratitude to our dedicated faculty, talented students, industry collaborators, and the editorial team for their relentless efforts. Together, we move forward – pushing boundaries, inspiring innovation, and upholding the enduring legacy of excellence that defines **SSN CSE**.

SMRITI Editorial Team

EXTERNAL INTERACTIONS AND RECOGNITIONS

Purdue University Northwest

Dr. T. T. Mirnalinee, Professor & Head/CSE and Dr. S. Angel Deborah, AP/CSE had research interactions with Dr. Magesh Chandramouli, Professor, Computer Information Technology & Graphics on 12th May 2025 Purdue University Northwest USA. As a result of it a research project titled “An Adaptive AR Therapeutic Platform for Cognitive and Emotional Skill Development in Children with Autism” has been submitted to DST-Vaibhav. Also Dr.Magesh arranged to be a resource person for the workshop on X3D.

National Research Centre for Banana

Dr. R. Kanchana along with **Prof. S. Selvakumar**, Prof, NITT and our UG student visited NRCB (National Research Centre for Banana), Tiruchirappalli and met Dr. Selvarajan, Director and Dr. Prabhu, Scientist for a possible research collaboration on 6th June 2025. They visited the 100-acre farm to understand the ongoing research projects.



Ashok Leyland

Dr.S.Rajalakshmi and **Dr.S.Angel Deborah** arranged for displaying the students' projects to the industry experts team of Ashok Leyland on Saturday, 12th July 2025. Students demonstrated their projects and received suggestions from the industry experts. **Dr.T.T.Mirnalinee** and **Dr.S.Rajalakshmi** interacted with Dr. Arvind, Deputy General Manager Project Planning at Ashok Leyland and his team members regarding possible collaboration.

Naan Mudhalvan Niral Thiruvizha 2.0

The CSE team, comprising Dr. S. Rajalakshmi and final-year graduands Sanjai Balajee, Sanjiit, Pranav, and Pooja Premnath, with the project titled "Makkal Kural: AI-based Petition Tracking System," was selected as one of the top 50 teams in Naan Mudhalvan Niral Thiruvizha 2.0 on July 7,

2025. The top 50 teams will be awarded 2 lakh Innovation Vouchers to further develop and commercialize their ideas, transforming them into startups.

BoS Member and Subject Expert

- **Dr. R. Kanchana** is invited to be a BoS member as subject expert for the faculty of CSE comprising programs BE(CSE), BTech(IT), and B.Tech(AI&DS) at Mepco Schlenk Engineering College, Sivakasi. On 2nd May, she attended the BoS meeting and reviewed the curriculum and syllabus.
- **Dr. Anusha Jayasimhan** has been nominated as a subject expert by Anna University for formulation of syllabus for the courses titled "Mobile App Development" & "Large Language Models". These courses shall be included in the curriculum of the B.Tech. (Information Technology), offered in affiliated institutions (non-autonomous) under the ambit of Anna University, from the ensuing academic year 2025 – 2026.

External Examiner for Phd Viva Voce

- **Dr. R. Kanchana** was invited as an External examiner for Project Viva-voce of ME(CSE) students in the Dept of CSE, NIT, Tiruchirappalli on 6th June 2025.
- **Dr. R. Kanchana** was invited to be an external examiner for the project viva-voce of B.Tech(IT) in the department of IST, CEG, Anna University on 8th May 2025.
- **Dr. Mirunalini P.** acted as external examiner at Rajiv Gandhi National Institute of youth development.

DC Members

- **Dr. Suresh J.** attended the First Doctoral Committee Meeting for Mr. Kishore Kumar of Sathyabama University on 30.06.2025
- **Dr. Suresh J.** attended the Synopsis Meeting for Ms. Patankar Ruhil Ajit of Sathyabama University on 30.06.2025 by 2:00 PM.
- **Dr. B. Bharathi**, ASP/CSE attended Doctoral Committee confirmation meeting for the research scholar Mr. Sankar T C, guided by Dr.V.Jamuna, Professor (EEE) and Dean-Student Affairs, Jerusalem College of Engineering on 8th July 2025 through online mode.
- **Dr. B. Bharathi**, ASP/CSE attended synopsis meeting for the research scholar Ms.Kripa Sekaran S on 17/07/25 at 1:30 PM at Seminar Hall, St Josephs College of Engineering
- **Dr. D. Thenmozhi** attended a DC meeting at SIMATS Engineering on 22nd July 2025.

MOCK NBA Expert

- **Dr. D. Thenmozhi** served as an expert for MOCK NBA audit at Jeppiar Engineering College on 23rd July 2025.

Invited Talks

- **Dr. T.T. Mirnalinee** delivered a session on Outcome Based Education on 01-07-2025, as a part of the five-day Faculty Development Programme on "Innovative Teaching and Research Practices for Holistic Development", held at VELS Institute of Science, Technology & Advanced Studies (VISTAS)

- **Dr. Bharathi B.** delivered a guest lecture on "Hands-on with NLP Tools (Text Classification & Chatbots)" at the Faculty Development Program on "Harnessing Intelligent Systems: Accelerating Digital Evolution in the Industry 5.0 Framework", Panimalar Engineering College, Chennai on 26.06.2025.
- **Dr. Ajaykumar Reddy** delivered a technical talk on "Multimedia Quality Assessment and its Importance in Optimizing the Performance of Image Processing Algorithms" at Jawaharlal Nehru Technological University, Kakinada Narasaraopet Campus (JNTUK Narasaraopet), a state government university, on 21st and 22nd July 2025.

Session Chair

- **Dr. Vijaya Lakshmi A.**, Assistant Professor, Department of Computer Science and Engineering, acted as a Session Chair in the 2nd International Conference on Computing and Data Science (ICCDs-2025) organized by the Department of Computer Science and Engineering, Rajalakshmi Engineering College on 25th and 26th July 2025.

Supervisor Recognition

- **Dr. Sakali Raghavendra Kumar** has been recognized as a Supervisor (Ref. No: 4540011) by Anna University for guiding Ph.D. scholars of the University under the Faculty of Information and Communication Engineering, effective from 16/06/2025.
- **Dr. Anusha Jayasimhan**, Assistant Professor has been recognized as a Supervisor by Anna University for guiding Ph.D. scholars of the University under the Faculty of Information and Communication Engineering.

INDUSTRY COLLABORATION

- **Dr.S.Rajalakshmi, Dr.S.Angel Deborah, Mr.V.S. Pranav, Mr.V.Yashasvee and Mr.Yenumulapalli Venkatasai Ojus** had online meetings with Mr.Ajoy Iphen and Mr. Sree Gururaj Jayachander of Caterpillar on May 2nd and 8th, 2025 regarding the progress in the consultancy project.
- **Dr.S.Rajalakshmi, Dr.S.Angel Deborah, Mr.V.S. Pranav, Mr.V.Yashasvee and Mr.Yenumulapalli Venkatasai Ojus** had online meetings with Mr.Ajoy Iphen and Mr. Sree Gururaj Jayachander of Caterpillar on June 19, 2025, to demonstrate the final version of their consultancy project.
- A project discussion meeting with the alumni was held on July 7, 2025 at 7PM to 8PM. Dr.Kala Vijayakumar, Dr.Radha S, Dr.Shahina A, **Dr.Mirnalinee T T**, Dr.Chandran Krishnan, Mr.Ananda V Raman Neelakandan, **Dr.Rajalakshmi S, Dr.Lakshmi Priya S**, Dr.Sripriya Natarajan, Dr.Subramanian A and Dr.Uthayan Kanni Rajendran interacted with the alumni industry experts Naveen Elangho, and Sai Subramanian and discussed about the project proposal.
- As part of ongoing efforts to enhance industry interaction, the Department has engaged domain experts as adjunct and contract faculty for the ODD Semester 2025–26. These initiatives aim to bridge the gap between academic concepts and real-world applications through expert-led, practice-oriented learning.

- Mr. Karuppusamy Prabhu Mysamy, Software Architect, Kyureeus, Dr. Rajesh Venkatesan, Computational AI Cybersecurity Scientist, Kyureeus, and Dr. Ranjani Venkataraman, Founder & CEO, Kyureeus, Co-Founder, Rezilyens LLC & Pinochle LLC, have been appointed as industry subject experts to conduct the course UCS2703 – Software Architecture for VII Semester students (Sections A, B & C).
- Dr. Kaushik Hatti Chief Information Security Officer, AI & Cybersecurity Expert is delivering the course UCS2728 – *Introduction to Blockchain Technologies* for VII Semester students.
- Mr. Agnel Joshua Raj D, Founder & CEO, DEZPROX LLP, has been appointed as the industry subject expert to conduct the course UCS2727 - User Experience Design (Professional Elective 4) for VII Semester students.
- Mr. Anand Kumar, Cognizant Technology Solutions, is handling the course UCS2734 – *Agile Methodologies* (Professional Elective 5) for VII Semester students
- Mr. Arunagiri Suresh, Security Operations Center (SOC) Engineer, Rezilyens is handling *Cyber Security* for 3rd semester P.G students.

MEMORANDUM OF UNDERSTANDING

- A Memorandum of Understanding (MoU) is signed between **Istinye University, Turkey**, and Sri Sivasubramaniya Nadar College of Engineering, India. Collaborative initiatives such as joint research, faculty and student exchange, and expert lectures are planned. **Dr. T.T. Mirnalinee, Dr. J. Bhuvana coordinated the MoU process.**

PUBLICATIONS

Journal Publications

- **Dr. Rajalakshmi Sivanaiah, Dr. Angel Deborah Suseelan**, Krupa Elizabeth Thannickal, Sanmati Pirabahr , “Depression and post traumatic stress disorder analysis with multi-modal data”, IAES International Journal of Artificial Intelligence (IJ-AI) (Quartile: Q2)Volume: 14,No:3, pp. 2358-2366, June 2025.
- Apurva NARAYAN, Charumathi PARIVALLAL, Olirva MAHESWARAN, **Sarath CHANDRAN K R**, "Prototyping a graph-based approach for efficient vehicle tracking in a cluster controlled CCTV surveillance systems", Romanian Journal of Information Technology and Automatic Control (WoS), ISSN 1220-1758, vol. 35(2), pp. 99-109, July 2025. (<https://doi.org/10.33436/v35i2y202508>)
- **Dr. K.R. Sarath Chandran**, Adithi Shankar, and Geethapriya Thandavamurthi , “Tailored Video Summarization: Catering to Patient and Impatient Users” , ICTACT journal on image and video processing (UGC Care), MAY 2025, VOLUME: 15, ISSUE: 04, pp: 3563 – 3568. (DOI: 10.21917/ijivp.2025.0504).
- **Dr. Thenmozhi D**, ASP/CSE, Multimodal few-shot learning for plant disease detection with contrastive pre-training and query addressal, Neural Computing and Applications, Vol:0, issue:0, Scopus, IF:1.102, Quartile:Q1

- **Ajay Kumar Reddy Poreddy**, Enhancing Surgical Laparoscopic Video Quality Assessment With Integrated Feature Fusion Accounting for Sensor and Transmission Distortions, IEEE Sensors Letters, Vol:9, issue:5, Clarivate, IF:2.2, Quartile:Q2, DOI:<https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=10935625>, ISSN:2475-1472, May 2025.
- **Prabavathy Balasundaram**, Pradeep Ganesh, Pravinkrishnan K, Rahul Kumar Mukesh, “A Novel Technology Stack for Automated Road Quality Assessment Framework using Deep Learning Techniques” June 2024 EMITTER International Journal of Engineering Technology 12(1):62-89 DOI: 10.24003/emitter.v12i1.83724.
- **Prabavathy Balasundaram**, Sushaanth Srinivasan and Sharvesh Shankar, A Novel Multimodal-imaging based Approach for Early Detection of Glaucoma using Deep Learning Techniques, International Journal of Natural Sciences, Vol:15, issue:84, Clarivate, IF:-, Quartile:-, DOI:-, ISSN:- June 2024
- **Thenmozhi D**, Kalaivani A, Effective Offensive Language Deduction Using Deep Learning In Social Media, Revue Roumaine Des Sciences Techniques—Série Électrotechnique Et Énergétique, Vol:69, issue:2, Clarivate, IF:0.26, Quartile:Q3, DOI:<https://doi.org/10.59277/RRST-EE.2024.2.14>, ISSN:0035-4066, July 2024
- Srinivasan, D., **Mirunalini, P.**, Desingu, K.M R, Maheshwari, Text-conditioned image generation using diffusion models. Multimed Tools Appl (2025).Vol:Online First, issue:-,Scopus,IF:3.0, Quartile:Q1, DOI:<https://doi.org/10.1007/s11042-025-20990-0>, June 2025
- **Sujaudeen Nannai John**, Lakshmi Priya Swaminatha Rao, Gayathri Venkatesan and Dharshni M, “Time Series Forecasting Analysis for Automated Smart Meter Reading System, Indian Journal of Energy and Energy Resources (IJEER), Vol. 4, No. 3, pp. 13-20, May 2025, Online ISSN: 2583-1186. <http://dx.doi.org/10.2139/ssrn.5252530>
- **D. Venkata Vara Prasad, Lokeswari Y.Venkataramana**, Rushitaa “Water Quality analysis of Well Water using Machine Learning Techniques”, International Journal of Environmental Sciences, Vol. 11 No. 5S, May 2025,ISSN: 2229-7359
- **JAGANATHAN, Suresh**; VEERAMANI, Karthika. Ledger on internet of things: a blockchain framework for resource-constrained devices. IAES International Journal of Artificial Intelligence (IJ-AI), [S.l.], v. 14, n. 3, p. 2506-2518, June 2025. ISSN 2252-8938. Available at: <https://ijai.iaescore.com/index.php/IJAI/article/view/25765>, Quartile: Q2.

Conference Presentations / Publications

- **Dr. Suresh Jaganathan**, presented a paper entitled "Design of Attendance Ledger using Hyperledger Framework" in the three-day ACM-sponsored International Conference on 7th Blockchain and Internet of Things (BIOTC-2025), organised by the University of Tsukuba, Tsukuba, Japan, from 25.06.2025 to 27.06.2025.



- Dr. K. A. Muthukumar** had the opportunity to attend the prestigious EMBC (Engineering in Medicine and Biology Conference) held in Copenhagen from July 12-18. During the event, I presented my research paper titled "EEG-Based Analysis of Breakfast Impact on Cognitive Performance Using Earth Mover Divergence." This work focuses on analyzing the relationship between dietary habits and cognitive performance, using EEG signals and advanced computational methods such as Earth Mover Divergence to quantify the effects of breakfast consumption. It was an enriching experience to engage with experts and peers in the field, gaining valuable feedback and fostering potential collaborations.



- Jahnvi Murali and **Dr. Rajalakshmi Sivanaiah**, SSN_MMHS@DravidianLangTech 2025: A Dual Transformer Approach for Multimodal Hate Speech Detection in Dravidian Languages, Proceedings of the Fifth Workshop on Speech, Vision, and Language Technologies for Dravidian Languages, pages 297–301 May 3, 2025, 2025 Annual Conference of the Nations of the Americas Chapter of the Association for Computational Linguistics (NAACL 2025), Albuquerque, New Mexico.
- Nithish M, Thiyagarajan P, **Dr. Rajalakshmi S**, DETECTING DECEPTION: A COMPARATIVE STUDY OF CNN APPROACHES FOR DEEP FAKE IMAGE DETECTION, 2025 2nd International Conference on Research Methodologies in Knowledge Management, Artificial Intelligence and Telecommunication Engineering (RMKMATE) 07 & 08 May 2025.
- **Dr. Vijayalakshmi A** presented a paper entitled "Enhanced Image Steganography Using Neural Style Transfer" in the two day International IEEE Conference on Advancements in Electrical, Electronics, Communication, Computing and Automation (ICAECA) organized by Kumaraguru college of technology, Coimbatore during April 4-5, 2025
- **Dr. Anusha Jayasimhan**, Assistant Professor presented a paper titled "An analysis of training Convolution Neural Networks for image classification using distributed deep learning" at the Second International Conference on Cognitive Robotics and Intelligent Systems (ICC-ROBINS 2025) held at KPR Institute of Engineering and Technology, Coimbatore on June 25-26, 2025.
- Ashwanth Ram Damodaran, **Rajeswari Jarayaraman**, Akila Rajesh, presented a paper titled "Tamil Text Summarization Using Graph Convolutional Networks And Googles MT5 Transformer," at the 2025 3rd International Conference on Advancements in Electrical, Electronics, Communication, Computing and Automation (ICAECA), Coimbatore, India, 2025, pp. 1-6, doi: 10.1109/ICAECA63854.2025.11012323.
- **Durairaj Thenmozhi**, Sripriya N, Bharathi B, Nandhini K, Kishore Kumar Ponnusamy, Charmathi Rajkumar, Prasanna Kumar Kumaresan, Rahul Ponnusamy, Bharathi Raja Chakravarthi presented a paper - Title: Insights into Sarcasm Detection in Social Media Posts for Dravidian Languages: Tamil and Malayalam, Proceedings of the 16th Annual Meeting of the Forum for Information Retrieval Evaluation, FIRE 2024, Held at DAIICT Gujarat.

International Joint Conference on Neural Networks (IJCNN 2025) held in Rome, Italy from June 30-July 5, 2025.

Dr. Anusha Jayasimhan from SSN College of Engineering attended the International Joint Conference on Neural Networks (IJCNN 2025) held from 30th June to 5th July 2025 at the Pontifical Gregorian University, Rome. The event brought together leading researchers and practitioners in the field of neural networks and artificial intelligence.

She presented her paper titled "A White-Box Knowledge Distillation Approach for Task-Optimized Large Language Model Compression". Her research focuses on optimizing large language models through task-aware distillation strategies and intermediate layer matching to enable more energy-efficient and generalizable NLP systems enabling sustainable AI development.

The conference featured a series of thought-provoking keynote addresses by global experts. Highlights included Prof. Sepp Hochreiter's unveiling of xLSTM, a scalable alternative to Transformers; Dr. Francesca Rossi's insights on AI ethics in the generative era; and Dr. Giacomo



Rizzolatti's talk on the neural basis of action and emotion through the mirror mechanism. Other distinguished speakers explored emerging themes in neurosymbolic AI, generative world models, and tensor networks for AGI, making it a deeply enriching intellectual experience. Alongside, the conference featured several cutting-edge papers addressing advances in neural network architectures, model interpretability, continual learning, and AI for biomedical, healthcare, legal and environmental applications offering an inspiring view of the intelligent systems for the betterment of the society at large.

Participating in IJCNN 2025 was an enriching academic and cultural experience for Dr. Jayasimhan, enabling her to connect with international researchers and contribute to the

global dialogue on sustainable, responsible AI and paving the way for future research directions

Patent Filed

- **Dr. S. Angel Deborah AP/CSE/SSNCE, Dr.S. Radha Principal/SSNCE, Dr. R.Hemalatha Associate Professor/ECE/SSNCE, Dr. M. Alagar TNAU, Dr. V. Baskaran TNAU, Sai Shashaank UG Alumni/SSNCE, Varun S. Roshan UG Alumni/SSNCE** has filed a patent titled "Early Stage Red Palm Weevil Detector with Edge-Based Monitoring "in collaboration with TNAU under Application Number 202541043033 on May 3, 2025.

SCHOLAR INFORMATIONS

- **Dr. J. Bhuvana,ASP/CSE** conducted the confirmation DC meeting for her full-time research scholar, Ms.Malarvizhi S on 14th May 2025.
- **Dr. Thenmozhi D,ASP/CSE** conducted the confirmation DC meeting for her part-time research scholar, Ms. G. Shimi on 29th May 2025.
- **Dr. Mirnalinee T T** conducted PhD viva voce for the full-time candidate Ms. S. Benisha
- **Dr. Mirnalinee T T** conducted confirmation DC meeting for her part-time scholar Ms. Deva Kiruba Dani on 5th June
- **Dr. Thenmozhi D** conducted the confirmation DC Meeting for her part-time research scholar, Ms.G.Shimi on 29th May 2025.

- **Dr. Bharathi B.** conducted the confirmation DC meeting for her full-time research scholar, Ms. K. Sreeja on 10.06.2025
- **Dr. Thenmozhi D** conducted the confirmation DC Meeting for her part-time research scholar, Mr.G.Sampath on 12th June 2025
- **Dr. B. Prabavathy**, conducted a confirmation DC meeting on 09.06.2025 for the part-time research scholar, A. S. Balaji, Reg. No. 22144997265
- **Dr. Mirnalinee T T** attended Synopsis meeting for the fulltime scholar at CEG Anna university.

PROJECTS APPLIED

- **Dr. R. Kanchana** submitted a research proposal titled “MANASIKA SVASTHYA: AI-driven system for Monitoring the Impact of Yoga and Meditation on Physical and Mental health using Multimodal data through Biofeedback and Personalized Digital Tools” to DST under the scheme SHRI (Science and Heritage Research Initiative) on 20th May 2025. The Co-PIs are Dr. B Geethanjali BME, Dr. L Suganthi BME and Dr. N. Radha, IT and the Budget is Rs. 1,85,31,228/-
- Project Title: A Hybrid EEG-Audio Enabled Assistive Edge Device for Stuttering Detection and Speech Correction, PI: **Dr. B. Bharathi**, Co-PI: **Dr. J. Bhuvana** ASP/CSE and Dr. R. Rajalakshmi, Professor/CSE, VIT Chennai, Total Budget (INR): 97,52,332, Funding Agency: ANRF-ARG
- Project Title: Graph Neural Networks for Efficient and Scalable Solutions in Combinatorial Optimization;Description: Leveraging the power of GNNs to approximately yet efficiently solve NP-complete optimization problems;PI: **Dr. Dhannya**. SM/AP/CSE;Total Budget: 25 lakhs; Funding Agency: Anusandhan National Research Foundation (ANRF - ARG MATRICS-2025)
- An project proposal titled “: "AutoGrade+: A LLM-based System for Digital Evaluation of Handwritten Scripts " was submitted to ANRF under Advanced Research Grant scheme on 15th july 2025 With Dr.Sripriya N as PI **Mirunalini.P**,Mohanavalli S, Shanmuga priya S and Vasuki P as CO-PIs for cost of 50,52,000/- .
- A project proposal titled “A Multimodal Framework for Psychological Behavioural Analysis in Learning Environments Based on Cognitive and Mathematical Assessments” was submitted to the ANRF Advanced Research Grant (ARG) scheme. The project is led by Dr. Appina Balasubramanyam (Principal Investigator) from IIT Indore, with **Dr. Poreddy Ajay Kumar Reddy (SSN CE)** and Prof. Ram Bilas Pachori (IIT Indore) as Co-Principal Investigators. The total proposed budget for the project is ₹82 lakhs.
- **Dr. Poreddy Ajay Kumar Reddy** submitted a project proposal titled “A Mathematical Framework for Joint Estimation of Quality, Realism, and Semantic Alignment in Artificial Intelligence Generated Videos” to the ANRF MATRICS scheme. The total proposed budget for the project is ₹15 lakhs.
- **Dr. K. A. Muthukumar** has successfully submitted a proposal for the India-Taiwan Programme of Cooperation in Science & Technology, responding to the 2025 Call for Joint Research Project Proposals. The proposal is titled "Securing Large Language Models using Prompt Protocol and Blockchain Auditing" and focuses on improving the security of large language models (LLMs) through innovative prompt protocols combined with blockchain

auditing techniques. The project, which seeks a funding budget of 36 lakhs, aims to address the growing concerns regarding the integrity and security of AI models, proposing a robust solution for ensuring transparency and trustworthiness.

PROJECT UPDATE

- **Dr. T. T. Mirnalinee** presented the project titled An Adaptive AR Therapeutic Platform for Cognitive and Emotional Skill Development in Children with Autism under VAIBHAV Fellowship
- **Dr.S.Rajalakshmi** and **Dr.S.Angel Deborah** submitted the hard copy of the project proposal titled Voice Enabled Braille Interpretation Pad for the second round with budget Rs89,950 to TNSCST-Innovation and Product Development cell on July 25, 2025.

PAPERS REVIEWED

- **Dr.S.Rajalakshmi** reviewed one paper on May 30, 2025 for Cluster Computing Journal.
- **Dr.S.Rajalakshmi** reviewed one paper in June 9, 2025 for LT-EDI 2025 : Fifth Workshop on Language Technology for Equality, Diversity, Inclusion to be conducted as a part of LDK 2025 – 5th Conference on Language, Data and Knowledge on Sep 9, 2025, Naples, Italy.
- **Dr.S.Rajalakshmi** reviewed one paper in June 30, 2025 for the European Journal on Artificial Intelligence
- **Dr. Sarath Chandran K. R.,AP/CSE** reviewed one manuscript for Displays Journal (Elsevier) on 30th May 2025.
- **Dr. S. Angel Deborah** reviewed a paper for Fifth workshop on Language Technology for Equality, Diversity, Inclusion 2025 to be held in Naples, Italy.
- **Dr. S. Angel Deborah**, AP/CSE reviewed a paper for Multimedia Tools and Applications, Springer on 26th June 2025.
- **Dr. S. Angel Deborah** reviewed a paper for Intelligent Decision Technologies, IOS Press on 30th May 2025.
- **Dr. S. Angel Deborah** reviewed a paper for Multimedia Tools and Applications, Springer on 14th May 2025.
- **Dr. Anusha Jayasimhan**, AP/CSE reviewed a paper for the journal of Signal, Image and Video Processing on 2nd June, 2025.
- **Dr.V.S.Felix Enigo** has reviewed a paper titled " Enhancement of Ancient Stone Inscription Images using Deep Learning Techniques: A Hybrid Approach" for the ACM Transaction on Asian Low-resource Language and Information Processing in April 2025.

EVENTS ORGANIZED

Training Program for Deaf and Hard of Hearing Individuals

This program, envisioned by our President Dr. Kala Vijayakumar, aims to empower Deaf and Hard of Hearing (DHH) individuals by providing specialized training for non-voice job roles and to place them as well. This program was scheduled from 5th May to 6th June 2025. Seventeen DHH students from St. Louis College for the Deaf, Adyar with academic backgrounds, namely B.Com. (General) and B.C.A. have attended the training. The program was inaugurated on 5th May, at CSE Seminar Hall. The language interpretation was provided by Ms. Vijaya Bhaskar, Interpreter from the Pudhiya Thalaimurai News Channel.

This program was organized by the Department of Computer Science and Engineering. Dr. T. T. Mirnalinee, Professor and Head, Dr. B. Prabavathy, Associate Professor and Dr. J. Rajeswari, Assistant Professor coordinated the event.



The training program was designed to equip participants with industry-ready skills tailored for non-voice job roles, significantly enhancing their confidence and employability. Beyond technical training, the program ensured a conducive learning environment by offering full support in the form of accommodation and food, allowing the participants to focus entirely on their development.

During this period, students were trained in the foundational aspects of written communication, including grammar, prefixes, and suffixes. This training was conducted by Dr. Martha Karunakar, Dr. Nimeshika Venkatesan, Dr. Praveen Sam, Dr. Sanchar Sarkar, and Dr. Vijaya Bhaskar. They also learned key principles of customer service such as appropriate tone, clarity, and email etiquette. To simulate real-world scenarios, students engaged in role-playing exercises focused on live chat support and customer interactions, facilitated by Dr. Prasanna Mohan Raj, Dr. Nizamudeen Anvar, and Ms. Naveena. These sessions included sentence construction, role-play dialogues, and email responses, all supported with





extensive worksheet practice. Additionally, Dr. Praba and Dr. B. Sivakumar provided essential aptitude training, covering concepts like ratio, proportion, age-related problems, and percentage calculations.

Supplementary activities such as sentence-building worksheets, homework assignments, essay writing, story reading, and typing tests were also included to reinforce learning and improve writing fluency. A lot

of such activities were prepared and conducted by Dr. B. Prabavathy, and Nandini Sree Alumnus from Batch 2021-2025.

The entire training program was interpreted by Mrs. S. Sathya Geetha, Assistant Professor from St. Louis College for the Deaf, Adyar. The valedictory ceremony, held on 6th June 2025, was a memorable occasion. The ceremony was graced by our respected President, Dr. Kala Vijayakumar, whose inspiring address motivated the participants and highlighted the importance of inclusion in the workplace. It featured the presence of Mr. Imthiyaz Sherrif C, CEO of Uniorn Diversity and his team along with Mr. Karthik, HR



Head of DHL Global Forwarding Shared Services, and his team who engaged in meaningful discussions around employment opportunities for Deaf and Hard of Hearing individuals. Their insights and commitment added great value to the event. During the event, certificates were distributed to the

participants in recognition of their successful completion of the training.

We are pleased to share that eight participants from this batch have secured placements in DHL marking a strong beginning to what we envision as a continued journey of success. We are also proud to share that one of the DHH candidates from this cohort has been offered a placement opportunity at SSN College of Engineering itself demonstrating our institution's commitment to inclusive employment.

X3D Workshop – Exploring Interactive 3D Web Graphics

On 12th July 2025, the SSN Coding Club – AR/VR Team successfully organized an insightful one-day X3D Workshop at JTL Lab, Ground Floor. Dr. T. T. Mirnalinee and Dr. S. Angel Deborah coordinated the event along with the student team. The session was facilitated by Dr. Magesh Chandramouli, Professor at Purdue University Northwest, USA. Dr. Magesh, a distinguished expert in 3D modeling and immersive technologies, led students through a comprehensive workshop on building, rendering, and deploying 3D content using X3D, the ISO-standard for web-based 3D graphics.

The workshop began at 9:30 AM and continued till 3:40 PM, drawing enthusiastic participation from students across various engineering departments. It aimed to equip students with practical skills in creating interactive 3D content and making it accessible directly via the web, without the need for proprietary tools or plugins.

Foundations: From VRML to X3D

The session started with an overview of VRML (Virtual Reality Modeling Language), the original 3D web standard, and how it evolved into X3D (Extensible 3D) – a more powerful, extensible, and modern standard. Dr. Magesh explained the core philosophy of X3D: openness, interoperability, and integration with the web. He demonstrated how X3D supports scene graphs, metadata, geometric modeling, animations, and interactivity.

Using clear analogies like drawing a view on a window to explain perspective projection, the concepts of FOV (Field of View), 3D clipping, stereoscopic vision, and depth perception were made accessible even to those new to 3D graphics.

Hands-on Training with X3D and Castle Model Viewer

A key part of the workshop was the hands-on training session, where participants built their own basic 3D scenes using X3D's XML-based syntax. They were introduced to various nodes such as <Shape>, <Box>, <Material>, and <Transform>, and learned how to structure an X3D file from scratch.

Students used the Castle Model Viewer, a free and open-source tool, to visualize the 3D models they created. This real-time viewer allowed them to load .x3d files, experiment with scene graphs,



transformations, and materials, and immediately observe changes in structure and rendering behavior.

Through trial and error, participants gained practical insights into scene organization, data typing (SF/MF), and parent-child relationships in a 3D hierarchy. Issues like incorrect attribute formatting, quote mismatches, and missing textures were discussed in detail, teaching students how to debug and refine their X3D scenes effectively.

Web Integration with X3DOM

In the latter part of the session, participants were introduced to X3DOM — a JavaScript framework that brings declarative 3D to the HTML DOM. Dr. Magesh explained how X3D can be embedded directly into web pages using the `<x3d>` tag, much like how `<canvas>` or `<svg>` is used. This makes it possible to display 3D content in any modern browser, without requiring additional plugins.

Students were guided through creating .html files that integrated their X3D scenes and were shown how to style and control them using JavaScript and CSS. This segment emphasized the power of plugin-free Web3D, enabling students to publish and share their 3D creations online.



Applications and Real-World Relevance

Dr. Magesh highlighted various application areas of X3D — including engineering visualization, medical imaging, geospatial data representation, educational tools, and interactive product showcases. He also demonstrated how commercial 3D modeling tools can export files to X3D, making it a highly interoperable and future-proof format for 3D deployment.

The workshop concluded with an encouraging note on exploring open standards, building browser-friendly 3D applications, and contributing to the Web3D community through platforms like X_ITE and X3D-Edit.

Conclusion

The X3D Workshop delivered a rich blend of theoretical grounding, hands-on coding, and real-time visualization under the expert guidance of Dr. Magesh Chandramouli. It equipped students with the foundational knowledge and tools to start creating and sharing their own interactive 3D scenes on the web. The SSN Coding Club – AR/VR Team thanks all participants for their active engagement and extends heartfelt gratitude to Dr. Magesh for his valuable contribution to this successful event.

EVENTS ATTENDED

- **Dr.S.Saraswathi ASP/CSE** attend “Capacity Building Programme on Cybersecurity under the Malaviya National Mission on Teachers” , Cyber security Essentials (Basic Course) conducted by Indian Institute of Technology Chennai from 05-05-2025 to 09-05-2025 through Online Mode.
- **Dr.S. Angel Deborah** and the final year student team comprised of **Swetha J and Saathvika** presented the project titled “Virtual Reality based Soft Skill Training and Tracking System using Machine Learning” to the regional review panel members of Naan Mudhalvan Niral Thiruvizha 2.0 (2025) at Madras Institute of Technology on May 20, 2025.
- **Dr.S.Rajalakshmi** and the final year student team comprised of **Sanjai Balajee K G, Sanjjit S, V S Pranav, Pooja Premnath** presented the project titled “Makkal Kural - PetitionTrack: AI-Driven Grievance Management and Resolution System” to the regional review panel members of Naan Mudhalvan Niral Thiruvizha 2.0 (2025) at Madras Institute of Technology on May 22, 2025.
- The Hub round for SAP Hackfest 2025 was held at Chennai Institute of Technology on 26th May 2025. The selected teams from the regional round of SSN participated and presented their work to the Jury members.
- **Dr.S.Rajalakshmi** and the final year students Sanjai Balajee K G, V S Pranav attended the two days boot camp conducted by Naan Mudhalvan Niral Thiruvizha 2.0 (2025) team at St. Joseph College of Engineering on June 25 and 26, 2025.
- **Dr.S.Rajalakshmi** and the final year students Sanjai Balajee K G, Sanjjit S, V S Pranav presented the project titled “Makkal Kural - PetitionTrack: AI-Driven Grievance Management and Resolution System” to the grand finale review panel members of Naan Mudhalvan Niral Thiruvizha 2.0 (2025) at St. Joseph College of Engineering on June 27, 2025. They were one among the top 150 teams selected from the regional review conducted for 1000 teams across various colleges in Tamil Nadu.
- The third level SAP round in Hackfest 2025 was conducted online on June 16, 17 and 18, 2025. Three teams leafline, V, Juz Green selected from state hub round out of the selected 10 SSN teams presented their business model to the review panel members.
- **Dr. M. Saritha and Dr. Dhannya. S. M**, Assistant Professor of CSE department attended one-week FDP-cum-workshop on "Advanced Computer Vision for Image, Video and Applications" organized by the Department of Computer Science and Engineering during 23rd - 27th June 2025, at Indian Institute of Information technology, Kottayam.

- **Dr. Nilu R. Salim**, Assistant Professor, completed one month course on “Quantum Computing” organized by Centre for Development of Advanced Computing, Hyderabad & Indian Institute of Technology, Roorkee with the support of Ministry of Electronics and Information Technology, Government of India from 03.05.2025 to 25.05.2025.
- **Dr.V.S.Felix Enigo** has attended the World Health Summit Regional Meeting at Bharat Mandapam, Pragti Maidan, New Delhi on April 25 - 27, 2025.
- **Dr.V.S.Felix Enigo** has completed NPTEL Swayam Course on "Design Thinking and Innovation" in January 2025 Semester.

Report on Summer School on Medical Imaging (SuSMI 2025), IIITDM Kancheepuram, June 16 to 20, 2025



SuSMI 2025 was a comprehensive and interdisciplinary workshop that my colleague and I had the opportunity to attend, aimed at equipping participants—students, faculty, and industry professionals across India—with both foundational and advanced knowledge in medical imaging. Over five days, we engaged in sessions covering imaging modalities, clinical physics, image analysis, AI/ML applications, and cutting-edge technologies such as AR/VR and quantum computing, along with discussions on regulatory, ethical, and IP frameworks. Expert speakers from

premier institutions like IIT Madras, NIT Trichy, IIITDM Kancheepuram, and industry leaders from GE Healthcare, Elsevier, and Morulaa HealthTech delivered insightful talks and training. We also participated in hands-on labs involving MATLAB, Python, and Qiskit, working on real-world problems such as cancer detection and battery life prediction. The workshop provided us with valuable exposure to practical tools and techniques, broadened our understanding of the field, and inspired us to contribute meaningfully to healthcare technology and innovation.

Dr.J.Bhuvana & Dr.P.Mirunalini

OTHER ACTIVITIES

- **Dr. Saraswathi S, ASP/CSE** attended the annual review - doctoral committee meeting on 02.05.2025 – Friday 10.00 AM at CSE department, Velammal Engineering College (Online)
- The Office bearers for the Association of Computer Engineers (ACE) for the Academic year 2025-2026 were announced on 30th May, 2025. The selected members are as follows: President - Chandravel Saravanan, Vice president - Kavin, Secretary - Oviasree Sampath, Treasurer - Karthik Raja C. , Event Coordinators - Vijay Srinivas and Sunil Sairaj J M., Joint secretary - Amudha Kavi, Joint treasurer - Thirumurugan R A., Joint Event Coordinators - Sudarshan O. and Anjana Venugopal
- **Dr. Mirnalinee T T** attended the Academic council meeting and presented UGR2024 curriculum & syllabus and PGR2025 Curriculum and Syllabus.
- **Dr. Mirnaliineee T T** was part of UG25 admission during 16th to 18th June 25.
- **Dr. S. Lakshmi Priya** acted as an Assistant to Chief Invigilator during the TNPSC Group IV exam on 12-07-25 held at Sri Sivasubramaniya Nadar College of Engineering.
- **Dr. S. Rajalakshmi** delivered a talk on “Quantum Machine Learning” on 31st July 2025 in the Faculty Development Program on Generative AI and Quantum Technologies for Embedded Intelligent Systems: Driving Innovations Across Industries conducted by Department of IT, SSN College of Engineering.
- **Dr. S. Angel Deborah** delivered a talk on “Quantum Algorithms” on 31st July 2025 in the Faculty Development Program on Generative AI and Quantum Technologies for Embedded Intelligent Systems: Driving Innovations Across Industries conducted by Department of IT, SSN College of Engineering.
- **Dr. T.T. Mirnalinee and Dr. B. Prabavathy** have attended a meeting on 05.08. 2025 from 1.00pm to 1.30 with P Rajasekharan (Raja), Co-founder, v-shesh, www.v-shesh.com , Anand Mayan from v-sesh and Ananda V Raman, Assistant Director, Marketing, SSN Institutions about the Placement opportunity for DHH candidates and further collaboration on training DHH candidates.

STUDENT ACHIEVEMENT

CO-CURRICULAR ACTIVITIES

- Our final year students **Sundaresh Karthic Ganesan, Tharunidhi TJ,** and **Ashwin Kumar S** of IT represented their project, **PlutusAI**, at the Grand Finale of the **SBI Life Hack-AI-Thon** in Mumbai on 13th June 2025. Out of more than **7500 initial registrations**, their team progressed through four competitive rounds to be among the **top 16 national finalists**, and they emerged as the Second Runners-Up. Their solution brought together reinforcement learning, GNNs, blockchain, NLP, and image forensics into a single fraud detection pipeline—built end-to-end to solve a real-world challenge at scale.
- **Bhuvan S , Ananth Narayanan P, Charan Balakrishnan and Darrshan Hariharan** - of Team NeoC@ts from CSE-A (IV Year, 2022-26), **mentored by Dr. T. T. Mirnalinee, Dr. J. Bhuvana**, successfully progressed through three rigorous rounds of the Caterpillar Tech-a-thon 2025 representing Sri Sivasubramaniya Nadar College of Engineering.

The team has successfully progressed through a highly competitive, multi-stage national-level selection process that included:

Round 1: PPT Shortlisting

Round 2: Virtual Presentation

Round 3: Virtual Presentation + Demo (Top 30 teams)

Round 4: Grand Finale – Prototype Submission (Top 10 teams)

They participated in the final round held on 20th June 2025 at the Caterpillar facility. Though not selected among the winners, the team gained valuable experience and proudly represented the department with dedication.

UnHack 2025: A Day of Pure Coding and Innovation

UnHack 2025, a prestigious individual hackathon conducted by KLA, brought together some of the brightest young minds to compete without the assistance of AI tools. Hosted at the KLA office, the event welcomed participants from various institutions, including SSN College, from which nine students were selected to participate. Among them, five were from the Department of Computer Science and Engineering (CSE).



In the lead-up to the main event, participants attended three online learning sessions, which included hands-on practice problems. These sessions laid a strong foundation and helped hone their problem-solving skills, setting the stage for the final showdown.

The hackathon took place from 9 AM to 5 PM on 26th July 2025 and featured three intense milestones that challenged participants to think logically and creatively. While AI tools

were strictly prohibited, mentors were available throughout the event to guide and support the participants whenever they faced hurdles. This created an environment of real-time learning and collaboration.

At the end of a rewarding and challenging day, the winners were announced. It was an individual competition, and among the winners from SSN's CSE department were Priya Verma and Padmasri, who earned top prizes for their exceptional performances.



Jayavarshini and Anee Jack also stood out and secured second prize positions. All the winners were honored with cash rewards in recognition of their efforts and accomplishments.

UnHack 2025 was a true test of skill, perseverance, and pure coding talent—a day the participants won't soon forget.

Code for Bharat Season 2



Out of 10,000+ registrations reaching the top 22 finalists and winning the Best Solo Team award at Code for Bharat Season 2 was an unforgettable experience. I found the hackathon on Unstop during my 4th-semester break while working on a project called Smart Files AI, a desktop app that helps users instantly find any file using natural language, even if they don't remember the file name or location. It uses AI to understand the meaning behind your search and pulls out the most relevant results, saving a lot of time for students, developers, and working professionals.

I submitted my idea and prototype video in Round 1 and was happy to get selected for the top 500. In Round 2, I pitched solo (which meant no confusion, no delays, no merge conflicts - just full focus) and soon got selected for the top 22 teams. At the finals held at Microsoft Office, Noida I interacted with startup founders, shared ideas, and gave a detailed pitch followed by Q&A. Among the 22 finalists, including 8 solo teams made up of 2-3 startup founders, winning the **Best Solo Team award** was a proud moment.

Key takeaways: building alone taught me ownership, clarity, and confidence and that a well-built product speaks louder than a big team. Most importantly when you truly believe in your idea and stay consistent, great things follow.

SSN CSE Team Among Top 20 in

Naan Mudhalvan Hackathon 2025 – Niral Thiruvizha 2.0!

We are thrilled to share that our team — Sanjai Balajee K G, Sanjjit S, V S Pranav, and Pooja Premnath, guided by Dr. Rajalakshmi S., emerged as one of the Top 20 Winning Teams in the prestigious Niral Thiruvizha – Naan Mudhalvan Hackathon 2025, organized by the Government of Tamil Nadu.

The hackathon witnessed the participation of over 40,000+ students from institutions across the state. After clearing multiple qualifying rounds and an intensive bootcamp, we advanced to the Grand Finale, which was held on June 27th, 2025 at St. Joseph's College of Engineering, Chennai.

At the final round, we presented our project titled “Makkal Kural”, an AI-powered petition management platform developed to strengthen civic engagement and modernize public grievance redressal mechanisms. The bilingual platform empowers individuals and communities to create,

support, and track petitions. It features voice assistance, intelligent petition drafting, group petitioning, automated moderation, and real-time impact analytics — all aimed at fostering transparency, inclusivity, and participatory governance at scale.

This achievement would not have been possible without the unwavering support of our mentor, Dr. Rajalakshmi S., whose technical guidance and constant encouragement were instrumental throughout our journey. We are also grateful to our HoD Dr. T. T. Mirnalinee, and Principal Dr. S. Radha, for their consistent support and motivation.



We extend our heartfelt thanks to the Naan Mudhalvan team, along with the various departments of the Government of Tamil Nadu and Anna University, for organizing and executing such a large-scale and inspiring innovation challenge with great professionalism.

As winners, we were awarded smart cards and innovation vouchers, which we plan to use to further develop and scale Makkal Kural into a robust civic tech solution in the months to come.

Participating in this hackathon has been a deeply enriching experience — not just in terms of technical growth, but also in learning the true potential of technology in public service.

SAP HackFest – 2025

Participant's response.....

Team - Vishal S, Vijay K, Varsha M, Varun S, and Vishal Bysani, II Year CSE C Section

I recently had the privilege of participating in SAP Hackfest 2025, a prestigious, multi-stage innovation challenge that brought together students and professionals from across the country to solve real-world problems through technology. Representing our college as Team V, Me - Vishal S, and my Team mates - Vijay K, Varsha M, Varun S, and Vishal Bysani, advanced through the highly competitive Regional and State Hub rounds, eventually earning a place in the final SAP Round. The experience was not only intellectually rewarding but also deeply enriching from a collaborative and ethical standpoint.

Our project, GlassboxAI, emerged from a shared concern about the growing opacity and bias in automated decision-making systems. Rather than jumping directly into coding, our approach began with an in-depth exploration of the problem space. We conducted extensive user and business persona research to understand the real-world stakeholders impacted by AI decisions in domains like recruitment, lending, and admissions. This phase was complemented by a comprehensive survey that collected insights from hundreds of respondents, allowing us to identify recurring patterns of distrust and unfairness stemming from black-box AI models.

These findings shaped the development of GlassboxAI—a tool designed not only to detect and quantify bias in machine learning models but also to provide interpretable reasoning behind AI outputs. Our objective was to bridge the gap between model performance and model accountability by embedding ethical considerations directly into the decision-making pipeline. We also mapped the solution against ethical AI guidelines and regulatory frameworks, pinpointing critical areas such as transparency, consent, and algorithmic explainability—where current systems often fall short.

One of the most memorable parts of the experience was our participation in the State Hub round. The environment was vibrant and interactive, filled with energetic dialogue, constructive critique, and cross-team learning. It was a space where innovation and ethical responsibility were equally emphasized, and where we were encouraged to think holistically about the societal impact of our solution. This round validated our research-driven approach and helped us refine our pitch from a conceptual prototype to a practical, impactful system.

In contrast, the SAP Round brought its own set of real-world challenges. While the opportunity to present at this level was an honor, it also exposed us to the commercial and financial constraints that come with scaling ethical AI solutions.

We encountered practical considerations such as cost trade-offs, data availability, and deployment feasibility—all of which underscored the importance of aligning ethical design with business viability.

These experiences provided us with a balanced perspective, reminding us that responsible innovation must be both principled and pragmatic.



Overall, SAP Hackfest 2025 was far more than a competition—it was a journey that blended technical learning with ethical reflection, creativity with constraint, and innovation with responsibility. I am deeply grateful to the organizers, our mentor Dr S Rajalakshmi Mam, and my Team mates for their Efforts into this project.

Team - Sathvika Kamali – II Year CSE C

When we first heard about the SAP Hackfest 2025, we were all eager to participate. Presented with three themes addressing global challenges, we engaged in thoughtful discussions to select the one that best matched our skills and ideas. This decision set the stage for a journey that tested our abilities and deepened our understanding of problem-solving.



The Hackfest kicked off on April 8th with the regional round, which took place in our department, with our Computer Science professors as the judges. In this round, we had to present our idea clearly, starting with our problem statement and explaining the core concept. It was a critical round — we were questioned about existing solutions and had to demonstrate how our idea was distinct and valuable.

A few weeks after the district round, we received the highly anticipated email: we had qualified for the next

stage! We were one of the 10 teams to advance, and this news motivated us to dive deeper into our project. Before every round of the competition, we had an online meet with our SAP coordinators, who were helpful in guiding us on what to expect in each round. They provided us with SAP student accounts and assisted us in integrating into the SAP platform for the 2025 Hackfest.

The next round focused on further developing our idea. We were required to deconstruct our problem statement, analyze user needs, and ensure our approach was sound. This round was held at Chennai Institute Of Technology, where our judges included both SAP guides and the StartUpTN Project Lead. To prepare for this critical stage, Rajalakshmi Ma'am organized a session with alumni, allowing us to receive constructive feedback on our presentation and approach. Their insights were incredibly helpful, enabling us to fine-tune our idea before the actual presentation.

When it was time to present in front of the Project Lead of StartupTN, we received both positive feedback and probing questions, which we were able to answer. The feedback we received helped us identify areas for improvement. Shortly after, we received the exciting news that we had qualified for the penultimate round: the SAP business Round.

The SAP business Round was entirely business-oriented, requiring us to analyze revenue models, study competitors, and understand the broader market landscape for our idea. This round was held online, with the judges from SAP. Their constructive criticism and feedback were crucial in refining the business side of our concept, ensuring that we had a clear understanding of how to position our idea in a competitive market.

Looking back on the entire experience, I am incredibly grateful for the guidance and support we received. Rajalakshmi Ma'am's mentorship was invaluable throughout the competition, helping us navigate each round. I also want to extend my gratitude to the college for providing us with such an

amazing learning opportunity. The SAP Hackfest has been a great experience — not only in terms of technical knowledge, but also in business strategy and problem-solving and I’m excited to apply what we’ve learned to future projects.

Team - Rohith V (Team Leader), Sri Krishnan, Micheal Berdiananth M and Rosan D (Third Year CSE)

We are Team JuzGreen from the Department of Computer Science and Engineering, SSN College of Engineering, and we’re thrilled to share our incredible journey through SAP Hackfest 2025 — a national innovation challenge organized by SAP and PSG iTech

Our team — Rohith V (Team Leader), Sri Krishnan, Micheal Berdiananth M and Rosan D — chose the theme “Sustainable Business”, a category that resonated deeply with us. Under this, we conceptualized and pitched “Mithran”, a smart digital assistant for small and marginal farmers across India. Mithran means “friend” in Tamil — and that’s exactly what we set out to build.

 What is Mithran?

In today’s tech-powered agriculture, large-scale farmers have access to everything — from IoT sensors and AI models to satellite monitoring. But what about small farmers, who make up over 80% of India’s agriculture, many of whom own less than one acre of land?

They face daily hurdles:

- No precision tools
- No awareness of government schemes
- No real-time data on crop health or prices
- No language-friendly guidance

They aren’t falling behind because of lack of effort — but because of lack of support.

Mithran was born out of this very realization. It’s not just an app. It’s a companion — one that helps farmers:

- Detect diseases via leaf image uploads
- Buy medicines from nearby shops
- Calculate fertilizers based on land size



- Track expenses with a “Khata Book”
- Understand weather forecasts
- Access local language insights through voice
- Learn about real-time market prices
- Explore AR/VR models of crop growth

It's technology with empathy — by farmers, for farmers.

● Round 1: Regional Ideathon

📍 SSN College of Engineering | 📅 April 7, 2025

The first round was held at our home campus, SSN. This was an idea-only pitch — no prototypes, just our storytelling and problem-solving skills.

We introduced Mithran as a sustainable business solution tailored for India's underserved rural farming population. Our slides told a simple but powerful story — of a farmer who didn't need handouts, but a friend who could speak his language, guide his crops, and improve his yield.

Our pitch focused on satellite-driven soil monitoring, voice-based disease diagnosis, and real-time regional support — all rolled into one seamless assistant.

We had just 10 minutes to convince the jury and 5 minutes for Q&A. It was nerve-wracking but fulfilling. Out of several teams, JuzGreen was selected among the Top 10 teams from SSN to move to the State Hub Round.

● Round 2: State Hub

📍 Chennai Institute of Technology (CIT) | 📅 May 26, 2025

The second round was all about Design Thinking — moving from “what” to “how.” We participated in a Design Thinking workshop on April 23 and received mentorship from professionals including SSN alumnus Mr. Edison (Amazon, Bangalore).

Here, Mithran evolved into a feature-rich, scalable solution with the farmer at the center.

We mapped the entire user journey:

- Upload leaf → Get disease diagnosis → Locate nearest agri shop → Place order
- Speak in native language → Ask about government schemes → Get real-time guidance
- Map land → Suggest fertilizer → Calculate quantity → Save in digital Khata Book

The most impactful moment came when a mentor said, “You're not just building an app. You're building trust.”

By the end of the day, our refined solution earned JuzGreen a place among the Top 20 teams selected from all over Tamil Nadu to face SAP's direct evaluation.

● Round 3: SAP Evaluation

💻 Mode: Online (Google Meet) | 📅 June 16, 2025

This round was conducted by SAP experts — a business-focused evaluation that tested how far we had thought through our model.

We presented:

- Mithran's complete architecture
- User flows (from image upload to medicine purchase)
- Our monetization strategy via agri-retailers and market data insights

It was in this round that SAP mentors gave us a game-changing suggestion — to integrate SAP Business Technology Platform (BTP), including SAP HANA and SAP Analytics Cloud, to strengthen our backend and insights engine.

We also registered on the SAP Octopus Platform, where we submitted our project details, received learning resources, and gained deeper insight into SAP's innovation ecosystem.

By the end of the session, the panel simply said:

“You're building something real. Welcome to the Finals.”

🏁 Grand Finale – Coming Soon!

📍 PSG iTech, Coimbatore | 📅 August 7, 2026

Now, all roads lead to PSG Institute of Technology, where we'll present a full-fledged working prototype of Mithran, enhanced with SAP tools and real farmer feedback.

We're currently refining:

- SAP-integrated architecture
- Voice + text UX in multiple languages
- Offline-first accessibility for rural areas

The finale will feature demos, pitch rounds, and potential opportunities for internships, incubation, or even real-world pilots.

Mithran isn't just a project. It's personal.

We've seen our own grandparents, relatives, and neighbors in rural India struggle with farming decisions. We've seen the confusion in their eyes when looking at pesticide bottles or trying to predict the weather. We've seen how language can become a barrier to survival.

That's why we built Mithran —
Not for the top 1% of the agri-world...
But for the forgotten 80%.

Final Thoughts

From the Ideathon at SSN to the State Hub at CIT to a direct SAP evaluation — SAP Hackfest 2025 has been a transformational journey. Every round challenged us to look deeper, build smarter, and dream bigger.

We thank the Department of CSE, SSN College of Engineering, and all our mentors for believing in us and guiding us through every phase. Their trust helped us turn an idea into something tangible — and hopefully, impactful.

We're now heading into the Grand Finale with full energy, big dreams, and a solution that we truly believe in.

-  Let's build tech that listens.
-  Let's build tech that cares.
-  Let's build Mithran — a true friend to every farmer.

Link to Media:

https://www.canva.com/design/DAGMcUOzq5o/5GP28No-lNnJO3zf4cSwVQ/edit?utm_content=DAGMcUOzq5o&utm_campaign=designshare&utm_medium=link2&utm_source=sharebutton

PLACEMENT & INTERNSHIP

2022-26 Internship Details

Company	Students
Agaram Infotech	Nivetha Dhanakoti
Amshuhu iTech Solution pvt ltd	Samyuktha D, Prithivi Rajan D, Rithekha K
Ant wealth Creation	Yuvapriya N
Ashok Leyland	Nithyasri S

Askan technologies pvt ltd	Varsha G
Barclays	Abhishek R, Akshatha Anbalagan, Prathiyangira Devi V C, Priyadharshini Thandavamurthi, Rohan R, Sundaresh Karthic G, Surabhi Kamath, Rithika S
Big Bang Boom solutions	Vijay Karthick V
Broadridge Financial Solutions	Aditya Jyosyula
Carnegie Mellon University	Ankitha Reddy A, Rohith Arumugam S, Saathvik B, Seetharam Killivalavan
Citi Bank	Srikrishnan V, Vishnu Praba A J, Ananth Narayanan P, Ashwin V Sundar, Harsh Pratap Singh, Ravindran V, Shreejith Babu
Copter Code	Harine Cellam N S, Harinishree K, Muthuselvi K, Nandhine A
Covergent technology	Manishkumar S
CSIR	Kavin Rajan G
Cybernaut Edu-Tech	Rithick R Rahul, Sharanraj K, Jeevansree E, Charan Balakrishnan
DE Shaw	Diya Seshan
Dezprox IT Services	Padala Praneetha
DHL	Tharunithi T J, Srivardhan S, Shankari S R
DRDO	Yuktha V, Sai Nikitha N S R
DreamsPlus	Roshini R
EBZON	Bharath Raj S, Sathish Kumar M P
Emertxe	Sarumathi P, Aruna Devi S, Dinesh S, Pawan Kumar Ramnani, Pravin M, Sunil Sairaj J M, Vijay Perumalraj N, Vishva S, Prabanjanraj M K
Esystem	Ishan Pandita
Fidelity	Sachin Rangabaskar, Shyam Sainarayanan Varadharajan, Srinidhi Lakshmi Narayanan, Ann Maria Thomas, Deepak Chandar S, Guntimadugu Kushal Varma, Janani Hariharakrishnan, Karthikeyan S, Keerthana K, Krithika C, Lavanya Vasudevan, Neha Shanmitha S, Nisha Ganesh, Ram Prasath P, Samah Syed, Vidisha Desai
Fiserv Solutions	Tharun Senthuravel K, Neeharika S
Foxconn	Nandhalal S, Vijaya Prasath L S
Futurestech innovations	Sahil Singh

Goldman Sachs	Amrit Krishnan
IIITDM Kancheepuram	Sweety Y, Syed Tahir Ali, Anandharaj D, Bhuvan S, Jagannathan B R, Keerthana G S, Keerthana S, Kisshor M, Magesh K, Mohamed Imran Fareeth S, Prashanna Kumar S, Rajesh G, Deepak M, Naren Karthik M
IIT Madras	Pranav Moorthi
IIT Roorkee	Mugilkrishna D U
Imaggar technologies	Dharunika S
Indsys	Jithu Morrison S
Inflibnet centre	Kamalnath K
Kripya Solutions	Srihari V K
L&T Technology Services	Hannah S
LandCheck	Dhinesh Ram K, Harikumar G, Karthik Raja C
MD Infotech	Niranjan B
MI infotech	Vineeth U
Mr Cooper	Mathumitha E, Hemalatha R
MyRMC solutions pvt ltd	Rajkumar M, Ritheesh K
NatWest	Niranjana A, Shaun Allan H
NIT Trichy	Micheal Berdianth M
NITTTR Chennai	Anierudh H S
NOBL Q	Kowshika S
NTU Singapore	Abirami J
Oceanwalk IT Private Limited	Inyadharshini G A, Logeshwari L, Navaneethakrishnan U, Shivakumaar S V
Orivent	Mohamed Ismail D
PayPal	Oviasree S, Shobith Kumar R, Tarun Subramani R, Varshini Venkatesh
Positive Integers	Shreedevi S B
Rocketlane	Abbhinav E, Abishna A, Athish Pranav H G , Avaneesh Koushik, Chandravel Saravanan, Darrshan Hariharan, Dilsha Singh D, Jetty Aashika, Karpagavalli S, Krishna Varun R, Pradeep K M, Rohan R, Rupnarayan B, Samyuktaa Sivakumar, Shri Vishaal D V, Shwetha S,

	Srivathsan S, Tarun R, Vijay Srinivas K, Vishal K
Satyam Venture Engineering Services	Sarthak Darshan
Skorpion Info Tech	Krishnaraj N
SSN	Nikilesh Jayaguptha
Strategi Solutions	Kavin T
Strategy Fox	Jagrath Mithin S, Rohith V, Rosan D, Lenkeshananth V, Srikanth S, Saisandeep Sangeetham
Stratforge	Skanta Samvartan R, Vishal SS
Tata Consultancy Services	Shreyamanisha C Vinay, Harsha Vardhini K S
Tech Mahindra Limited	Rishab S
Temenos	Siddharth Subramanian A
Tringapps Research Labs	Harish K
Trios Technology	Angappan Raasu
Tykevision	Janeshvar S
Web Ventures	Preethi Prative
Wipro	Hishitha K
Zceppa	Paul Andrew S

My Journey at DHL Global Forwarding: Bridging Academia and Industry

Shankari S R, Computer Science and Engineering

Internship Duration: May 19 - July 16, 2025

As a Computer Science student, I often wondered how classroom theories translate into real-world applications. This summer, my internship at DHL Global Forwarding provided the perfect opportunity to discover this connection.

My two-month internship was conducted through DHL's Virtual Development Center, featuring twice-weekly seminars, daily mentor check-ins, and extensive peer collaboration.

The Project: Automating Anomaly Detection

I worked on automating anomaly detection within GSConnect, DHL's internal system, using data science methodologies to identify operational inefficiencies through traditional analytics and modern AI techniques.

The project involved developing a comprehensive data pipeline covering data ingestion, preprocessing, anomaly detection, and insight generation. I worked extensively with Kubeflow for building scalable machine learning workflows and leveraged Azure Cloud Platform for data handling and pipeline execution.

Technical Skills Gained

Throughout the internship, I gained hands-on experience with cutting-edge technologies:

Kubeflow Pipelines taught me end-to-end ML workflow automation, emphasizing reproducible and scalable solutions in production environments.

Azure Cloud Services provided exposure to enterprise-level data storage and operational integration, crucial for understanding large-scale data operations.

Machine Learning Techniques were applied to identify unusual patterns in operational data, moving beyond textbook examples to real business applications.

Prompt Engineering and LLMs offered insights into how large language models support data-driven insight generation.

Agile Development Practices became routine through regular sync-ups, feedback loops, and collaborative development approaches standard in industry.

Key Learning Outcomes

The internship demonstrated how academic knowledge applies in enterprise environments, with algorithms and data structures having tangible business impact. Understanding automation and anomaly detection in logistics gave me insights into how technology drives operational efficiency in global supply chains.

Working with industry-standard platforms like Kubeflow complemented our academic curriculum, while the collaborative environment strengthened my communication, teamwork, and problem-solving abilities.

Professional Development

Beyond technical skills, daily mentor interactions and peer collaboration sessions fostered continuous learning and professional growth. The feedback mechanisms ensured iterative improvement, reinforcing that learning from both successes and setbacks is essential for development.

Reflection

This internship successfully bridged classroom concepts and industrial applications, reinforcing that computer science involves solving complex problems with real-world implications. Every algorithm optimized and anomaly detected potentially impacts global operations and customer experiences.

The experience has shaped my career perspective, helping me understand various paths in data science and machine learning, particularly in enterprise environments where scalability, reliability, and business impact are paramount.

Moving Forward

I'm grateful to our department for facilitating this opportunity and to DHL for providing such a comprehensive learning environment. The knowledge gained will undoubtedly influence my academic choices and career trajectory.

For fellow students considering similar opportunities, I encourage embracing such experiences. They provide irreplaceable insights into how academic learning applies professionally and help develop both technical expertise and professional skills essential for career success.



My Quantum Internship Experience at NIT Tiruchirappalli

Jayavarshini K S | Computer Science and Engineering

Internship Duration: May 22 - June 20, 2025

Entering the World of Quantum Problem Solving

This summer, I had the opportunity to intern at the Department of Computer Science and Engineering, NIT Tiruchirappalli. As someone passionate about emerging technologies, I was eager to explore how quantum computing—something I had only encountered theoretically—could be applied to real problems. What awaited me was a deeply enriching journey into quantum search algorithms, specifically Grover's algorithm, in the context of classical cryptography.

Building Grover's Algorithm for Caesar Cipher Search

The central objective of my internship was to implement a quantum solution to the Caesar cipher key search problem using Grover's algorithm. It wasn't just about writing code—it was about engineering quantum logic. I designed and tested quantum circuits capable of performing modular arithmetic in-place, embedded within Grover's framework. This required precise handling of quantum state transformations and uncomputation to preserve reversibility.

Hands-on with Quantum Toolchains and Concepts

Working extensively with Qiskit, I developed a solid understanding of how quantum algorithms are built and tested. I learned to construct oracle circuits, apply diffusion operators, and analyze the effect

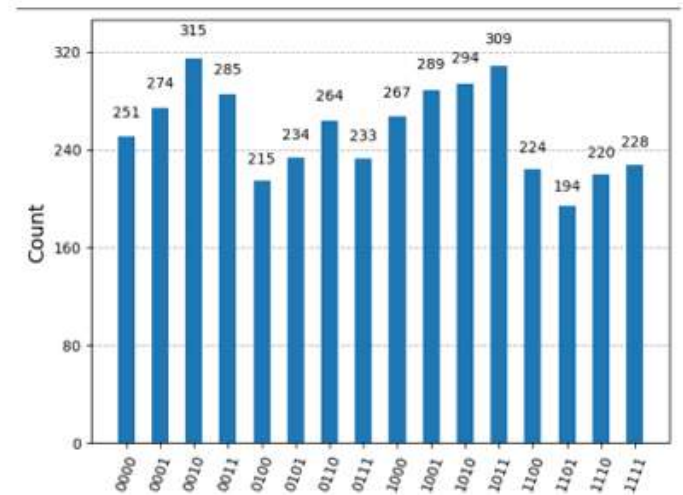
of each gate on the amplitude distribution. Designing a quantum modular adder from scratch and reversing it correctly in the circuit flow was a challenging and rewarding task.

From Debugging Circuits to Conceptual Mastery

One of the most valuable parts of the experience was how it pushed me to internalize the why behind every step. Whether it was observing how amplitudes evolved or ensuring auxiliary qubits were reset, I was constantly thinking through the consequences of each design choice. I also realized that debugging in the quantum world often demands both linear algebra insight and a clear grasp of state evolution.

Collaboration and Mentorship

Regular reviews with mentors at NIT Trichy helped me refine my thought process and improve implementation strategies. Every suggestion or challenge led to deeper learning. These conversations went beyond syntax—they revolved around understanding what makes quantum algorithms efficient and correct in principle.



Looking Back and Moving Forward

This internship was a transformative experience. It sharpened my technical skills, deepened my theoretical understanding, and inspired me to further explore quantum computing as a potential research direction. Seeing classical cryptographic challenges addressed through quantum logic opened my mind to what's possible when emerging technologies intersect with foundational problems.

Histogram of output from ibm brisbane

What began as curiosity about quantum computing ended with a deep appreciation for its challenges and elegance. And perhaps most importantly, I came away with the conviction that the intersection of theory and application is where true learning happens.

Internship Experience at NIT Trichy (May–June 2025)

The journey began when I applied through NIT Trichy's official internship portal, which opens for applications every March. After submitting my profile, I had a meaningful conversation with Dr. Usha Krithika, where I spoke about my keen interest in artificial intelligence and multi-agent systems. Our interaction was inspiring, and shortly after, I was thrilled to be selected for the program. I was also allotted campus accommodation, which made it easier for me to collaborate closely with faculty and peers and stay focused in the lab environment.



My research centered around Multi-Agent Reinforcement Learning (MARL) — a fascinating area where multiple intelligent agents learn to work together in shared environments. Specifically, I implemented the QMIX algorithm along with communication scheduling techniques that help agents exchange only relevant information. This makes teamwork among agents more efficient and improves their performance on cooperative tasks.

To bring this idea to life, I built custom simulation environments using Python, PyTorch, and PettingZoo. I spent hours experimenting with agent behavior in different scenarios \watching how they communicated, adapted, and learned was genuinely exciting. Every tweak to the communication strategy brought new insights into how collaborative intelligence can be modeled in machines.

The internship wasn't just about writing code. It was structured around three formal presentations, where I shared my progress and received feedback from faculty and fellow interns. These sessions helped me think critically about my work, refine my approach, and better understand the rigor involved in academic research.

As the internship wrapped up, I compiled my results into a research article and submitted it to a peer-reviewed journal. Looking back, this internship not only strengthened my foundations in reinforcement learning but also gave me hands-on exposure to research methodologies and collaborative problem-solving. I'm incredibly grateful for the experience.

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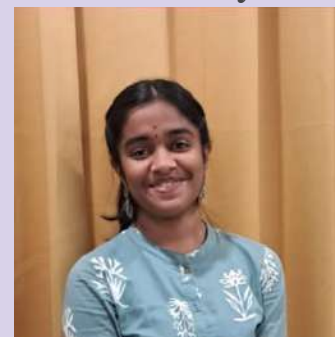
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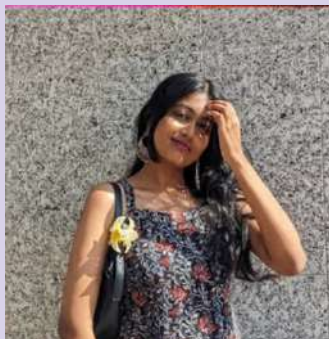
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ALUMNI ACTIVITY

Course delivery by industry expert

Dr. Aravind R, a distinguished 2004 alumnus from the Department of Computer Science and Engineering, conducted an introductory session for the One Credit Course titled “*Skill Development Lab – 1*” on **28th July 2025** at the **CSE Seminar Hall**. The session was organized for the **third semester CSE students**.

Dr. Aravind provided an insightful introduction to the **foundations of Prompt Engineering**, setting the stage for the course content to be covered throughout the semester. His session emphasized the emerging significance of prompt engineering in modern AI applications, thereby igniting curiosity and engagement among the students.

He will be handling the course for the current semester, and his industry and academic experience is expected to greatly benefit the students in building practical skills relevant to the field.



Campus Visit by Mr. Abhinav Ram, 2024 Alumnus



Mr. Abhinav Ram, a proud alumnus of the **2024 batch** from the **Department of Computer Science and Engineering**, visited the campus on **20th July 2025** during the summer break of his **Master's degree program**.

During his visit, he had a warm and engaging interaction with the faculty members of the CSE department. The visit served as a pleasant reunion and a moment of mutual pride, with discussions on his

academic journey, experiences in his Master's program, and reflections on his time at the institute.

ValueOneUp - App Development by Alumni

Swetha J and Udanthika B V(Batch 2021-2025) writes...

We deployed our app ValueOneUp on Google Playstore and Apple Appstore as a part of our 6-month internship and here's a description about it.

Value One Up : Portfolio Tracking made seamless!

As part of our internship, we were entrusted with the end-to-end development of a mobile application for Value One Up Distribution Pvt. Ltd., a firm specializing in wealth and investment advisory services. The objective was to build a minimal-maintenance, high-efficiency portfolio tracking and management app that would enhance the client experience by simplifying access to their financial information.

Purpose of the App: The core goal of the app was to empower clients with real-time access to their investment portfolios, including systematic investment plans (SIPs), folios, and consolidated financial summaries. The app aimed to bridge the gap between clients and financial advisors by offering instant access, simplified communication, and actionable insights—all in a secure, user-friendly environment.

Key Features

- **Portfolio Overview:** Clients can view detailed reports of their current holdings, SIPs, and folios, along with a summarized investment dashboard.
- **Report Management:** Investment reports can be accessed, downloaded, and automatically sent to clients, streamlining financial communication.
- **Client Review & Tracking:** Tracks past interactions, pending reviews, and provides a transparent summary of financial consultations.
- **In-App Chat Support:** Clients can directly communicate with the admin for queries or service requests—no need for external tools.
- **Schedule Video Calls:** A built-in feature allows users to schedule and join video meetings with their financial advisor.

Built using React Native, Firebase, and AWS, the app is now live on both Play Store and App Store. Despite unexpected hurdles like static IP requirements and app store compliance, the experience

taught us the realities of real-world development—from crash courses in networking to navigating developer bureaucracy. Every download now stands as a testament to the technical learnings and collaborative problem-solving we encountered along the way.



Here's the link to download our app:

Android: <https://play.google.com/store/apps/details?id=com.valueoneup.vou>

iOS: <https://apps.apple.com/in/app/valueoneup/id6747002946>



Swetha Jayaraman



Udhanthika Venkatesh

Alumni Visit for Campus Recruitment – Motorq

Mr. Logesh (Batch of 2020) and Ms. Poorvaja (Batch of 2019), alumni of the Department of Computer Science and Engineering, visited the campus on 29th July 2025 as part of the campus recruitment team from Motorq.

Their visit was part of the ongoing campus placement drive, where they interacted with current students and facilitated the recruitment process on behalf of their organization. It was a proud moment for the department to witness its alumni contributing to the growth of future graduates.

Their continued involvement with the institution reflects the strong alumni network and the department's commitment to industry engagement.



Making the Most of Your College Days



G. Varshitha, Batch: 2017 writes...

I completed my B.E. in Computer Science and Engineering in 2017. Though the calendar says it's been years, it still feels like yesterday. So much has changed, the world has moved on, careers have evolved, and responsibilities have grown—but the memories remain vivid and cherished. I still remember the daily bus rides being a day scholar, the routine of preparing for unit tests every Monday and Friday, juggling lab work and assignments, doing project work, completing project reports overnight before reviews, preparing for semester exams, organizing symposiums and participating in cultural fests amidst all these.

Looking back, I realize how those four years shaped us not just into engineers, but into adaptable and resilient individuals. The friendships we built, the mentors who guided us, the small wins that lifted us and the challenges we overcame together all shaped us in ways we didn't even realize at the time. If I could go back and give my younger self some advice, it would be this: soak it all in. Learn with curiosity, participate with passion, and don't be afraid to fail. College is not just about grades, it's about growth.

Explore beyond the syllabus and say yes to opportunities that scare you

Don't limit yourself to textbooks. Explore online courses, attend guest lectures, participate in workshops, try open-source contributions and participate in hackathons. Try for internships every semester, which would give real corporate experience along with great learning. Go for research projects and publish papers, we have amazing mentors to guide us throughout. Join clubs, whether it's coding, debating, singing, or volunteering—these experiences teach leadership, teamwork, and time management in ways classrooms can't. Knowledge is your greatest asset—build it wide and deep.

Master the Fundamentals

Don't rush past the basics — Operating systems, Databases, Computer networks, Data structures, Algorithms and OOP. These are the pillars of your future tech stack, interviews, and real-world projects.

Build Projects Early

Start small — a to-do app, a portfolio site, or a chatbot. Projects teach you what classes can't: debugging, documentation, version control, and the joy of seeing your code come alive. Do mini projects and dive into topics that spark your curiosity.

Internships: Your Gateway to the Real World

Start looking early — even if it's a small startup or a research assistantship. Internships teach you how industry works:

- Apply widely — don't wait for the “perfect” role.
- Tailor your resume — highlight projects, GitHub links, and relevant coursework.
- Practice interviews — LeetCode, mock interviews, and behavioral questions matter.
- Network smartly — LinkedIn, alumni, and tech communities can open doors.

Even unpaid or part-time internships can give you the edge — experience is your best teacher.

Build Meaningful Connections

Your peers today could be your collaborators tomorrow. Network with classmates, professors, alumni, and industry professionals. Relationships built in college often last a lifetime.

College is not just about getting a degree, it's the journey of self-discovery, passion and creating memories that last a lifetime. So, embrace every opportunity, show up, stay curious and make every moment truly count.

What'd I tell my college-self

Ms. Madhu Ratha (2019 Batch) writes...



Everyone talks about going back to their school days. But for me, I wish I could time travel back to my days at SSN.

That's where I formed long lasting friendships and truly learned the art of networking.

With the rise of LinkedIn and the AI boom, it's easy to believe that we can get everything done online, right from learning to building apps to connecting with people. But nothing beats meeting people face to face. Sounds old school, right? Maybe, but people tend to remember face to face connections more deeply. I've often regretted not attending many networking events. So, here's my message to you : Learn from my mistakes.

For starters, symposiums and hackathons are a great way to network with other colleges and yes, you can start doing that from 1st year if possible. It is not just enough to attend them and win cash prizes (though those definitely help you stand out to recruiters) The real gold is in striking up conversations with peers from other colleges. That's how you build meaningful networks which could land you a referral one day.

That's where communication comes in and it is one of the most underrated skills you can build. Speaking up not only helps you in networking during your college days but it will pave way for you to be more confident in pitching ideas after you start your career (which could transition into roles like Product Management after a few years in tech), showcasing your work (trust me, it's as important as working) and so on. I am definitely not suggesting 'All talk no work', but communication skills are as important as being up-to-date with emerging technologies.

If all else fails, by putting yourself out there, you might just gain a good friend. I did.

TECHNICAL ARTICLES

Quantum Computing

Introduction

Quantum computing is a revolutionary paradigm that leverages the principles of quantum mechanics—superposition, entanglement, and interference—to process information. Unlike classical bits, quantum bits or qubits can represent both 0 and 1 simultaneously, allowing quantum computers to solve certain problems much more efficiently than classical systems.

This report introduces the core concepts of quantum computing, its computational model, and its potential applications across various domains

Motivation

As classical computers approach their physical and theoretical limits, quantum computing offers new computational capabilities. Problems in cryptography, optimization, material science, and machine learning that are infeasible for classical machines can be tackled using quantum algorithms.

Principles of Quantum Computing

Qubits and Superposition

A classical bit is binary. A qubit, on the other hand, exists in a linear combination:

$$|\psi\rangle = \alpha|0\rangle + \beta|1\rangle, \quad \text{where } |\alpha|^2 + |\beta|^2 = 1$$

Entanglement

Two or more qubits can be entangled such that the state of one affects the state of the other instantly, no matter the distance. Entanglement is key for quantum parallelism.

Measurement

Measuring a qubit collapses its state to either $|0\rangle$ or $|1\rangle$ probabilistically based on amplitudes.

Quantum Gates

Analogous to classical logic gates, quantum gates (like Hadamard, Pauli-X, CNOT, and T gates) are unitary transformations that manipulate qubit states.

Quantum Circuit Model

Quantum algorithms are implemented as circuits consisting of:

- Input state preparation
- Quantum logic gates (unitary operations)
- Measurement of final qubit states

Popular circuit frameworks include Qiskit (IBM), Cirq (Google), and Q# (Microsoft).

Important Quantum Algorithms

Shor's Algorithm

Efficient integer factorization algorithm with exponential speedup over classical methods. It threatens RSA encryption, which relies on the hardness of factoring.

Grover's Algorithm

Searches an unstructured database of size N in $O(\sqrt{N})$ time. Applied in cryptography, pattern matching, and optimization.

Quantum Fourier Transform (QFT) Transforms quantum states into the frequency domain and is crucial for phase estimation and Shor's algorithm.

Quantum Hardware

Quantum computers are realized using:

- Superconducting qubits (IBM, Google)
- Trapped ions (IonQ)
- Photonic quantum computing (Xanadu)
- Topological qubits (Microsoft)

These devices operate at near absolute zero to minimize decoherence and noise.

Applications of Quantum Computing

- Cryptography: Breaking or building secure systems (e.g., post-quantum cryptography).
- Chemistry & Materials: Simulating quantum systems like molecules and reactions.
- Optimization: Solving complex optimization tasks (e.g., traffic routing, portfolio optimization).
- Machine Learning: Enhancing model training and inference speed using quantum-enhanced data structures.

Challenges in Quantum Computing

- Decoherence and Noise: Qubits are sensitive to environmental interactions.
- Scalability: Difficult to maintain coherence in large systems.
- Error Correction: Requires many physical qubits for one logical qubit using QEC codes.

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3. Arute et al., "Quantum supremacy using a programmable superconducting processor", Nature, 2019.

Jayavarshini K S, 3rd year

Healthcare's Next Frontier: Explainable AI in Medical Diagnosis

Introduction:

Artificial Intelligence(AI), encompassing machine learning and deep learning, is gradually becoming a digital partner to doctors, from detecting tumors in CT scans to predicting disease risks, and even suggesting treatment plans. However, can we really trust a diagnosis we don't understand? The "black-box" nature of traditional AI models — where the logic behind predictions is hidden in layers of complex mathematics — raises concerns in high-stakes environments like healthcare. Doctors can't act on AI's recommendation unless they understand and trust it and patients deserve to know why a particular treatment or diagnosis is suggested. This is where Explainable AI (XAI) steps in, emerging

as a necessary bridge to resolve this conflict, enabling the safe and ethical integration of AI into clinical workflows.

The Problem with Black-Box Models and The Imperative for Transparency:

In healthcare, the lack of transparency is more than a technical issue — it's a matter of life and death. Hence, a high-accuracy model that can't justify its predictions may be unusable in critical care scenarios. Worse still, black-box models can make correct predictions for the wrong reasons. A well-known case in medical AI involved a model that seemed excellent at identifying pneumonia — until researchers discovered it had learned to rely on hospital-specific markings in the image rather than the actual lung condition.

What is XAI? :

Explainable AI (XAI) refers to a set of techniques and tools that make the decisions of AI systems understandable to humans. It aims to render AI algorithms and their resulting decisions understandable to humans, thereby fostering trust and reliability. This transparency is critical for clinicians, allowing them to validate AI recommendations and ensure alignment with established medical expertise.

Core XAI Techniques for Medical Interpretability:

Various techniques are employed to provide interpretability for complex AI models in healthcare, particularly in medical imaging and patient data analysis.

LIME (Local Interpretable Model-agnostic Explanations)

LIME explains individual predictions by locally approximating the behavior of a black-box model with a simpler, interpretable model. It operates by perturbing input data—for instance, masking parts of an image or removing words—and observing how the model's predictions change, thereby highlighting influential features. LIME's model-agnostic nature makes it broadly applicable across various AI systems.

Real World Usage: Cardiovascular Risk Prediction

SHAP (SHapley Additive exPlanations)

Based on game theory, SHAP assigns an importance value to each feature, quantifying its contribution to the model's output. Positive SHAP values indicate a positive influence on the prediction, while negative values suggest a negative impact, with the magnitude reflecting the strength of this effect. SHAP is highly versatile and model-agnostic, capable of explaining diverse machine learning models.

Real World Usage: Lung Disease Classification

Grad-CAM (Gradient-weighted Class Activation Mapping)

Primarily designed for Convolutional Neural Networks (CNNs), Grad-CAM generates heatmaps that visually highlight regions in an input image most influential to a model's prediction. This visual

representation allows clinicians to directly observe what the AI is focusing on, for example, confirming if a pneumonia detection model is concentrating on the correct regions of an X-ray image.

Real World Usage: Brain Tumor Detection

Limitations of XAI approach and Future Directions:

Despite its significant benefits, XAI faces several challenges in its application to medical diagnosis. Historically, a trade-off was perceived between the interpretability of simpler AI models and the higher performance of complex, "black-box" models. While this notion is increasingly challenged, achieving both high accuracy and clear explainability remains a key research focus. Although modern approaches (e.g., attention mechanisms, SHAP values, or prototype-based learning) attempt to bridge this gap, achieving both high diagnostic accuracy and clinically meaningful interpretability remains an open challenge.

Conclusion:

In this new era of AI-powered medicine, explainability isn't just about how the model works — it's about ensuring that every prediction respects the knowledge of clinicians, the rights of patients, and the ethics of care. It redefines the relationship between doctors and machines, between data and decisions, and ultimately, between technology and humanity. Because in the end, it's not enough for AI to be right. It has to be understood.

Vishwajith L K , 3rd year, Mtech Integrated

From Google to GPT: How Search is Evolving with AI

Introduction: The Search Habit That We have Never Questioned

For years, "Just Google it" on our lips/mind has been the go-to solution for everything - from solving a math problem to finding the best late-night snacks. Google became more than a search engine, it became part of our everyday language and behavior. But recently, a quiet shift is taking place in all aspects. People are now starting to say, "Just ask ChatGPT." for every single task.

This change highlights a major shift in how we think about searching. It's not just about finding links or related contents anymore - it's about having conversations and getting direct answers. Welcome to the era of generative AI.

What Makes GPT - Style Search Different?

Traditional search engines like Google work on by extracting keywords from your search questions and returning a list of links for pages where the answer might be. You then have to click around, scan through content, and figure out what's relevant. GPT- style search, on the other hand, works by understanding your question in full sentences and giving you an actual answer in a natural way.

You're not just typing keywords - you're asking real questions. And the AI responds with real, easy, and structured answers that make sense.

An Ongoing Story That Every Student Can Relate To:

Imagine you're trying to reverse a string in Python. You Google it, and suddenly you're stuck in StackOverflow threads, complicated code snippets, responses and functions you've never seen before. It works, but it's exhausting and irritating in some sense when under pressure.

Now imagine you ask ChatGPT: "How do I reverse a string in Python, and can you explain it simple and easy to understand?" Boom ! You instantly get a clean answer, example code, and an explanation that makes sense to you as a beginner. That's the difference generative AI makes - it turns search into a personal assistant.

The Rise in Popularity

According to recent usage reports in 2025, over 2 billion users visit AI chat platforms like ChatGPT every month. Students, developers, professionals, and even teachers are turning to AI for faster, more helpful answers.

While Google still dominates in terms of global traffic, users are shifting their behavior and daily activity. People have started to trust AI models to guide them through learning new skills, writing content, and even debugging code.

How Generative AI is Changing Search

1. Conversations, Not Clicks.

With AI, you're not just searching - you're having a dialogue or conversation. You can ask follow-up questions, request examples, or get the answer rephrased in simpler terms.

2. Smarter Context Understanding.

AI remembers what you asked previously, so it builds on the conversation. It adapts to your level of understanding in real time and responds accordingly.

3. Summarization Over Scanning.

Instead of sending you to five different blogs, the AI summarizes everything you need to know in one answer at one place, easier to understand.

4. Personalized Learning.

Whether you're a beginner or an expert, the AI adjusts its response to match your level, something traditional search engines can't do.

Latest Developments in 2025

Tech companies have noticed the shift. Google is rolling out AI-powered summaries in its search results. Microsoft is fully integrating Copilot into its Windows and Office tools. Even educational institutions are experimenting with using AI tools as teaching assistants and feedback systems. The world of search is rapidly evolving - and it's becoming smarter, faster, and more interactive.

A Touch of Humor

Fifteen years ago, if you told your parents you didn't know the answer to something, they'd say, "Google it." Today, the answer is more likely to be, "Ask your AI."

It's funny how quickly we've moved from typing keywords to chatting with machines. And it's even more surprising how natural it now feels to ask AI to explain rocket science using pizza as an analogy.

Should We Still Use Google?

Absolutely. Generative AI doesn't replace traditional search; it complements it. For real-time news, specific sources, or official information, Google remains essential. But for learning, writing, understanding, and summarizing, generative AI offers a faster and more personalized experience.

Think of it this way: Google is a giant library, and GPT is a helpful librarian who walks you to the right shelf and even summarizes the book for you.

Conclusion: The Future of Search is a Conversation.

Search is no longer just about finding information - it's about engaging with it. Generative AI tools like ChatGPT have transformed the way we interact with knowledge. They make learning more accessible, coding easier, and explanations clearer.

In the future, search will not be about typing the perfect keyword - it will be about asking the right question. And more importantly, having the right conversation. The response you get totally depends on how you give prompt.

Priya Verma, 3rd Year

Open Source: The Gateway to Real-World Software Development

Introduction

Modern software development thrives on diversity of ideas and approaches. No single developers can think of all possible features, improvements, or use cases. When multiple minds work together, software becomes not only functional but also robust and innovative. This makes collaboration a crucial aspect of creating impactful technology. Open source embodies this collaborative spirit, where code is openly shared, reviewed, and improved by contributors from around the world.

The Culture of Collaboration: What Open Source Teaches Beyond Code

At its core, open source is about shared responsibility, transparency, and learning through real-world contributions. It goes beyond individual coding skills to emphasize teamwork, constructive feedback, and global problem-solving. Open source projects are open to contributions from anyone, allowing for a continuous evolution of software driven by a wide range of perspectives.

The collaborative nature of open source teaches valuable lessons: how to read and understand others' code, how to give and receive feedback, how to navigate disagreements respectfully, and how to work

toward a common goal with a distributed team. These soft skills are just as critical as technical knowledge in the modern workplace.

How Open Source Works

Open source projects are typically hosted on platforms like GitHub, GitLab, or Bitbucket. The code is freely accessible, and anyone can view, fork (copy), modify, and propose changes through pull requests. These changes are reviewed by maintainers or core contributors before being merged into the project. Open source licenses like MIT, GPL, or Apache ensure that the software remains open and reusable.

Well-documented repositories include contribution guidelines, issue trackers, and labels like “good first issue” to help newcomers get started. Contributions can range from fixing typos to building new features or improving performance.

Examples of Notable Open Source Projects

- Linux – The foundation of countless systems, from servers to Android phones.
- Python – A versatile programming language used in data science, web development, AI, and more.
- TensorFlow – A leading machine learning framework by Google.
- VS Code – A highly popular source-code editor developed by Microsoft.
- Mozilla Firefox – A secure, privacy-focused web browser.

These projects have grown through the collective effort of thousands of contributors worldwide.

Open to All: Contributions Beyond Code

One of the strengths of open source is its inclusivity. Contributions are not limited to writing code. People with diverse skills can add immense value to a project in various ways:

- Designers can improve UI/UX or create visual assets.
- Writers can work on documentation, tutorials, and blogs.
- Testers help identify bugs and validate features.
- Translators localize projects for global users.
- Community managers moderate forums, discussions, and foster healthy collaboration.

Open source encourages a multidisciplinary approach where every skill set finds purpose and recognition.

Getting Started with Open Source

For beginners, it can feel overwhelming to choose a project among the thousands available on GitHub. Fortunately, many beginner-friendly programs help individuals make their first contributions:

- Social Winter of Code (SWoC)
- Social Summer of Code (SoC)
- GirlScript Summer of Code (GSSoC)
- Hacktoberfest – An annual event promoting open source with global participation

These programs usually involve mentorship and guidance and are aimed at helping newcomers contribute meaningfully. While they are unpaid, they offer an excellent gateway to learning real-world development workflows and gaining confidence.

Prestigious Open Source Programs: Learning and Earning

Apart from beginner programs, there are globally recognized initiatives that offer stipends for contributing to open source. These programs are competitive and prestigious, offering not only financial incentives but also deep technical and community exposure:

- Google Summer of Code (GSoC) – Offers mentorship and a stipend to work on open source projects.
- Outreachy – Focuses on supporting underrepresented groups with paid remote internships.
- MLH Fellowship – An open source-focused program that simulates a real-world team development environment.
- Linux Foundation Mentorships – Provides financial and educational support to work on key open source technologies.

Participating in these programs significantly enhances one's portfolio, builds global networks, and often leads to future career opportunities.

A Community Built on Passion

While recognition and career benefits are valuable, many contributors engage in open source out of genuine passion. The sense of community, the joy of solving real problems, and the opportunity to learn from others often serve as primary motivations.

The open source community is known for being welcoming, helpful, and respectful. Beginners are guided with patience, and knowledge sharing is a core value. This environment cultivates both personal growth and collective progress.

Open source is not just about software; it's about the people who build and use it. It's a space where innovation, inclusivity, and integrity come together. Contributors often participate not just to build resumes or earn stipends but to fuel their love for technology, collaboration, and continuous learning.

Conclusion

Open source represents more than just publicly accessible code—it reflects a philosophy of openness, collaboration, and continuous learning. It prepares individuals for the realities of modern software development and fosters a spirit of global cooperation.

Whether one contributes to documentation, design, or core code, each role is valuable. And in doing so, contributors not only sharpen their skills and expand their network but also become part of a movement that is shaping the future of technology. Open source is a journey—driven by curiosity, sustained by community, and powered by the love of creation.

S Kowshika, 4th year

Artificial Intelligence & Machine Learning in 2025: A Transformative Era

Artificial Intelligence (AI) and Machine Learning (ML) have entered a new phase in 2025—marked by emergence of autonomous agents, multimodal intelligence, advanced reasoning, ethical imperatives, and a growing global political-economic framework shaping their trajectory.

Evolution of AI: From Generative Models to Agentic Systems

What began with large language models (LLMs) and generative AI has progressed toward agentic AI—systems capable of planning and executing multi-step workflows on their own. Enterprise-focused models now operate with goals, tools, memory, and autonomy, significantly narrowing the gap between predictive systems and fully autonomous digital assistants.

According to recent analysis, agentic AI is expected to be the defining story of 2025: models now coordinate multiple sub-agents, handle software tools, and complete tasks independently—within realistic business contexts. MIT Sloan underscores the rising focus on agentic architecture and unstructured data deployment across enterprises.

Meanwhile, generative AI continues to mature: advanced models now generate high-fidelity text, images, video, and even 3D content seamlessly. Businesses report rapid integration into creative workflows—from marketing to design to prototyping.

Multimodal and Reasoning Centric AI

The era of narrower, single-modality models is giving way to multimodal intelligence capable of processing and fusing text, vision, audio, and even video input. Tools like GPT 4.1 and Gemini 2.0 Flash—and specialized agents like Helix (by Figure AI) and NVIDIA's GRoot N1—are designed to control physical embodiments like humanoid robots using vision-language-action architectures.

At the same time, reasoning-centric models are gaining traction. AI systems now solve technical math and logic-heavy problems via chain-of-thought reasoning, with controlled inference scaling—offering toggles between “thinking” and fast-mode outputs to balance accuracy and efficiency. DeepMind's Gemini Pro and OpenAI's O1 series recently achieved gold-level performance at the International Mathematical Olympiad by adopting multi-agent debate and extended “thinking time” strategies.

AutoML, Tabular AI & Domain Specific Models

Automated machine learning (AutoML) has matured into a scalable reality, enabling non-experts to build and tune ML pipelines with minimal effort. Still, experts emphasize that human oversight remains valuable—especially in interpreting and validating model outputs.

For data professionals working with structured/tabular data, foundation models for tables like TabPFN have emerged. Released in January 2025 and developed by PriorLabs, TabPFN serves as a transformer-based tool optimized for classification and regression tasks on small-to-medium datasets with high accuracy even when data is sparse.

In addition, sector-specific AI models tailored to healthcare, finance, real estate, or scientific research are expanding rapidly—with tailored architecture and data ingestion frameworks—ensuring relevant domain performance beyond general-purpose systems.

Ethical, Explainable & Federated AI

The 2025 landscape is also shaped by strong concerns over ethical AI, fairness, transparency, and safety regulation. The first International AI Safety Report, published January 29, 2025 by 96 experts including Yoshua Bengio, laid out wide-ranging policy recommendations—from safeguarding against misuse to climate impact and social equity.

Meanwhile, Explainable AI (XAI) remains a high priority for industry and government alike. Techniques such as LIME, SHAP, and inference-scale control help stakeholders interpret model decisions—especially critical in domains like healthcare, finance, and law.

Federated learning and privacy-preserving approaches continue gaining traction—allowing model training across decentralized data sources without exposing raw data. These techniques support use cases in sensitive areas like medical research and financial systems, but still face deployment complexity challenges.

Real World Impact & Industry Adoption

Globally, organizations are racing to quantify ROI from AI. A Morgan Stanley survey reveals major sectors—finance, consumer, real estate—have seen significant performance benefits: cost savings, enhanced risk analysis, smarter supply chains—even REITs automating 37% of tasks.

Countries like India and China are pursuing strategic infrastructure and talent development plans. Meta recently announced a global undersea cable project linking India with Africa, Brazil, and the U.S., while Indian institutes such as IIT Kanpur and IIIT Hyderabad are launching advanced courses and GPU based AI research labs to supply a skilled workforce and drive innovations. In China, state-directed investments and open-source initiatives are accelerating domestic AI capability growth despite export controls.

Challenges: Regulation, Labor, Energy & Trust

The trillion-dollar AI infrastructure race is underway—Google, Amazon, and Meta are investing tens of billions annually in cloud, computer, and data centers. But environmental sustainability and power usage remain key concerns. Academic studies underscore the carbon footprint of large-scale model training and hardware lifecycles, underscoring the need for sustainable AI design.

Labor dynamics are shifting too. A TIME newsletter highlights the decline of “sweatshop data”—heavy reliance on low-wage annotation work—in favor of expert-trained systems using reinforcement learning with human feedback. Still, data moderation and verification tasks continue to use traditional labor structures.

Trust and public sentiment are under scrutiny. While some view AI as empowerment, many remain wary—demanding greater accountability, regulation, and human oversight over automated systems.

Education & Talent: Preparing the Future Workforce

AI's influence in education is transforming pedagogy. OpenAI recently launched “Study Mode” for ChatGPT—designed to promote reflective learning by guiding students with Socratic questioning instead of passive answers. Google's Gemini for Education offers similar tools.

In India, student preference has shifted markedly: AI and data science now top the higher-education intake list in Maharashtra, surpassing traditional computer engineering—reflecting the economic demand for AI skills.

Srikrishnan, 4th year

Transformers Beyond NLP: A New Era of Deep Learning

Since their introduction in 2017, transformers have redefined how we build and train deep learning models. Originally designed for sequence modeling in natural language processing (NLP), the transformer's core innovation—self-attention—quickly proved powerful beyond text. Today, transformers are fueling breakthroughs in vision, multimodal reasoning, and foundational AI systems. This article explores how transformers have expanded far beyond their language roots, becoming a unifying architecture across domains.

Vision Transformers (ViT): Treating Images Like Words

The Vision Transformer (ViT), proposed in 2020, applied transformer mechanics directly to image classification. Rather than scanning an image with convolutional filters, ViT splits an image into fixed-size patches, flattens them, and treats them as a sequence—much like words in a sentence. These patches are embedded, combined with positional encodings, and processed through standard transformer blocks.

ViT's strength lies in its ability to model global context early in the network, allowing any patch to attend to every other patch. However, this comes at a cost: ViT performs best when trained on extremely large datasets and lacks the strong inductive biases (like locality and translation invariance) that make convolutional networks efficient on smaller data.

Swin Transformer: Making Transformers Vision-Friendly

To overcome ViT's limitations, researchers introduced the Swin Transformer (short for “Shifted Window”), which combines the advantages of transformers with CNN-like structure. Swin restricts attention to local windows within the image, dramatically reducing computational cost. It then shifts these windows across layers to enable interaction between different image regions.

Swin also uses a hierarchical design, where patch resolutions are gradually reduced, forming multi-scale representations similar to CNN feature pyramids. This architecture scales well to high-resolution images and supports dense prediction tasks like object detection and semantic segmentation—something ViT struggled with.

Multimodal Transformers: Bridging Vision and Language

As transformers advanced in both vision and language, researchers began building multimodal systems that could jointly reason over both types of input. Two key models in this space are CLIP and Flamingo.

CLIP: Matching Images and Text in a Shared Space

OpenAI's CLIP model learns to associate images and their descriptions by mapping both into a shared embedding space using separate encoders for text and vision. Through contrastive learning, CLIP brings matching pairs closer while pushing non-matching pairs apart. This enables impressive zero-shot classification: by simply describing target classes in natural language, CLIP can classify images without retraining.

Flamingo: Visual Reasoning with Language

Flamingo, developed by DeepMind, extends transformer capabilities even further by enabling multimodal generation. Given a few interleaved image-text examples, Flamingo can answer questions about new images, generate descriptions, or engage in dialogue. It combines pretrained vision encoders with a language model and interleaves them using cross-attention layers—effectively allowing the model to understand and reason across modalities.

Challenges and Future Directions

Despite their versatility, transformers still face several open challenges:

- **Efficiency:** Standard self-attention scales poorly with input size. Researchers are actively developing sparse or linear attention mechanisms to make transformers viable on longer sequences and larger images.
- **Interpretability:** Understanding how transformers make decisions remains difficult. New tools for model introspection are being explored, but the architecture's black-box nature is still a concern for high-stakes applications.
- **Multimodal grounding:** Models like CLIP and Flamingo can associate vision and language, but they often rely on surface correlations rather than deep understanding. Grounding models in real-world interaction remains an open area of research.
- **Unified models:** The field is moving toward foundation models that can handle language, vision, audio, and even action in a single architecture—like GPT-4V or Google Gemini.

Conclusion: The Transformer as a Universal Learner

What started as a language model has now evolved into a general-purpose deep learning architecture. Vision Transformers demonstrated that self-attention could replace convolution. Swin made transformers practical for large-scale vision tasks. CLIP and Flamingo bridged vision and language, unlocking powerful zero-shot and few-shot capabilities.

Transformers are not just a trend—they represent a fundamental shift in how we approach representation learning. As we continue scaling them across data modalities and tasks, they bring us closer to building models that understand, generate, and reason more like humans.

Dhanush Parthasarathy, MS, MLE Drexel Program

How Are Generative AI Models Different from LSTMs?

The Evolution from Memory to Attention in Sequence Modeling

Before there was ChatGPT, Midjourney, or any serious generative AI movement, sequence modeling meant one thing: LSTMs. These networks powered early breakthroughs in machine translation, predictive text, and speech recognition. They were our best attempt at building models that could understand and generate coherent sequences over time.

But in 2017, transformers arrived, and with them, a new way to model language, context, and even vision. Today's generative models, from GPT to DALL·E to Gemini, are transformer-based. So what changed? Why did LSTMs fall out of favor, and what makes transformers so fundamentally different?

Let's unpack this from first principles.

What Is an LSTM, Really?

LSTM stands for Long Short-Term Memory, a specialized form of Recurrent Neural Network (RNN) engineered to retain information over time. LSTMs process inputs one token at a time, updating an internal hidden state that theoretically "remembers" past inputs. This design aims to solve one of the original problems with vanilla RNNs: the tendency to forget long-term dependencies due to vanishing gradients.

Internally, LSTMs maintain:

- A cell state that carries long-term memory across timesteps.
- Gates (input, forget, output) that regulate how information flows, is retained, or discarded.

The architecture is explicitly sequential: each token's representation depends on the prior one. For example, given the sentence:

"I forgot my umbrella because it was raining."

An LSTM tries to remember that "it" refers to "raining," even though many tokens have passed since the word appeared. This is its strength; but also its bottleneck.

Yes, LSTMs Can Be Generative

LSTMs aren't just for classification or tagging; they can generate sequences. Early models like char-RNNs were trained on Shakespeare's plays or Wikipedia dumps and could generate human-like text by predicting one character at a time, feeding the output back as the next input.

This autoregressive process: predict, sample, repeat; is exactly how transformers generate text too. But the key limitations of LSTMs became painfully clear:

- Limited memory: Dependencies degrade as sequences get longer.
- Sequential computation: Training and inference are slow because you can't process tokens in parallel.
- Compression bottleneck: The hidden state has to summarize the entire context into a fixed-size vector at each timestep.

- Inflexibility in context: LSTMs can't "jump" to relevant context dynamically; they rely on what's been compressed into memory.

These issues capped the scale and effectiveness of LSTM-based generative models, especially as datasets and model sizes exploded.

Transformers: Sequence Without Recurrence

Transformers dropped the entire notion of recurrence. Introduced in the seminal paper "Attention Is All You Need", they replaced time-dependent memory with self-attention, a mechanism where each token can directly consider all other tokens in a sequence, regardless of position.

For example, in the sentence "She poured water into the cup until it was full," "it" could refer to "cup" or "water." Transformers use self-attention to figure out which word "it" likely refers to, based on weights learned during training.

Key technical innovations:

- Self-Attention Layers: Each token computes dynamic "attention weights" to every other token. Instead of relying on a hidden state, the model learns which parts of the input are most relevant.
- Positional Encoding: Since there's no inherent order in a transformer, position information is explicitly injected into the token embeddings.
- Layer Stacking: Multiple self-attention layers are stacked, interleaved with feedforward networks and normalization, allowing deeper, more abstract understanding.

This design completely removed the serial bottleneck of LSTMs. During training, transformers process entire sequences in parallel, enabling them to exploit modern GPU hardware far more efficiently.

Why Transformers Excel at Generation

Transformers are fundamentally more flexible and scalable for generation tasks:

- Long-range context modeling: Transformers attend over the entire input sequence. An LSTM compresses history into a hidden state; a transformer refers back to everything, weighted dynamically.
- Massive parallelism: While LSTMs process one token at a time, transformers process entire sequences during training, crucial for training on billions of tokens.
- Multi-modal extensibility: The attention mechanism works not just for text, but for vision, audio, code, and more, making transformers the foundation for unified models like GPT-4 or Gemini.
- State reuse during inference: Modern transformer decoders cache intermediate computations (key and value projections), allowing faster generation with linear efficiency during inference.

So yes, transformers can be used in autoregressive fashion just like LSTMs, but the context they access and the scale they can operate at is orders of magnitude more powerful.

If LSTMs were the first serious attempt to give models memory, transformers are the first successful attempt to give them reasoning over context. LSTMs tried to carry context forward in time; transformers bring the whole context into view at once and ask, “what matters right now?”

This is why the entire field of generative AI (text, vision, audio, video) is now built on attention-based architectures. The transformer didn’t just replace LSTMs, it redefined the way machines process, understand, and generate sequences altogether.

Samah Syed, 4th year

Jobs of the Future: NLP Engineers and Prompt Designers

Feeling overwhelmed by the AI wave? You’re not alone, but AI isn’t just coming, it’s already here. At the heart of this revolution is Natural Language Processing (NLP), the technology that enables machines to understand, interpret, and generate human language.

From chatbots and search engines to Alexa and Siri, NLP powers the tools we use every day. It blends linguistics with machine learning and deep learning, making it possible for machines to communicate almost like humans and shaping the future of human-AI interaction.

Language as the Next Computing Interface

Natural Language Processing (NLP), a subfield of artificial intelligence, has become a cornerstone in building systems that can understand and generate human language. From search engines and voice assistants to automated summarization and intelligent chatbots, NLP is transforming how we interact with technology.

The shift from rule-based methods to neural language models has driven the demand for new roles, particularly NLP Engineers and Prompt Designers who play critical roles in deploying and managing language-aware systems.

NLP Engineers: Architects of Language Intelligence

NLP Engineers are responsible for developing, training, and deploying models that extract structure and meaning from unstructured language data.

Key Responsibilities

- Preprocessing and annotating large-scale textual or speech datasets.
- Building and fine-tuning transformer based models (e.g., BERT, RoBERTa, GPT, T5).
- Implementing end-to-end NLP pipelines for tasks such as sentiment analysis, machine translation, summarization, and named entity recognition.
- Integrating models into scalable applications using APIs and microservices.

Technical Stack

- Programming: Python, Java, C++
- Frameworks: PyTorch, TensorFlow, Hugging Face Transformers
- Tools: spaCy, NLTK, OpenAI API, LangChain
- Industry Application

- Finance: Market sentiment analysis from news articles.
- Healthcare: Extraction of clinical concepts from EHRs.
- E-commerce: Product recommendation and review analysis.

Prompt Designers: Optimizing Model-User Interaction

With the emergence of large language models (LLMs), a new role Prompt Designer has become increasingly relevant. These professionals guide generative models by designing optimal input queries (or prompts) to elicit accurate, safe, and contextually appropriate responses.

Core Functions

- Designing structured prompts for specific use-cases such as content generation, summarization, code completion, or tutoring.
- Evaluating model outputs for correctness, relevance, and tone.
- Iterating on prompt templates using prompt engineering techniques (e.g., few-shot prompting, chain of thought reasoning).
- Collaborating with domain experts to fine-tune interactions for industry-specific requirements.
- Interdisciplinary Skills
- Strong command of language and reasoning
- Familiarity with LLM behavior and limitations
- Understanding of ethical AI principles (bias, hallucination, safety)

The Growing Demand for NLP Talent

The global NLP market is projected to reach USD 439.8 billion by 2030, growing at a compound annual growth rate (CAGR) of nearly 39%. Industry reports indicate a significant talent gap in AI-related fields, particularly in NLP and generative AI.

- AI job postings increased by over 30% between 2022 and 2024.
- Prompt engineering is now among the most in-demand emerging skills, even for non-developers.
- Leading companies are building dedicated teams for prompt optimization, user alignment, and NLP research.

These roles represent a fusion of computer science, linguistics, and creativity — and are already reshaping industries from healthcare to finance to education. As the demand for intelligent, language-driven systems grows, so does the need for professionals who can bridge the gap between technology and communication.

Whether you're building models or designing prompts, one thing is clear: in the age of AI, the ability to make machines understand us isn't just valuable, it's essential. And those who master that ability won't just work with the future, they'll help define it.

Tarun Suresh, 3rd year, M.tech Integrated

Pinecone: A High-Performance Vector Database for AI Applications

Introduction

Modern AI systems rely heavily on vector embeddings—dense numerical representations of unstructured data like text, images, and audio—because they allow machines to understand and reason about complex data in a mathematical form. These embeddings enable algorithms to capture subtle relationships and contextual meaning that traditional symbolic methods miss. At the core of many AI applications lies the challenge of finding similar items efficiently in vast, high-dimensional spaces. This is where Approximate Nearest Neighbor (ANN) search becomes essential. ANN algorithms prioritize speed and scalability over exact precision, making them ideal for use cases like semantic search and real-time recommendations. Pinecone is a fully managed vector database built specifically for this purpose. It is optimized for ANN search, enabling low-latency, real-time retrieval of semantically similar vectors at scale.

Core Architecture & Key Features

Pinecone leverages Hierarchical Navigable Small World (HNSW) graphs, a cutting-edge ANN algorithm, to balance accuracy and speed in vector search. Unlike static libraries such as FAISS or Annoy, Pinecone supports dynamic updates, allowing real-time insertion and deletion of vectors—no index rebuilds required.

1. Vector Indexing & Query Optimization:

Uses HNSW for near-logarithmic time complexity in high-dimensional spaces.

Tuned for low-latency responses, crucial for interactive applications like recommender systems and chatbots.

2. Metadata Filtering & Hybrid Search

Supports filtering of vector search results using structured metadata (e.g., category, price).

Enables hybrid search, combining traditional keyword matching with semantic retrieval for richer, more flexible queries.

3. Scalability & Managed Infrastructure

Fully managed, serverless infrastructure with automatic horizontal scaling.

Multi-tenant architecture provides isolation and security across applications.

Use Cases in AI & Machine Learning

- Semantic Search & NLP – Goes beyond keyword matching by retrieving documents based on their contextual meaning.
- Recommendation Systems – Boosts personalization by comparing user and item embeddings to suggest relevant products or content.

- Anomaly Detection – Detects unusual patterns in logs or transactions by comparing embeddings against known behaviors.
- Image & Video Retrieval – Enables reverse image search by matching visual embeddings to find similar content quickly.

Comparison with Alternatives

While tools like FAISS (static, high-performance) and Milvus (feature-rich, self-hosted) are widely used, Pinecone differentiates itself by offering a serverless, production-ready platform with built-in metadata filtering and real-time vector updates. This greatly reduces operational overhead for teams, though it may come with higher costs for extremely large-scale or cost-sensitive deployments.

Limitations

Despite its strengths, Pinecone does have some trade-offs. Being a managed solution, it may not suit organizations requiring strict on-premise control or deeply customized indexing strategies. Additionally, the current cost model could be a barrier for hobbyist projects or startups experimenting at scale.

Future Directions

Pinecone is evolving rapidly. Future improvements may include memory-efficient quantization techniques, on-premise deployment options, and deeper integration with transformer models for seamless AI pipelines.

Conclusion

Pinecone addresses a fundamental challenge in modern AI: connecting unstructured data to intelligent systems that can interpret and act on it. With HNSW-based indexing, real-time updates, and metadata-aware search, Pinecone stands out as a robust, developer-friendly platform for vector search. As machine learning systems become more complex and data-hungry, tools like Pinecone will play an increasingly vital role in turning raw data into real-time, actionable insights.

Keerthana R, 3rd year

Article on Exploratory Data Analysis

Exploratory Data Analysis is the first step in data analysis . It involves observing data, cleaning it and making it ready for next higher end processes like data analysis and machine learning.it would be achieved by techniques like descriptive statistics and data visualization.

Some common steps include :

- Loading data
- View structure
- Handle missing value
- Visualize data
- Look for outliers
- Correlation etc

Loading data :

Loading data is the first crucial step in data analysis workflow. It allows you to import structured or numerical data from various sources like csv, json or excel into the format suitable for manipulation and analysis

Some examples :

```
import pandas as pd
```

```
df=pd.read_csv("file.csv")
```

```
df=pd.read_json("file.json")
```

View Structure :

viewing the structure of data is essential for understanding its shape, type and quality before analysis. It helps detect errors early and prepare the data effectively for modelling or visualization

`df.shape` to view dimensions

`df.columns` to view column names

`df.info()` to view datatypes and Null counts

`df.describe()` summary statistics for numerical features

Things that I wondered :

Why does pandas show objects instead of list, string or dict in `df.describe()` ?

Pandas are built on top of numpy. numpy arrays requires elements are of sametype to handle. so if a columns have mixed or non-standard datatypes it uses the generic type object

Handling missing values :

Handling missing values is important to avoid errors during analysis.

Some common methods include removing rows, filling with mean, median, mode, or using forward, backward fill methods.

Edge cases that I come across :

All Zeros in a Column

Sometimes a numeric columns may contain only zeros, but you won't see it in `.describe()` in such cases check `.unique()` or `.value_counts` on suspicious columns

Data Visualization :

Data visualization is the graphical representation of data to make insights and patterns easier to understand. It helps communicate complex information clearly using charts, plots, and graphs.

This EDA uses line plots to track how scores vary by name and bar plots to compare scores across individuals. A histogram is used to visualize the age distribution, A box plot highlights the spread and outliers in score values and scatter plot shows the relationship between age and score, helping detect trends or correlations.

Outlier detection :

Outliers are values that are much higher or lower than the rest of the data. They can affect averages and mislead your analysis. We often use box plots or the IQR method to detect them. Example: If most people in a survey are aged between 20 and 40, but one person is 95, that age is an outlier because it's far outside the typical range.

Correlation :

Correlation shows how strongly two numerical variables are related. A positive correlation means both increase together, while a negative correlation means one increases as the other decreases. It helps identify patterns and redundant features in a dataset

Gokul N V, 2nd year, M.tech Integrated

Turing to GPT: The Evolution of Thinking Machines

Latest AI foundations and Breakthroughs:

Recent times have witnessed a sudden and significant increase in artificial intelligence. The rapid development of high performance IT infrastructure, combined with the availability of vast data, has launched machine learning to great heights. Algorithms can now recognize patterns from texts, images and speech also.

GPT Revolution and Large Language Models:

Large language models (LLMs) lead this change, with OpenAI's GPT series showcasing their capabilities. Trained on a wide range of large datasets, models like GPT-3 and its successors do more than just answer questions and outline texts. They also create content for any topic, help with coding, support complex conversations and at times provide emotional support also.

Their ability to understand and act like a human in different situations makes them essential in education, business, and customer support. Additionally, ongoing improvements in how the models are adjusted and aligned are promoting safer and more responsible use.

New features and Technical Breakthroughs:

Multi Model Understanding:

Current LLMs produce text, images, and audio. This allows for interactive conversations, content creation, document analysis, and even verbal exchanges. Combining these elements leads to enhanced applications, such as describing visual scenes or reporting and analysing spoken language in real time.

Efficiency and Model Maximization:

Creations like model compression, quantization (using lower-precision calculations), and sparse activation (using only parts of a network when needed) have made Large Language Models inexpensive and more available. These enhancements allow deployment on mobile devices and lower environmental costs, supporting the rise of “edge AI,” where LLMs run on personal devices instead of the cloud.

Safety, Ethics, and Customization:

GPT models now have better safety features, approaches to reduce bias, and clear explanations of how answers are generated. Customized Large Language Models use privacy-friendly techniques to adjust to individual user styles and needs while keeping data secure.

Extended Context and Longer Conversations:

With context windows now capable of holding tens of thousands of tokens, today’s Large Language Models can brief long documents, remember detailed chat histories, and provide more reasonable, context-aware responses.

Real-Time and Fact-Checked Outputs:

Integrations with live web data enable Large Language Models to check facts and provide current information, rather than depending only on outdated training sets. This improves their usefulness for research, journalism, and decision support.

Effects, Challenges and the New Territory:

The integration of thinking machines into daily life is changing the life of humans and the society. AI-powered systems enhance management, personalize healthcare, provide security and drive automation across many sectors. However these advancements in the technology raise controversial questions about ethics, transparency, privacy and the societal impact of machine autonomy.

Researchers and deputies are working together to create guidelines and regulations that ensure safe and fair use of AI. Looking forward to, the focus is shifting from just increasing the size of models to building AI systems that are more intelligible, energy-efficient, and in pace with human values. This paves the way for a new era of responsible and life changing machine intelligence.

Anuvinda S, 2nd year

Zero Trust Architecture: Redefining Enterprise Security

Introduction

In the present dynamic digital environment, traditional network security models that operate on the basis of trust inside the network perimeter are no longer valid. Factors such as cloud services, remote workforce, and mobile plus IoT device usage have effectively dissolved the previous network boundaries. As a result, organizations not only face more sophisticated cyber threats but also need an even more adaptive responsive security posture. Zero Trust Architecture (ZTA) Access and Trust redefine access and trust management by imposing a new model of "never trust, always verify" for every user, device, and connection irrespective of their location.

Zero Trust Architecture refers to a security architecture model whose basic principle prescribes that implicit trust, whether inside or outside the network infrastructure, should not be an assumed de facto standard in the protection of organizational assets. Unlike traditional models that allow broad access once someone is inside the boundary, ZTA conducts strict identity verification, continuous authentication, and limited access for every request. This careful approach reduces risk, limits the movement of threats, and helps contain breaches if they occur.

What is the mode of operation for Zero Trust?

It takes place as a continuous process, long after the initial login. Every attempt made at access is evaluated in real time based on identity, contextual risk factors, policy compliance, and the health state of the device.

Major mechanisms are

- Gateways and proxies dynamically enforce security policies based on real-time risk assessment allowing, restricting, or blocking access.
- Smaller isolated zones within a network. Resources pertaining only to a particular segment of the network are breached; other resources in different segments of the network remain uncompromised.

Core Components of ZTA:

- Identity and Access Management (IAM)
- Enforces multi-factor authentication (MFA) for every user
- Uses role-based access controls depending on what users need to do. Trusts the device.
- Ensures only compliant, updated, and secure devices can connect
- Continuously evaluates device health and configuration

Granular Access Control:

- Allows fine-tuning permissions at the resource and action level
- Implements least privilege, giving users only the necessary access they need Continuous Monitoring and Analytics
- Real-time monitoring identifies abnormalities and threats as they happen
- Logging provides detailed information for auditing and meeting regulations

Businesses function amidst intricate surroundings where information and software are present on-premises, in the cloud, and through hybrid systems. Remote work and Bring Your Own Device (BYOD) rules make traditional outer defenses even more challenging. To greatly lessen the area vulnerable to attacks and control internal dangers as well as manage secure remote entry without depending heavily on VPNs Zero Trust Architecture is essential.

- Ensure <PRIVATE_PERSON> and NIST data privacy standards as well as other regulations
- Centralizing place where policies are enforced makes managing IT infrastructure easier
- Improve user experience through single sign-on (SSO) and streamlined authentication

ZTA's advantages include:

- Robust defense against insider threats and breaches: least privilege and micro-segmentation lessen the impact of compromised credentials.
- Safe Cloud and Remote Environments: ZTA facilitates mobile workforces and intricate hybrid models.
- Regulatory Compliance: Strict data security regulations are met in part by ongoing auditing and control.
- Better Visibility and Control: Clear insights into network activity are provided by centralized monitoring.
- Cost-Effectiveness: ZTA reduces the long-term expenses of breach recovery and IT complexity, even though the initial deployment may need investment.
- Improved User Experience: Adaptive authentication and SSO enable smooth access.

Conclusion

Zero Trust Architecture is a crucial strategy for safeguarding contemporary enterprises; it is not merely a passing security fad. Organizations can adopt digital security by assuming a breach, regularly confirming each access attempt, and implementing least privilege.

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Department Vision, Mission, PEOs, POs and PSOs

Vision

To emerge as a world class technology department through education, innovation and collaborative research.

Mission

- To impart quality education to students.
- To create and disseminate knowledge for the betterment of mankind.
- To establish a center of excellence in collaboration with industries, research laboratories and other agencies to meet the changing needs of society.
- To provide individual attention and enable character building.
- To encourage entrepreneurship skills among students.

B.E. (Computer Science and Engineering) SSN Regulations 2024

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1. Professional Success: Our graduates will excel in their career in industries associated with Computer Science and Engineering, or in research, or as entrepreneurs by applying their expertise in diverse domains.

PEO2. Adaptability: Our graduates will adapt to emerging technologies and develop new skills to remain competitive.

PEO3. Professionalism: Our graduates will maintain ethical and professional standards in their technical work keeping sustainable development of the society in view.

PROGRAM OUTCOMES (POs)

The graduates of the B.E degree program in Computer Science and Engineering will be able to

1. **Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
3. **Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

4. **Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
5. **Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6) P
6. **The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
7. **Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
8. **Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
9. **Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
10. **Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
11. **Life-Long Learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAM SPECIFIC OUTCOMES (PSOs)

The graduates of the B.E degree program in Computer Science and Engineering will be able to

PSO1: Solve computing problems by leveraging knowledge in foundational principles, distributed systems, security, artificial intelligence, machine learning and emerging technologies.

PSO2: Design and implement software and hardware systems using contemporary information processing technologies by applying software engineering principles and practices

5-year Integrated M.Tech (Computer Science and Engineering) Regulations 2023

Program Educational Objectives (PEOs)

PEO1: Industry career: To enable graduates to be competitive in the field of computer science and be well versed in cutting-edge technologies as well as tools used in the industry to take up a challenging career.

PEO2: Research Skills: To enable graduates to clearly formulate research problems and solve them effectively thus making them competent to pursue higher studies.

PEO3: Entrepreneurial skill: To enable graduates to work on inter-disciplinary projects, exhibit leadership qualities and initiate business ventures that provide innovative solutions for problems of social relevance.

Program Outcomes (POs)

The graduates of the 5-year integrated M. Tech degree program in Computer Science and Engineering will be able to

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. (K3)
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. (K6)
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. (K6)
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. (K5)
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations. (K6)
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
9. **Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

1. Develop computational solutions to problems in diverse domains by applying principles and practices of computer science and Engineering (K3)
2. Conceptualize, construct and evaluate optimal solutions for practical problems by applying suitable computing techniques and tools. (K5)

M.E. (Computer Science and Engineering) SSN Regulations 2025**Program Educational Objectives (PEOs)**

PEO1: Career Growth – Graduates will be successful in foundational and modern computing practices, have an attitude for research, and engage in entrepreneurial ventures, promoting growth of national and global economy.

PEO2: Professional Development – Graduates will have a passion for the profession, demonstrate professional standards, with good communication skills, and excel in their employment and leadership roles.

PEO3: Societal Concerns – Graduates will maintain high ethical standards adopting equitable and sustainable practices.

Program Outcomes (POs)

The graduates of the M.E degree program in Computer Science and Engineering will be able to:

PO1: Independently carry out research / investigation, and development work to solve practical problems (K6)

PO2: Read, write, and present a substantial technical report/document

PO3: Demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program (K6)

PO4: Analyze computational problems and develop software systems methodically, applying suitable modern AI techniques. (K4)

PO5: Apply ethical principles and sustainable practices with a concern for societal issues while using technologies for solving problems.

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