

AN INSIGHT INTO CSE

BUFFERED READER v6.1

AUG
2024

REBIRTH OF CSE SOCIETY

COVER BY
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M.TECH 2025



Version 6.1
August Issue
Rebirth of the CSE Society

revive.

A phoenix is a mythical bird, radiant and unyielding, born from flames and ashes. Welcome to a new era of Buffered Reader



Computer Science &
Engineering

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explore

BUFFEREDREADER V 6.1



From The HOD's DESK

Dr. Chiranjeev Kumar

HEAD OF THE DEPARTMENT

"Welcome to the new era of BufferedReader!"

It has been a testament to our department's spirit of innovation, collaboration, and relentless pursuit of excellence. Today, we reignite that flame with the relaunch of BufferedReader. It is with great pleasure that I introduce the relaunch of our esteemed departmental magazine, BufferedReader. For years, this publication served as a beacon of knowledge, innovation, and scholarly excellence within our community. Its hiatus left a noticeable void, but today, we proudly revive its legacy with renewed vigor and dedication.

The revival of BufferedReader signifies not only a continuation of our commitment to academic and professional excellence but also a celebration of the collective efforts of our students, alumni, faculty, and staff. This magazine will once again become a platform where ideas are exchanged, achievements are highlighted, and the future is envisioned.

This magazine has always been more than just a publication; it's a showcase of our society's creativity, hard work, and dedication. From insightful articles and research highlights to fun features and interviews, there's something for everyone. Whether you're here to learn something new, get inspired, or just catch up on what's happening in the department, you're in the right place.

I extend my heartfelt gratitude to everyone who contributed to this relaunch. May BufferedReader v6.1 continue to inspire, inform, and engage its readers as we embark on this exciting new chapter.

A huge shoutout to everyone who helped make this relaunch happen. We're excited for you to dive in and see what we've been up to.

Enjoy!

Letter from The EDITOR

Dear Esteemed Readers,

An erudite welcome to the intellectual beacon of the CSES, *BufferedReader v6.1*, back after a hiatus. The pages ahead are not just collections of articles and other stuff, rather they are a confluence of ideas that serve as cornerstones of our department.

At the heart of this issue lies a tale of resurrection and through the lens of our cover story, I entice you to join hands of the promising future of our very own Computer Science & Engineering Society or the CSES.

This edition features a plethora of well researched and immaculate pieces. To start with, we have got the faculty article, a profound exploration authored by Prof Arup Pal titled "Terabytes in Milligrams", where we get to know bioinformatics and storage media in an engaging way.

Next up, we have done an experiment to provide a systematic freshers' guide in addition to the regular departmental highlights and events showcased in every edition. Speaking of events, how can we forget YAADEIN - the farewell ceremony, where emotions flow and memories are cherished. We do have it covered - the last dance of the graduating ensemble.

For the tech buffs, we present a comprehensive case study on the phenomenal rise of NVIDIA - aimed at sophisticated analysis of a company that has constantly been at the vanguard of AI and graphics processing advancements. As for the regulars, we have Tech Milestones and Tech News, but in a more alluring fashion than erst.

Shifting focus to insightful journeys, we have chronicled internship experiences that contain narratives that can act as guiding light for aspiring batches to come and yes, we do have tangled some statistics in between. Coming to the alumni, we are thankful to Parvinder Kumar (B.Tech 2005 batch), Shirisha Vislavath (B.Tech 2021 batch) and Ayush Kumar (B.Tech 2019 batch) for their valuable additions for the integral Alumni Section. We have kept a section for contributions from our readers and are very grateful to everyone who submitted, taking out their precious time.

Now, I would like to express my sincere gratitude to the department, especially our esteemed Head of Department, Faculty-Coordinator and Faculty-Co-Coordinator, for their guidance and encouragement as well as for believing in me. I appreciate the exceptional members of the Editorial Team, whose relentless efforts have brought this edition to fruition. Additionally, I appreciate the design team for their artistic acumen, providing the aesthetic element to the issue.

As for you all, you will always remain my most favorite readers.

Happy Reading!

Sarthak Saumya
Lead Editor



THE CSE SOCIETY AND ITS GRAND RENAISSANCE

Spandan Kundu (CSES Secretary) B.Tech 2025
Sarthak Saumya (Lead Editor), B.Tech 2025

A grand renaissance! The title itself feels hulking, doesn't it! Well, we give you a fair warning that isn't exaggerated even a bit.

For readers who aren't aware, the Computer Science and Engineering Society was established in the fall of 2011 under the aegis of the Computer Science and Engineering Department of the then Indian School of Mines, Dhanbad. Given the great importance of Ohana culture for a department whose students are tested, tried, evaluated and judged at every step they take, the society proved to be a panacea to a plethora of problems the pupils faced. From providing a robust environment to a wide diaspora of talents to curating a gourmet menu for students to rejuvenate, the society left no stone unturned in making its beneficiaries competent from every angle.

With a few days of it coming into action, the society sprawled into action organizing spectacular events, one after the other. The likes of Udbhav saw highly esteemed dignitaries, from all across India and abroad, reaching in person to a place which is not even air connected. Such was the popularity amongst students, that some of the coding events saw over half a thousand participants.

But bygones are bygones, right? What's a journey without hurdles? Numerous unforeseen circumstances somewhat corroded the layer of galvanized zinc. And finally, the Achilles heel came with the worldwide coronavirus pandemic right at the beginning of 2020. Life was completely halted, with students and faculty, restrained to their homes, making it a herculean task to sustain a society! As luck would have it, the wildfire victimized our beloved society!

Things took a turn at the start of 2024, when the entire department consolidated, showed that all that is damaged is not irreparable! In a fit to bring back the lost glory, the students and the faculty members decided to take every possible step to reinstitute our beloved Society. Fueled by remarkable perseverance and courage, we, the new members who had little prior knowledge of the society, eagerly joined in to accelerate its revival. And lo and behold! The society came back into action in March 2024.

Since then, there has been no looking back. In just five months, the society pulled off a grand farewell to its outgoing students, worked into constructing its website from scratch and planned for numerous other one-of-a-kind events, with the much awaited Udbhav coming into action on the first of September.

We will conclude it here with the anticipation that we have been able to justify what we claimed as a grand renaissance. We request each of the students here at CSE to extend your support, in whatever form you can to the society. Whether it is in the form of participation or in lending a helping hand to organizing events, your assistance is integral to the success of the society. And of course, it is always great to reach out with ideas and innovations galore, since they serve as founding stones to paving a better future for our society.

As we forge ahead, your involvement will be the key to unlocking new heights and ensuring that the Computer Science and Engineering Society not only sustains its renewed momentum but also thrives in ways that set new benchmarks for excellence. Let us all work together to build a community that not only celebrates our achievements but also supports each other through challenges and opportunities.

Thank you for your unwavering support and enthusiasm. Let's make this renaissance a memorable and impactful chapter in the history of our society. Together, we can transform aspirations into reality and make a lasting difference.

Here's to the future of the Computer Science and Engineering Society, a beacon of innovation, collaboration, and excellence!



Unleash Your Brilliance:

Fresher's Guide to Conquering New Heights

Dear Freshers, Welcome to the family of IIT(ISM), one of the most prestigious institutions in this country. We know you may be nervous because entering college is an exciting yet intimidating task, so we are here to help! The name itself sets it apart as a world-class college that provides students with top-tier faculty and research to drive innovation and excellence in education. Students at IIT(ISM) gain very beneficial skills and connections for their future careers, with a large and powerful alumni network alongside comprehensive curriculum. Campus life is vibrant with a range of clubs and activities waiting for everyone, hence promising fulfillment while its worldwide recognition and a big and strong alumni network makes it rather appealing when entering the jobs market.

Grow to be the best version of yourselves with us as we embark on this adventure of growth and success.



Do's

- 👉 Make sure you go to classes regularly and develop healthy time management skills in order to keep up with your academic ambitions. It will help you to manage your study and other working hours for both with effective time management. This makes it extremely important for freshers to walk on a fine line between studies and extra-curricular activities.
- 👉 Be engaged with your professors to make the most of the class and ask for academic help.
- 👉 IIT(ISM) is acclaimed for its cultural values and unity between seniors and juniors. Hence freshers should start networking with their seniors so that they can take advice from their experience and hence seek mentorship to make decisions based on what benefits them most when having the edge over other college mates.
- 👉 Join various clubs and societies to explore your passions, improve upon new abilities and join other students who have equal loves.
- 👉 Look into different areas in tech as you can choose from multiple fields to decide what your interests are and where the future career lies. Many new fields such as Artificial Intelligence, Machine Learning, Blockchain Technology are starting but have lots of opportunities in the near future so freshers may step into these areas.
- 👉 Work on increasing your communication abilities, they are a vital skill request for the job and future career chances.



"In the middle of every difficulty lies opportunity."
- Albert Einstein

As you start this amazing journey at IIT(ISM), let us remind you, this is just the prelude of a beautiful book that your life would become! Adopt More Challenges, Seek new experiences and Stay Curious. Your potential is infinite and your opportunities here are unlimited. Trust in your abilities, make connections, and always strive for excellence.

Stay Connected: Your Essential Contact Guide!

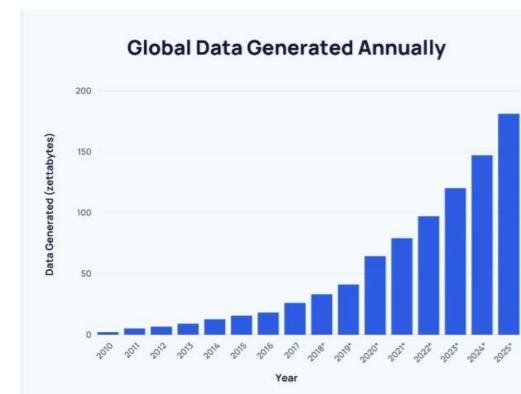
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Terabytes in Milligrams

DNA as a Next Generation Data Storage Medium



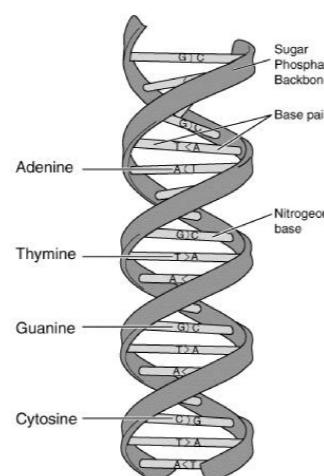
Humans, from the time of their evolution, have been collecting information through various sources of nature by the five sense organs and have tried to interpret the meaning behind them. To pass on the information from one generation to another, they have devised various mechanisms to preserve it. The means to record and preserve the data have evolved in an equal percentage as the evolution of human civilization itself, from the cave paintings of early man to the modern digital storage mechanism. While the means of storage of data have become more compact, less volatile, faster, and cheaper, the total volume of data has also increased to a great extent because of modern technologies like the Internet, Blockchain, Machine Learning, Generative AI, etc. This has brought a new challenge in finding better means of storing digital data.



An estimate of the exponential growth of digital data over the years

What is it?

One of the major challenges has always been the secure storage of data, for which various techniques have been developed. DNA data storage is an emerging technology that aims to convert digital data under the information technology module directly into a sequence of DNA nucleotides: Adenine (A), Cytosine (C), Guanine (G), and Thiamine (T). DNA has the potential to store the hereditary information from even the earth's living organisms. It makes room for extensive data, in a meadow space, generally calculated around 700 terabytes in a gram. Digital information can, in turn, be stored in DNA molecules by its representation as a sequence of nucleotides. The stored sequences stay intact for thousands of years and recover to retrieve the original information.

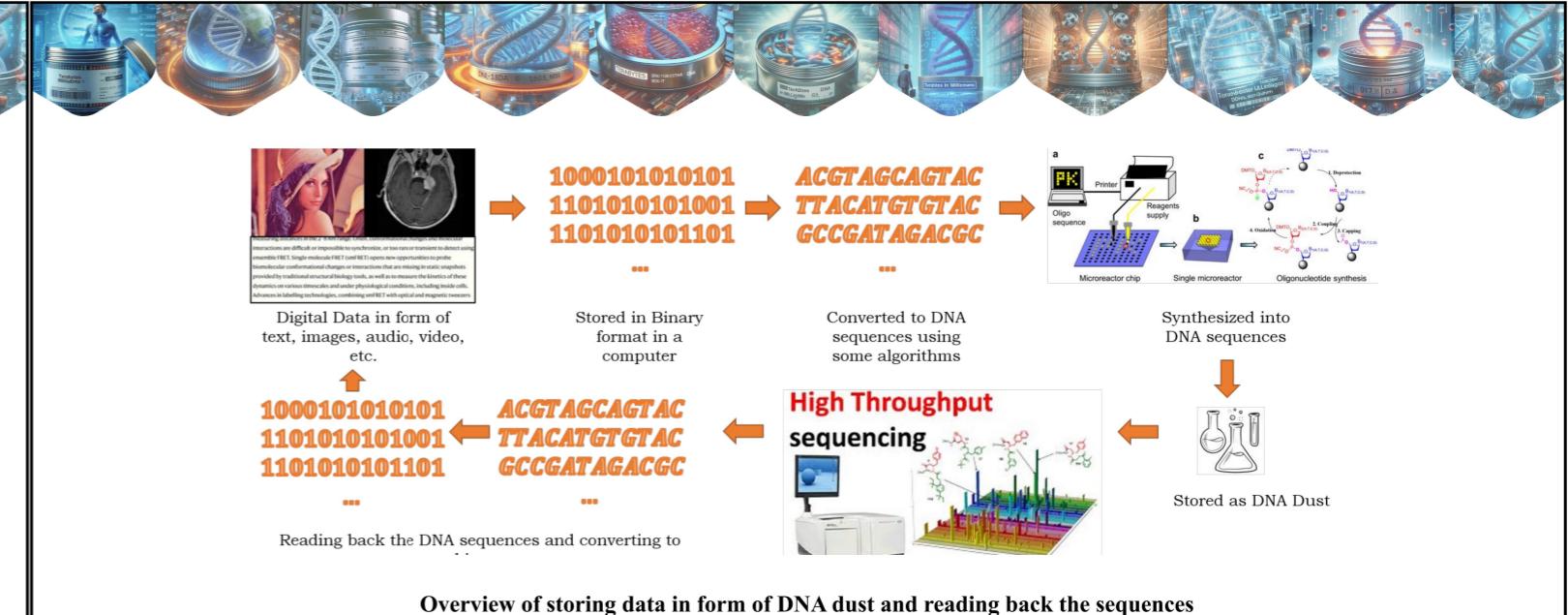


Double-helical structure of DNA

How?

Several algorithms developed for DNA-based archival storage describe that an entire digital file can be wholly stored in the form of DNA sequences, because it allows for the storage and preservation of enormous information for long periods in small volumes. In this process first, information gets changed into some sort of digital format and then to constrained DNA code words. One of the first algorithms proposed by Church was where each data bit was mapped to a DNA nucleotide such that not to increase the homopolymer run greater than three, maintaining GC constraint. This algorithm was very less efficient in terms of code efficiency, which was improved by Goldman wherein the digital data was compressed by a ternary-Huffman tree before DNA encoding. In Pooja Mishra, Chiranjeev Bhaya, Arup Kumar Pal, and Abhay Kumar Singh's 'Compressed DNA coding using minimum variance huffman tree', the authors aimed to get compressed DNA codewords by creating minimum variance DNA Huffman tree, which could efficiently store data following GC-constraints and a run-length of at most one. The algorithm could also be employed in effective image compression by breaking them down into bit-planes and block grouping them before generating the DNA huffman tree. Other archival-based storing techniques were developed by researchers in the field of 'Digital storage on DNA'. These codewords in DNA could then be made into DNA dust and it could be read back by these techniques such as Sanger Sequencing or High-Throughput Sequencing techniques. The data in the

~Dr. Arup Kumar Pal
Associate professor
IIT (ISM) Dhanbad



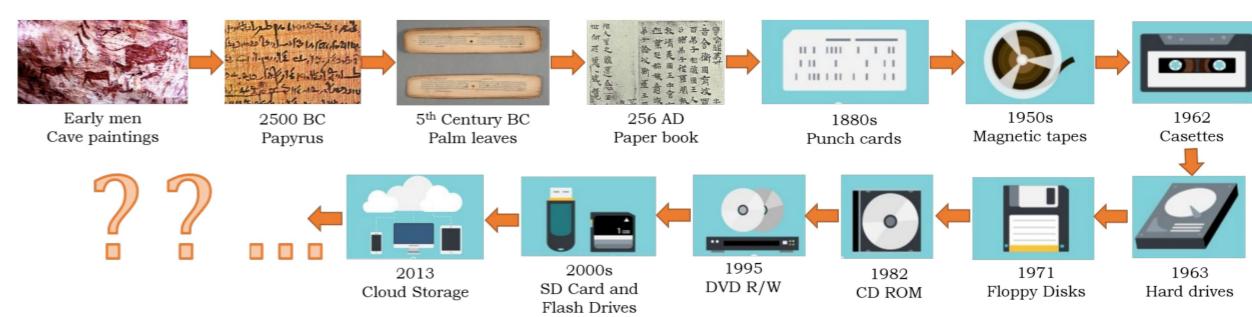
Overview of storing data in form of DNA dust and reading back the sequences

form of DNA dust proves to be compact, non-volatile and it can be read and converted back to the corresponding digital information.

History

The archival techniques are efficient in the way that a large amount of data is represented in a small fragment of DNA, which helps in reducing the synthesizing cost. Some of the algorithms developed by scientists have been used in developing addresses as DNA primers for random access along with the storage of data, helping to efficiently store and retrieve large strands of DNA. Yazdi proposed a method of random access in DNA data in 'A rewritable, random-access DNA-based storage system' by providing an architecture which contained encoded DNA sequences in the form of address and data. The first design that has to be undertaken is for a set of addresses A of length n. Now, all the addresses would have to be mutually uncorrelated, and they would have to be long enough so that the GC-content would be close to 50%. A higher Hamming distance will allow more error correction in case of substitution, deletion, and coverage errors during sequencing and synthesizing. Organik in 'Random access in large-scale DNA data storage' designed a DNA primer library consisting of pairs of orthogonal primers to be used as file IDs. These primers

were optimized to avoid secondary structures, avoid long run-lengths and at least 30% of unique sequences. El-Shaikh in 'High-scale random access on DNA storage systems' used DNA chips, a.k.a, microarrays to synthesize the sequences and store them in a DNA library. Probes or barcodes of single-stranded sequences could uniquely identify the microarrays and be useful in extracting the DNA fragments lying in a region of interest. The full coded sequence could then be divided into DNA packets, which in turn would combine back into DNA strands storing the data. DNA data storage remains one of the most exciting and promising research areas. The challenges in practical realization and fast access, which should be relevant to today's disk read/write speeds, are important. Although DNA as a storage medium can be used effectively for archival data, random access for buffer reading is complex and has many biological constraints. Apart from the above-described practically implemented processes, many researchers are also trying to find the theoretical limits for free energy of the synthesized DNA strands so as to create DNA codewords with high code efficiency and more stability. However, it still remains a challenge to develop such DNA data storage that can effectively be used in place of the current silicon technologies.



Evolution of data storage devices



The Phenomenal Rise of NVIDIA: A Comprehensive Case Study

Saksham Jha, B.Tech 2025

From Niche to Dominance: The Astonishing Rise of NVIDIA

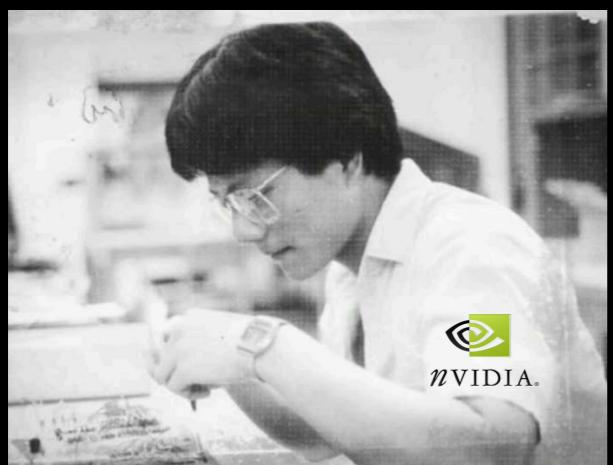
On June 18, 2024, Nvidia Became The Most Valuable Company In The World With A Market Value Of \$3.34 Trillion, Surpassing Giants Such As Microsoft, Apple, Samsung And Alphabet.

NVIDIA Corporation, a company that started as a niche player in the graphics card market, has become a technological powerhouse. Its stock price journey, from \$0.82 per share in 2016 to over \$1200 per share in 2024 (before the 10:1 stock split), reflects its incredible growth and strategic focus. This case study explores the factors behind NVIDIA's success, focusing on technological innovations, strategic decisions, and market performance.



Early Days and Major Innovations

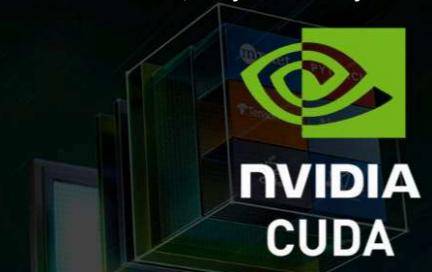
Established in 1993 by Jensen Huang, Chris Malachowsky, and Curtis Priem as a provider of high-performance graphics cards. When the GeForce 256 was released in 1999 it became known as the first GPU — incredibly exciting stuff. This revolution not only redefined benchmarks for gaming visuals but also paved the way for NVIDIA's future moves.



Strategic Pivot to AI and Data Centers

The Foresight of CUDA and Parallel Computing

Investing in parallel computing - like everything else NVIDIA does, they were early.



CUDA (short for Compute Unified Device Architecture) was introduced by the company in 2006. It even allowed developers to make use of the raw computing power that GPUs provided for many non-graphics tasks, such as scientific research and more prominently AI.

Reinventing the Future: NVIDIA's Bold Leap into AI and Data Centers



NVIDIA's game-changer in the past years was its move to join the emerging markets of artificial intelligence and data centers. GPUs are the perfect companion to use for AI projects because of their ability in excelling at performing parallel work on a lot of data. NVIDIA became the GPU of preference for training AI models, by tech majors like Google, Facebook, and Amazon. NVIDIA's acquisition of Mellanox Technologies in 2019 also strengthened its position with data center vendors. Mellanox's networking solutions can support the performance requirements of NVIDIA GPUs making them a perfect choice for all modern data center needs. As a result, this was one of the most important strategic acquisitions that NVIDIA made to take over AI infrastructure lead.

Financial Performance and Stock Market Success

Stock Market Marvel: NVIDIA's Unstoppable Financial Surge

NVIDIA stock was trading at around \$0.82 a share in 2016. By mid-2024, NVIDIA was trading at around \$1200 and went for a ten-for-one stock split. The split made NVIDIA shares more affordable for a new class of investors, which sparked even higher stock price gains.



Revenue and Profitability

NVIDIA has produced fantastic results over the years. The amount its revenue has grown from 2016 (\$5 billion in 2016 to \$26+ billion in only Q1 2024) wasn't all due to gaming, or AI/DC but that sector grew a lot during that time). Profitability surged as well with structural margin expansion leading to consistent improvements in net income margins and strong AI product gross profits.

Notable Technological Advancements

1. GPU Advancements

The GeForce series, particularly the RTX 30 series, demonstrated what was held out hope for some time - real-time ray tracing radically altered gaming graphics accomplished through generations. These GPUs served a wider range of works beyond just gaming, such as in professional visualization, design, and video production.



2. AI Titans: NVIDIA's Role in the AI and Deep Learning Revolution

NVIDIA's GPUs underpin applications of AI and deep learning. The company's DGX systems -- tailor-made for AI workflows -- offer researchers and enterprises the computational firepower required to train complex models. Its AI capabilities are also augmented by NVIDIA's software stack, which features libraries like cuDNN and TensorRT.

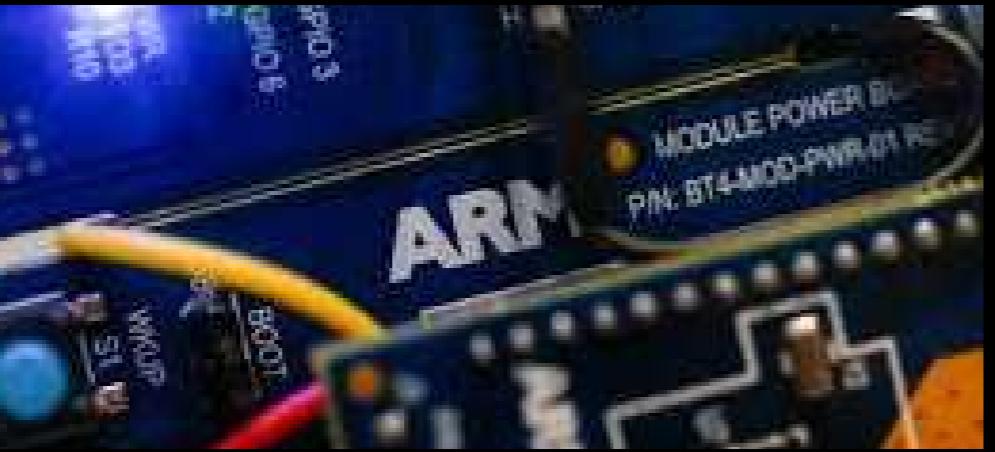
3. Driving the Future: NVIDIA's Vision for Autonomous Vehicles



NVIDIA's DRIVE platform is an end-to-end solution that offers a broad spectrum of hardware and software, consisting of DRIVE AGX Orin System-on-Chip with Hypervisor support. It offers high-performance processors and AI algorithms for real-time processing of sensor data to enable a wide range of safe, cost-effective autonomous driving (AD) solutions. NVIDIA has long been the leader in this field, with partnerships on some of Tesla and Mercedes-Benz's future vehicles to back it up.



Strategic Acquisitions, Partnerships



ARM Holdings

NVIDIA made a deal to buy ARM Holdings for \$40 billion in 2020. Nothing ever came of it due to regulatory concerns, but the deal underscored

NVIDIA's desire to make a splash in mobile and IoT. The acquisition would have given NVIDIA a significant play in the ever-present ARM processor designs that power many smartphones and embedded systems.

Mellanox Technologies

NVIDIA made a competitive play to expand its data center leverage with the 2019 acquisition of Mellanox Technologies. The high-speed networking solutions of Mellanox are important across AI and data analytics workloads at scale.



Working with Tech Giants

NVIDIA has a lot of collaborations with major tech companies to make advancements in AI and computing. NVIDIA's DGX-1 which for years, underpins cloud-based AI services from Google Cloud, Amazon Web Services, and Microsoft Azure. This way, preventable collaborators allow NVIDIA's technology to be easily available to developers and enterprises globally.

Market Challenges and Competitive Landscape

Rivals: NVIDIA vs. AMD and Intel in the GPU Arena

AMD's rival in the consumer space consists of its Radeon GPUs, while Intel has had an eye on entering the discrete GPU market for both gamers and AI accelerator markets. But because of NVIDIA's steady evolution and deep brand loyalty, it still wins.



Geopolitical Chess: Managing Risks in a Global Marketplace

Geopolitical tensions, especially between the US and China, weigh on proceedings. NVIDIA operations can be affected by trade restrictions and supply chain disruption, the company said in its filing. The company has sought to mitigate certain risks by diversifying its manufacturing and supply chain networks.

Surviving the Chip Crunch: Tackling Semiconductor Shortages

The global semiconductor shortage has hit all tech companies, and that also includes NVIDIA. Although there is a strong continued demand for GPUs, supply constraints have left the prices quite higher and availability severely lower. This is exactly the issue that NVIDIA aims to address with its long-term supply deal and putting money into new manufacturing capacity.

Future Outlook of AI and Machine Learning

The AI revolution is only just starting, and NVIDIA seems as if it can consolidate a definitive position in the landscape. NVIDIA's ongoing investment in AI R&D, meanwhile sees its GPUs continue to be the preferred option for both training and running deployed applications. NVIDIA AI software ecosystem and how it consolidates the platforms like NVIDIA AI Enterprise is a fully loaded toolset that developers can use.



1. Virtual Worlds: How NVIDIA is Shaping the Metaverse



The concept of the metaverse, a virtual world where people interact through digital avatars, is gaining traction. NVIDIA's Omniverse platform (which enables people to collaborate within the same virtual space) illustrates how early on this trend they are. The need for high-growth GPUs to stimulate the metaverse will increase NVIDIA revenues.

2. Quantum Leap: NVIDIA's Foray into Quantum Computing



NVIDIA exploring quantum computing, one of the few remaining uncharted territories in technology that promises orders-of-magnitude return on computational power. NVIDIA seeks to be the leader in this revolutionary technology by investing in quantum research and developing cutting-edge, quantum-accelerated computing solutions.

Conclusion

NVIDIA's evolution from a graphics card maker to one of the world's leading technology companies speaks volumes about its vision, innovative drive, and agility in navigating through rapidly evolving markets. This phenomenal growth and investor confidence is reflected in its stock price. Its focus on AI, data centers, and autonomous vehicles combined with important acquisitions made along the way has carved out a very strong niche for NVIDIA to become one of the market leaders. Even with external headwinds in the form of new competitors and geopolitical risk NVIDIA's "tech DNA" makes it a long-term winner, no matter what. With the world shifting towards AI, metaverse, and quantum computing, NVIDIA will be there to lead. It is a tale not just of business success but also of the limits you can break in technology.



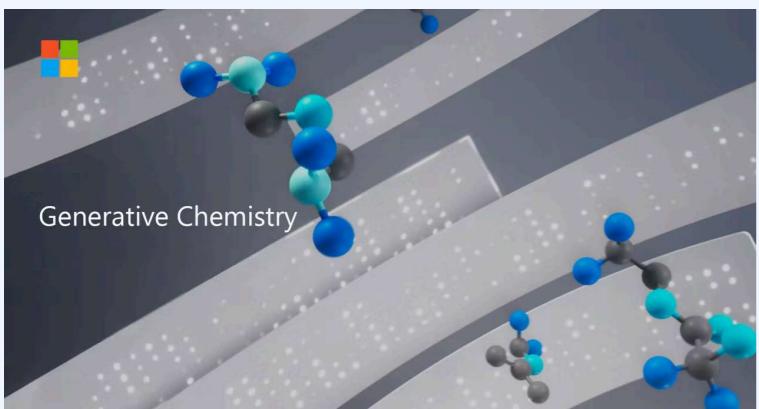
TECH MILESTONES

Sumit Kumar, B.Tech 2027

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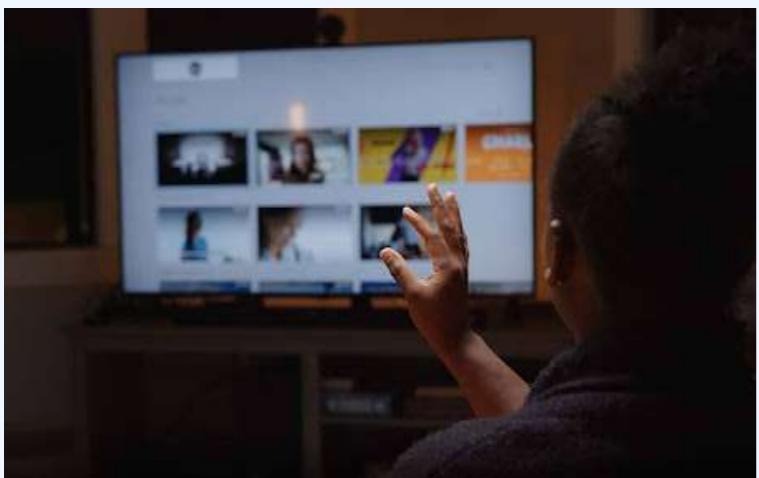
AlphaFold3 Model

AlphaFold3 is a cutting-edge AI model created by Isomorphic Labs and Google DeepMind. This model can accurately predict the structures of DNA, RNA, proteins, and ligands, as well as their interactions. Since living organisms are composed of biomolecules such as proteins, DNA, and RNA, prediction of how different combinations of these molecules with the help of this model can revolutionize our understanding of biology and drug discovery.



IBM Analog AI Chip

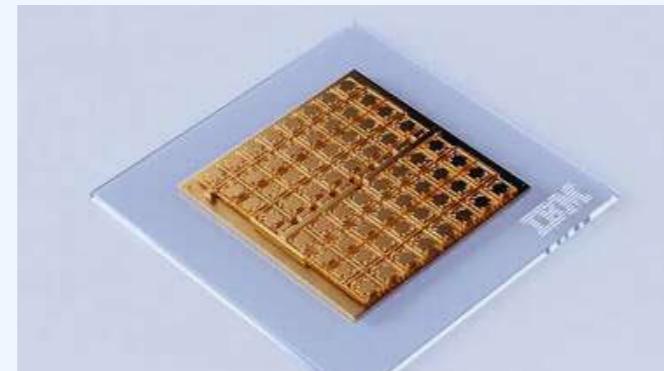
The IBM AI chip is a revolutionary development in artificial intelligence. It significantly enhances performance and its energy requirements are far less than that of a GPU. Unlike CPUs, GPUs, and TPUs, which use digital computing, these chips utilize analog computing. This enables more efficient representation of specific computations, particularly those related to AI and neural networks. Its analog computing capabilities make it ideal for real time processing related to AI.



NeuralLabs AirTouch

NeuralLabs AirTouch is an air gesture technology that allows users to use any device having a camera using hand gestures in the air without need of any physical touch. It leverages AI and computer vision to precisely track human hand movements using a camera. This technology is very easy to set up and does not require any code to integrate. It works in both 2D and 3D environments. It has 12 pre-programmed gestures and users can also customize the gestures to suit their specific needs. Its AI powered system is capable of distinguishing between intentional and unintentional gestures.

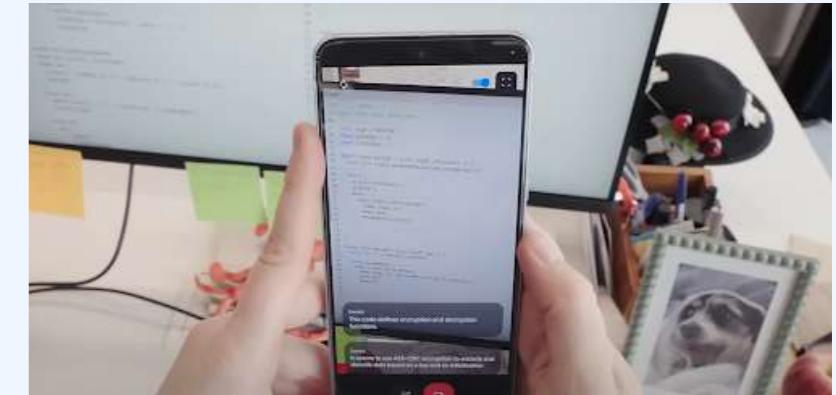
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Project Astra

Project Astra is a versatile AI assistant that processes inputs from cameras, microphones, smart glasses, and text. It excels in tasks like object recognition, understanding programs, generating responses, telling stories, and answering complex questions. Powered by Gemini's 1 million-token context window, Astra handles large amounts of data efficiently and in real time.



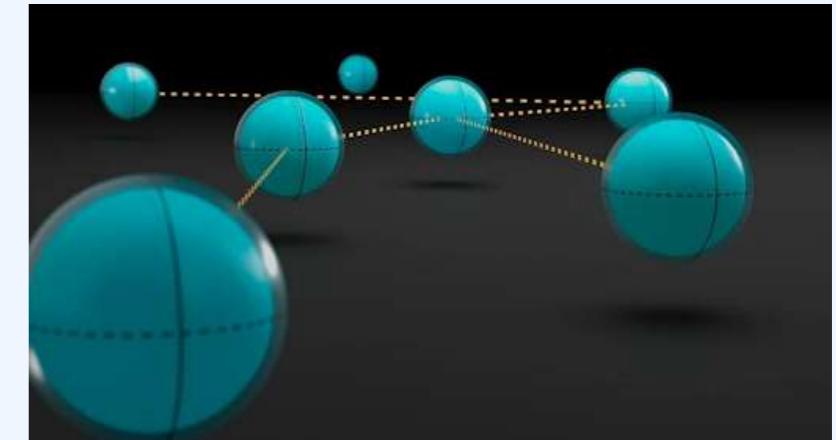
Azure Quantum Elements

Azure Quantum Elements is a part of Azure Quantum platform. It integrates Azure High Performance Computing (HPC) clusters with quantum computing capabilities to simulate molecular and material properties of chemical compounds including their chemical reactions. It can also predict structures of new materials with similar properties. It uses advanced machine learning and artificial intelligence to enhance its accuracy and efficiency.

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Azure Cobalt 100

Azure cobalt 100 is an ARM based processor developed by Microsoft specifically for Azure cloud virtual machines. ARM based processors are more power efficient as compared to x86 architecture based processors that were used traditionally for cloud computing. Over the years ARM processors have gone through many improvements. The new Azure Cobalt processor offers up to 1.4 times the CPU performance of previous Azure ARM-based VMs, and up to twice the performance for web servers, .NET applications, and in-memory cache applications.



07

Photonic Quantum Networking

Quantum networking is an emerging field that uses the principle of quantum entanglement to quickly transmit and receive information. Photonic in collaboration with Microsoft has successfully teleported a CNOT gate between two silicon spin qubits separated by distance using photons at telecom wavelengths. This achievement shows that our existing telecom networks have the ability to do long distance quantum communications.



GyroGlove

GyroGlove is a mechanical medical device used to stabilize hand tremors, such as those caused by Parkinson's disease. It has a high performance gyroscope that spins rapidly and works on the principle of gyroscopic stabilization to oppose hand movements. It includes a fabric glove, a gyroscopic stabilization module, and a battery system. Its fabric glove is designed for comfort and durability and is IP65 waterproof. Its battery can last from 4 to 10 hours depending upon its usage. Many people around the world live with persistent, incurable hand tremors.

08

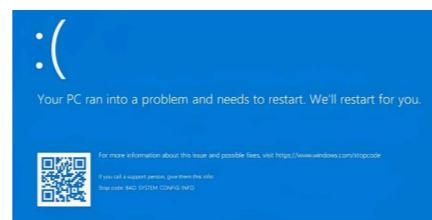
Microsoft - CrowdStrike Outage



On 19th July 2024, the world came to a standstill due to the Microsoft - CrowdStrike Outage. It caused heavy disturbances in the Airlines Industry resulting in cancellation of most of the flights. The root cause of the problem was distribution of a faulty update by CrowdStrike to its Falcon Sensor security software.

The outage resulted in the crash of 8.5 million windows systems and led to a financial loss of US \$10 billion.

If we go into the technical depths of the problem, we find that for security checks CrowdStrike's Falcon Agent is required to run a Windows Kernel driver (written in C/C++).



In the latest update for Windows Systems, Falcon encountered a null pointer dereference because it tried to read from an invalid memory address (0x9c).



This led to the whole system to crash - resulting in the infamous Blue Screen of Death that we have seen during the outage.

Battle for Search Engine Supremacy

If you ever thought your peers and colleagues are the most competitive guys there on the Earth then you are mistaken. Ever since the rise of AI like ChatGPT, Gemini AI, Copilot and Llama, the competition among Tech Giants has breached the limits.

While the fight for dominance of search engines was always on, the intensity has just skyrocketed with the entry of OpenAI in the arena.



Sam Altman's OpenAI has announced a prototype of its SearchGPT search engine. The company says it aims to give users "fast and timely answers with clear and relevant sources." The AI-powered search engine has ramped up pressure on Google. "We think there is room to make search much better than it is today," wrote Sam Altman. You can bet this fight is getting more fierce than Djokovic vs Federer in Wimbledon 2019.



Google Maps announces India-focused features

Google announced a slew of new features to woo Indian users including EV charging station information, flyover, callouts, public transport and AI driven routing capability to reduce narrow road usage for four-wheeler drivers.

It is "an exciting time in mapping", Google Maps said announcing the new lineup, which comes in the backdrop of a pitched battle with Ola Maps

The enhancements aim to provide a more seamless and intuitive navigation experience tailored to the unique needs of Indian commuters.

By incorporating EV charging station details, Google Maps is not only supporting the growing adoption of electric vehicles but also contributing to a more sustainable future.

Turing Awards 2023

Named after *Alan Mathison Turing* (a British computer scientist), it is the greatest honor in the field of Computer Science.

On April 10, 2024 the Israeli Computer Scientist Avi Wigderson received the Turing Award. The Association of Computer Machinery (ACM) gave him the award for "reshaping our understanding the role of randomness in computation, and for decades of intellectual leadership in theoretical computer science".

This recognition highlights the profound impact of their contributions to the field, influencing countless researchers and sparking new directions in computational theory. Their work has not only deepened our grasp of complex algorithms but also paved the way for innovations in cryptography, optimization, and the analysis of large data sets.



A statue of Alan Turing, created in slate by Stephen Kettle in 2007, is located at Bletchley Park in England as part of an exhibition that honours Turing (1912–1954)

Wigderson has also won the Abel Prize (Nobel Prize of Mathematics) in 2021.

The list of the Turing Award winners include Dijkstra, W.Floyd, Tim Berners Lee and many more.



Left to right : Avi Wigderson (2023), Edsger Dijkstra (1972) , Tim Berners (2016)

Yaadein 2024

Kshitiz Pratap Singh, B.Tech 2026

As the sun dawned on 6th May 2024, 3rd and 2nd year students seemed very engaged with preparations ongoing in the Penman Auditorium which was getting ready to host the Farewell Event of 2024 Passout Batch. Also, this was the first time after the COVID-19 disaster that the CSES was going to hold a get-together. Put differently, it would mark the revival of CSES. So the stakes were very high and the onus lay on Juniors to make the event a success.

Finally the time came, when the outgoing batch students and professors started taking their seats. As the evening came by, a cloud of mixed emotions swept across the Penman. The proceedings started with a welcome address by Spandan Kundu, Sec., CSES. It was followed by an energetic dance by Soumya, Nityam and Ishita. Then we had Binary Bonanza : The Tambola Edition in which everyone including the professors participated. The event added flavors of joy and excitement to the evening. After the spell of fun, we had a stunning rendition of

Tum se hi by Akash blending beautifully with the audience. As the caravan moved on, we reached the most anticipated event of the evening, Mr Trailblazer and Miss Maverick Maven (a contest of charisma) to be held in two rounds. In the preliminary round, the contestants were required to share memorable moments from their college days. Whereas in the final round of the event, the contestants

were assessed on the basis of presence of mind and oratory skills. The winners were adjudged on the basis of performance in both the rounds. Ashmita was declared the Miss Maverick Maven while Rounak Asnani became the Mr Trailblazer. We too had the Musical Thrones, in which participants were required to grab a chair as soon as the music stopped.

Among all these activities, the outgoing batch was poured with blessings by our Professors. Prof. PK Jana asked the outgoing graduates to do something beneficial for the society and be a good country man. Prof. Saurabh Srivastava gave a glimpse of challenges and opportunities in the professional world and emphasized the role of Prompt Engineering in the future. Prof. Gadadhar Sahoo shared his experience to enrich the young minds and urged graduates to show dedication towards their work. Prof. Rajendra Pamula thanked Prof. Chiranjeev Kumar, President , CSES, for bringing back the CSES. Further he asked students to never have bad intentions

towards anyone. He also asked students to take care of their parents. Finally to lighten the environment we had a stand-up comedy by Master Yash. At last we had a concluding address by Prof. Chiranjeev Kumar,HOD,CSE. The graduating ensemble was also bestowed with mementos with a note to remain connected. The event culminated with a sumptuous dinner.

"I have got my leave. Bid me farewell, my brothers!
I bow to you all and take my departure.

Here I give back the keys of my door
---and I give up all claims to my house.
I only ask for last kind words from you.

We were neighbours for long,
but I received more than I could give.
Now the day has dawned
and the lamp that lit my dark corner is out.
A summons has come and I am ready for my journey. "
— Rabindranath Tagore





MY DAYS @ IIT(ISM) DHANBAD

IN CONVERSATION WITH



QUEST FOR GEM STONES IN A LUSTY GREEN MINE

It was a rainy morning in the middle of September 2022, when our blue Baleno was about to enter the IIT(ISM) Dhanbad campus to drop me there on my joining day. As soon as the car reached the main gate, two to three security guards, grabbing their umbrellas, rushed towards us. One of them tapped on the foggy window glass and asked, "Whom are you going to meet?". As I opened the window, I got immediately drenched by the rain shower ruffled in the stormy wind. It was raining so hard that my reply did not reach him properly.

So, I had to open the intimation email regarding my arrival to the campus and showed the same to the security personnel. However, he seemed not much convinced and immediately dialed to some higher authority. After a few exchanges of words through the telephonic discussion, he instructed the driver for some formal steps regarding gate-entry and welcomed us happily. I felt extremely relieved...not because the entry stage was over, but due to realizing that I would be staying under the secure arm of an IIT campus, protecting all its mines (departments) and gemstones (faculty, staff, and beloved students) with utmost care.

As our car was slowly moving through the misty green campus, the scenic beauty compelled me to keep the window open. The majestic fragrance of Plumeria, Orange-Jasmine and Coral-Jasmine was spread all over. Soon we reached the Executive Development Centre (EDC)—the temporary accommodation allotted to me for staying on campus. After dropping me there the car travelled back to my hometown in West Bengal. Within a few minutes I arranged my luggage and then walked towards the CSE building to join the department.

On my very first day at CSE, I could meet only the departmental head and three to four other office staffs. All of their hearty greetings and friendly behavior filled me with a feeling of homely atmosphere. After three days of continuous heavy rain, I finally got the chance to meet almost all my faculty colleagues together in a nice interaction session in the conference room of the department. At first the session appeared to me as a serious interview going on with lots of queries from some of the ardent faculty members, regarding my ongoing research projects. Slowly the discussion took a different flavor and I felt it like a family get-together and myself as a new member of the family. Immediately after the introductory meeting, I got the opportunity to visit the entire campus, accompanied by the Head of the Department. While visiting the nicely adorned campus, I got familiarized with two tall buildings, named as "Old Rosaline" and "New Rosaline" hostels, but at that moment I did not imagine that very soon I would be allotted as the Warden of these two.

A few months went on doing research and administrative works. Finally, the long-awaited day of appearing as a teacher came in January 2023. As a faculty member from the Dept. of CSE, I was allocated "Introduction to C Programming" theory as well as lab courses, and also the "Object-Oriented Programming (OOP)" course to teach the 1st year undergraduates and 2nd year undergraduate students, respectively. My first lecture was scheduled at the very first lecture hour on the day of commencement of the winter semester 2022-23. It was the first OOP class of the semester. Being a newly joined faculty member of the Department, in the evening before my first lecture day, I received best wishes from some of my senior faculty colleagues. Additionally, they tried their best to make me aware of the various nuisances created by the students, including the playing with mobile phones, mimicking the voice of the teacher, and so on, which I might expect during my forthcoming days. Being slightly tensed, on the said day I reached the lecture hall little earlier than the scheduled time. The students started coming and taking their seats in the gallery of LH-3 at NLHC. The whole lecture hall was initially filled with the buzzing of the students. However, as I greeted everyone and started delivering the lecture, the entire class, comprising of around hundred students, suddenly became quiet. To my greatest pleasure, even without requiring any kind of scolding/commanding, a pin drop silence prevailed throughout the entire duration. The students attended the class with rapt attention and I myself was fully satisfied being able to deliver what I planned.



My subsequent teaching days and semesters went on well with continuous encouragement and appreciation from the students. Since all the courses, including "Programming", "Artificial Intelligence" and "Deep Learning", that were allocated to me, were either open elective type or modular type courses, in every case, I had to deal with a class of over hundred students from multiple stages (UG/PG/PhD) as well as multiple branches. Explaining the same concept to reach the level of understanding of all of them was really a challenge. Further, introducing C programming within a half of the semester to the 1st year UG students with no programming background was also quite difficult. However, both of these issues were well handled with utmost dedication to teaching while having intense care for the students. As I am leaving the Institute, I would like to express my heartfelt thanks to all of them, for their support throughout my journey at IIT(ISM) Dhanbad. I also wish them grand success in all their future endeavors.

Unlike what I felt during my very first entry, today (19th of July, 2024), while standing on the verge of leaving the Institute, the entire IIT(ISM) campus, adorned with tall big Deodars, Siris, Saptaparni, Gulmohars, Peepals, and Rain trees, is suddenly appearing to me as a lusty green mine, and all my old days here as the precious gemstones that came with different colors and shades. All gemstones are precious, though all of them may not suit everyone. Likewise, all my days at the campus were memorable, although all were not pleasant for me. Still, at this moment, I feel myself a wealthy lady, possessing all these gemstones, which will remain secured forever at the core of my heart.....I'll always cherish my days at IIT(ISM) Dhanbad.

Dr. MONIDIPA DAS (Assistant Professor)
Department of CSE, IIT(ISM) Dhanbad

Can you share with us your journey and how you came to join IIT(ISM) Dhanbad?

After receiving my doctorate degree from the Department of CSE, IIT Kharagpur, in 2018, I joined the School of Computer Science and Engineering (SCSE) at the Nanyang Technological University (NTU), Singapore, to work as a Post-doctoral Research Fellow. I continued there till the end of my research contract in 2020 and subsequently joined as DST-INSPIRE Faculty Fellow at the Machine Intelligence Unit (MIU) of ISI Kolkata. While working as the INSPIRE Faculty Fellow, in 2022, I applied for the regular Assistant Professor position at IIT-ISM Dhanbad and I joined the said post in September 2022.

You have done your PhD from IIT Kharagpur and worked at ISI Kolkata. And now you have also worked at IIT(ISM) Dhanbad. So how do you see your stay at these premiere institutes? Any differences and similarities?

I feel honored to get opportunities to work in such prestigious and world-recognized Indian institutes. All these Institutes are dedicated towards reaching a common goal of student excellence, and developing human resources for the ultimate progress of the nation. Only difference I feel is in their policy and perspectives such that the graduates and post-graduates produced from the IITs seem more inclined to the industry, whereas those produced from ISI seem more motivated towards research and academia.

Apart from teaching, our college offers a plethora of opportunities to work on various projects and research works. Can you reflect upon the various projects and research works you undertook at the college? How did it impact you?

Within my short journey of less than two years in IIT(ISM) Dhanbad, I handled three projects which are all research-oriented and sponsored by DST, Govt. of India, New Delhi. Timely attaining the goals of the projects seemed quite difficult as I had substantial load of teaching courses with around hundred or more students registered in each. Moreover, as there was lack of manpower in each project, I had to put significant effort to fulfill my commitments.

How did you manage your time between teaching, projects, research works, administrative works and personal life?

My teaching and the various administrative works, including my warden duties, were mostly restricted till 7PM in the evening. I spent the remaining hours for the homework and daily household works. The project and research related activities with the students/scholars were scheduled either in the free working hours or in the weekends.



INTERNS' ODYSSEY

Deepika Tanuvi, B.Tech 2025
Riya Kumari, B.Tech 2026
Bitra Sri Pragna, B.Tech 2026

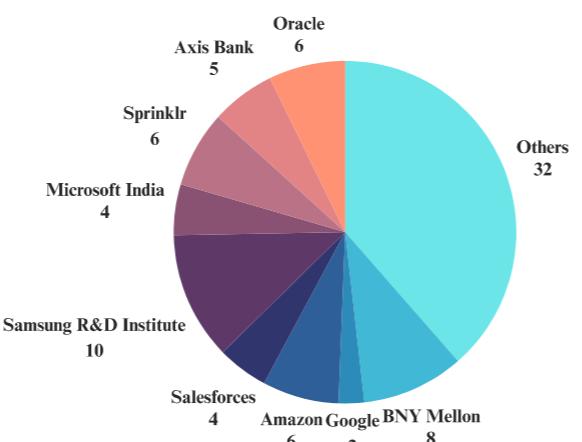
Right from the time one enters into an IIT, everyone sets their sights on "Dream Placements". What can be a better way to boost one's future prospects than grabbing an internship opportunity at a good firm. In layman's terms internships sets the tone of one's career and introduces them to work ethics of the industry. Ultimately it helps students to gain practical experience and become fully employable. Based on the performance, internships turn into full time employment.

So you can bet the intern season is one of the most important phases of college life. In our institute, the intern season for the 2025 batch commenced in July 2023. Guess what? CSE undergrads were the front-runners in the whole intern season grabbing the most number of opportunities.

The companies for opportunity ranged from Microsoft, Google, Amazon to D.E. Shaw. In all, as many as 30 various companies offered internships to CSE students.

Here are some highlights from **2025 intern season**

- Number of opportunities : **83 (80 B.Tech. & 3 M.Tech.)**
- Maximum stipend (per month) : **2.00 lacs (Sprinklr)**
- Median stipend (per month) : **1.00 lac**
- Most number of opportunities : **Samsung R&D Institute (10)**
- Most common role for internship : **Software Development Intern**
- Average time duration of internship : **8-9 weeks**



LET'S LISTEN FROM INTERNS



Gourab Roy
(M.Tech'25)

A

t Axtria, our work primarily involved SQL commands, with tasks focused on data cleaning and validation. Coming from an Electronics background, I faced a learning curve, but I managed to overcome it.

We were assigned to an internal project, details of which are confidential due to company policies. Our team had daily meetings with the project lead to discuss our objectives. During our free time, we used to play Table Tennis, UNO and Carrom in our company's game room. It was really fun, and we got to bond strongly with each other.



M

y internship in GenAI involved working on Process Automation projects, where I developed an RAG model using Azure OpenAI key.

I automated the generation of release notes, test cases, selenium scripts, and direct access scripts, and introduced a chunking mechanism to avoid token limit errors. I believe in teamwork and growing together with colleagues by keeping egos aside. I enjoyed living in Hyderabad. We went on various trips like Wonderla, Ramoji film city and many more. We enjoyed the weather and people there.



Ashwani Kumar
(M.Tech'25)

A

s a Software Developer intern at Microsoft in the Cloud & AI team, I focused on enhancing security by integrating Trusted Launch and Network Virtual Appliance validations.

As a Software Developer intern at Microsoft in the Cloud & AI team, I focused on enhancing security by integrating Trusted Launch and Network Virtual Appliance validations into the pre-publication process for Virtual Machines on the Azure Marketplace.



Microsoft

I began with preparing the design documents (HLD, LLD), followed by implementing the project using the .NET framework. I performed thorough testing, including Unit, E2E, and BVT testing, and successfully deployed the project to production within 2 months. This experience taught me the importance of meticulous planning, thorough testing, and efficient execution in delivering high-quality software in a fast-paced environment.



Utsav Chabhadiya
(B.Tech'25)

J

oining GS with no prior experience in a multinational corporation, I initially found adding features to an existing codebase with unfamiliar libraries intimidating.



Digvijay Anand
(B.Tech'25)

Working on the project required me to quickly learn and understand several tech stacks and open-source libraries. Seeking help from colleagues and maintaining regular interactions with them were crucial for overcoming challenges. Our discussions ensured project alignment. Working alongside some of the brightest minds and leading experts in the industry was profoundly enriching and insightful. A highlight of my internship was winning the Intern Coding Challenge, where I stood first in the Hyderabad office and received an iPad as a reward.



D

uring my internship with the Google One ML team, I developed a testing framework to automate the testing of ML-generated results.

I had to quickly learn and adapt to new technologies, using Google's internal tools. I read documentation, completed codelabs to grasp the concepts, and overcame access issues. Midway through the project, I faced a change in implementation, which required flexibility and problem-solving. Throughout the experience, I focused on continuous learning, seeking guidance, and regular practice. I also emphasized developing soft skills, being proactive, networking, and maintaining a healthy work-life balance.



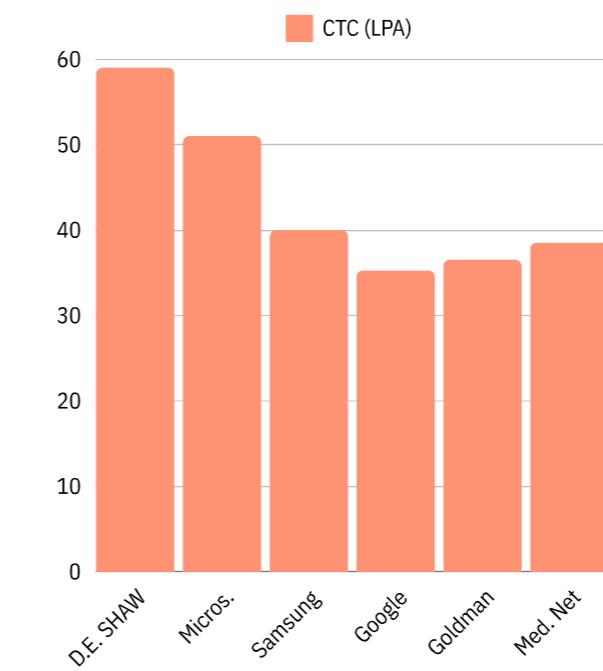
Avani Jain
(B.Tech'25)

STATISTICS 2024

The 2024 placement season for the Computer Science & Engineering Department has seen robust outcomes, with a significant portion of students securing offers from top-tier companies. This report provides a comprehensive overview of the placement statistics, including key figures such as average, median, and minimum CTCs, alongside insights into the highest-paying recruiters. The data highlights the successful placement of both B.Tech and M.Tech students, reflecting the department's strong performance this year.

Here are some highlights from *2024 Placement season*:

- Total Students(B.Tech + M.Tech): **183**
- Total Placed Students: **148**
- Total Number of students got PPO: **47**
- Maximum CTC: **₹59.00 LPA**
- Average CTC: **₹23.87 LPA**
- Median CTC: **₹19.50 LPA**



Vishal Shrivastava
(B.Tech'25)



Sajal Singhal
(B.Tech'25)

During my internship, I worked on enhancing a customer support portal, focusing on the frontend using Ember.js and the mid-tier REST service.

Although I was familiar with the tech stack, adapting to their code quality standards was challenging. I overcame this by utilizing the references provided and drawing on my experience from college projects, which helped me quickly adapt. I used C++, Python, SQL, and HTML/CSS/JavaScript throughout the project. This broad exposure ensures you're familiar with various technologies when you enter the industry, regardless of specific languages.



It is important to have a broad understanding of tech, even outside your current field, as this knowledge can help resolve doubts.

My internship involved pushing Spark streaming application metrics to Prometheus, where I configured Spark settings and added config maps for the Prometheus T2 adapter. Effective team communication is key don't skip initial training, as they provide valuable insights. If you're briefed on your project beforehand, learn the basics to ease collaboration. Engage actively with your buddy and mentor, make friends, and enjoy the experience. Luck plays a role in getting opportunities, but when you get your chance, seize it with hard work.



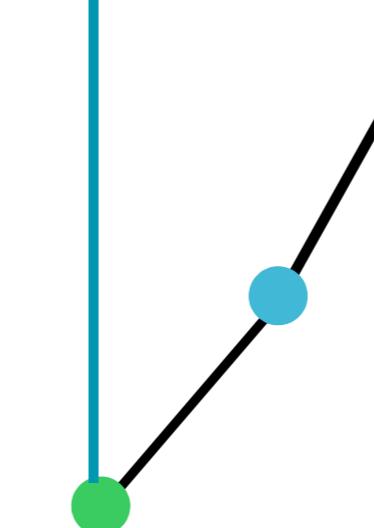
Kollati Satwika
(B.Tech'25)

DE Shaw & Co

The Company has given highest CTC upto **59 LPA**.

ARISTA

1st Student was given pre placement offer. They also recruited an intern for summer training.



The Company has hired more than **15 students** and has also offered summer internships.

Goldman Sachs

Less Than 10 LPA 6%

Above 40 LPA 12%

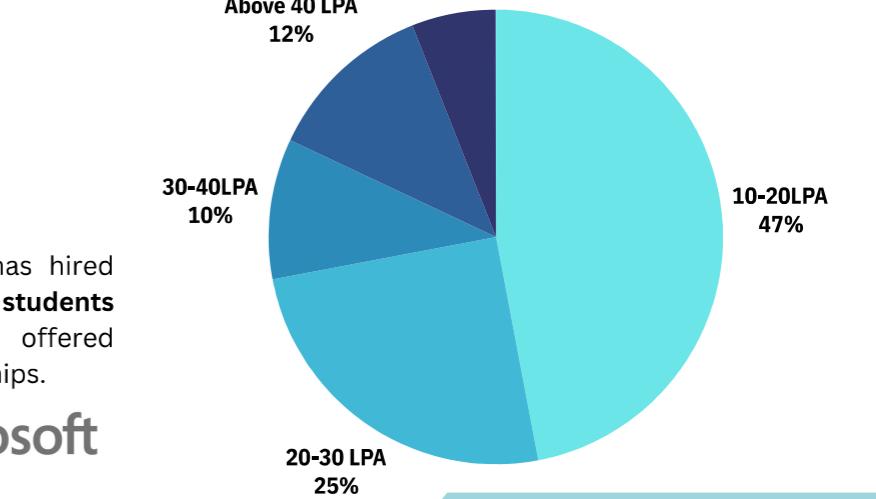
30-40 LPA 10%

20-30 LPA 25%

10-20 LPA 47%



The Company hired **2 M.Tech** Scholars and offered PPOs at their firm.



ORACLE



IN CONVERSATION WITH

Ms. Shirisha Vislavath

from the batch of 2021 is currently an Associate at Goldman Sachs. An ex-Chair of ACM Student Chapter, and known for her vibrant and bubbly personality, she takes us through her college journey and offers advice to juniors in this conversation.



Which three things about college do you miss the most?



Well, it is the college, the clubs, RD momos and tea, fotowalks that I miss the most in my college. What I really miss is the freedom from not having to bother about anything, just attending classes and going to clubs. Also, I miss spending time with my friends.



How do clubs, workshops, and fests contribute to your personal development?



They played a big role in developing a person's personality. Hence, the clubs, seminars, and festivals helped me form meaningful friendships and realize the importance of team work. It is also through clubs that the senior-junior bond is formed. It was essential to take up responsibility, especially as a key committee member. In the first year, I followed my interests; in the second, I charted out a clear course; in the third, I shouldered major responsibilities adapting to the teamwork and deadlines of corporate life.



How do you see the significance of academics compared to extracurricular activities and other pursuits?



My interests and priorities are multifaceted. The spine of my education is academics, with a focus on deepening my knowledge of the core subjects and keeping up with new developments. Extracurricular activities like clubs and sports bring in badly needed energy and refreshments. While projects are necessary for career development, I also know how to take some flexibilities and fun—like skipping classes once in a while—to manage my stress and well-being. Being the first female member of Fotofreaks, it was one place where I made some of the finest memories of my college life.

What would be your message for: the students entering the college and the students leaving the college?

Message for Students Entering College:
Try out everything. Don't be afraid of making mistakes. Make some good friends, network with your seniors, and utilize their mentorship. Find out your interests and pursue them. These will also be your stress busters. At the end of the day, don't have any regrets.

Message for Students Leaving College:
Cherish the experiences, lessons learned, and new relations that forge. You will keep the friends made and the networks established. Reflect over your college journey with no regrets that you have explored your interests and used your time to the fullest. Apply the skills and experiences from college as a base for your future.

What does it feel like to belong to society with regard to personal growth and future expectations? What advice can you give others in this context?

I was the secretary of the ACM Student Chapter, and it helped me a lot in my all-round personality development. Also, I regularly attended CodeISM sessions, a part of the CSE Society, which is aimed at honing one's coding skills. Those sessions were extremely helpful in preparing for the upcoming internship/placement seasons. While CodeISM relates more to one's technical expertise, societies are meant to build up leadership, teamwork, and networking skills. Therefore, I would encourage involvement in both, as well as large groups so that there may be complete all-round development with a strong base for future success.

ALUMNI PEN

Eshita Paliwal, B.Tech 2025
N. Naga Chaitanya, B.Tech 2026
Sachin Rajguru, B.Tech 2027



Mr Parvinder Kumar

from 2005 Batch has 15+ years of experience in the Software Development field and is currently developing his AgriTech startup Wayfield Ag. In this conversation, he reminisces about his college days and gives his valuable advice to students.



What is your fondest memory of college?



There are so many memories associated with college during my four-year stay. At this great institute some of the best ones are time spent at Ramdhani with friends, juniors and seniors, and in mess parties, especially mess welcome party and Lohri parties. Apart from that, there is much natural beauty in the campus with so much greenery, new and old trees in the campus paths/buildings and hostels backyard and a variety of birds. Time spent in the green, serene and beautiful campus is still memorable. We had a trip to Parasnath Hills with legendary mountaineer Bachendri Pal in February 2003. That trip is also very memorable. There are so many memories.



Given your long term experience in the industry, what would be your advice to students who are going to kickstart their professional journey?



Focus on mastering the core subjects of your discipline. For Computer Science students, this includes a deep understanding of Operating Systems, Data Structures, Programming Languages, and Database/AI concepts. This knowledge is crucial for job interviews and further education. Avoid becoming complacent in your final year after securing a job; continue to focus on studies, projects, and productive work that will benefit you in professional life or higher education. If you don't secure a job through campus recruitment, don't stress—many factors could be at play. Keep preparing and maintain your morale; many students find excellent opportunities off-campus.



Is there something you wish you had done more effectively or improved upon during your college years?



Although I was part of some extracurricular activities in college, I still think I could have been involved in some more extracurricular activities. There are so many facilities for extracurricular activities like different sports facilities, art/music societies, etc. College time is best for personal development by participating in different extracurricular activities. It is good to allocate some time for these activities.



How do you think students can leverage the advantages of alumni connections in the industry and how beneficial will it be for them?



Our institute has a great legacy and a great alumni network working in different areas, and they hold important positions in their respective fields. Current students should definitely leverage the alumni connections, but in a mature way and judiciously. They can take up suggestions, guidance for developing expertise in a profession, higher education (like M.S or M.B.A)/University selection and other things. This will fast-track the learning of students and can save lots of time and money. Sometimes alumni can also have some constraints on providing support for something. So that should also be understood in a mature way by the students.



Being the founder of Wayfield Ag, from your wealth of experiences what would be your advice to students who wish to venture into startups?



Communication is an important aspect. Both written and oral communication are important. Students should keep improving their English vocabulary as well. This will help in understanding content, speaking and writing skills in English. Students should upgrade their natural communication rather than try to make a complete shift in developing a new style. All of us have basic communication skills, so we just need to upgrade them. Indeed, communication skills are very important for professional collaboration and academic success.

A Glimpse into the Present and Future



Ayush Kumar
B.Tech 2019
Software engineer at Rubrik Inc.

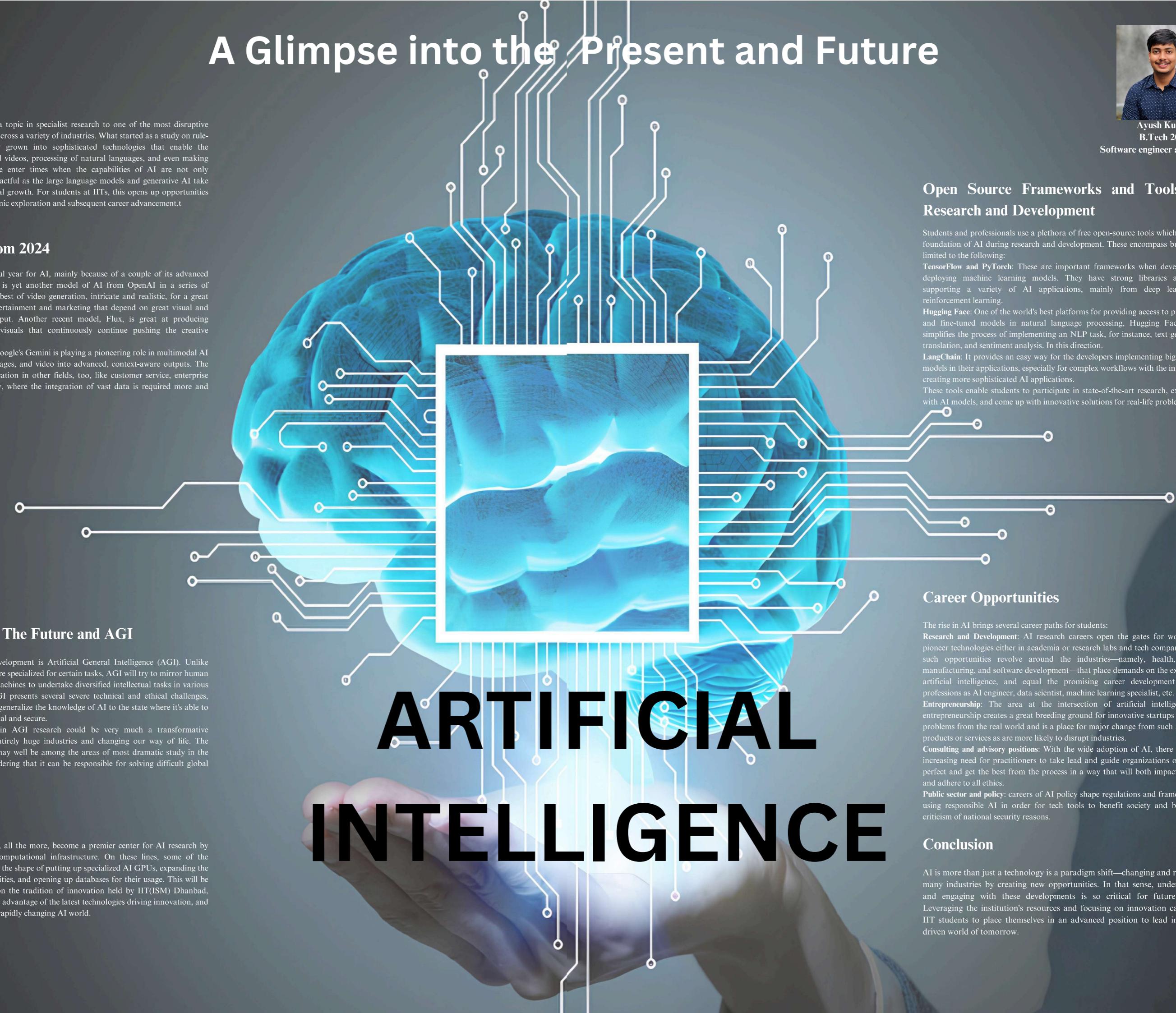
Introduction

AI has developed from a topic in specialist research to one of the most disruptive forces at work currently across a variety of industries. What started as a study on rule-based systems has now grown into sophisticated technologies that enable the generation of images and videos, processing of natural languages, and even making competent decisions. We enter times when the capabilities of AI are not only impressive but more impactful as the large language models and generative AI take their pace in technological growth. For students at IITs, this opens up opportunities up to unparalleled academic exploration and subsequent career advancement.

Highlights from 2024

2024 has been an eventful year for AI, mainly because of a couple of its advanced generative models. Sora is yet another model of AI from OpenAI in a series of attempts to set the very best of video generation, intricate and realistic, for a great might in sectors like entertainment and marketing that depend on great visual and auditory domains of input. Another recent model, Flux, is great at producing involved and dynamic visuals that continuously continue pushing the creative potential of AI.

In tandem, meanwhile, Google's Gemini is playing a pioneering role in multimodal AI to convert input text, images, and video into advanced, context-aware outputs. The model finds wider application in other fields, too, like customer service, enterprise solutions, to name a few, where the integration of vast data is required more and more.



What's Next: The Future and AGI

The next leap in AI development is Artificial General Intelligence (AGI). Unlike current AI systems that are specialized for certain tasks, AGI will try to mirror human intelligence and enable machines to undertake diversified intellectual tasks in various disciplines. Reaching AGI presents several severe technical and ethical challenges, such as the capability to generalize the knowledge of AI to the state where it's able to take actions that are ethical and secure.

For students, working in AGI research could be very much a transformative technology, reshaping entirely huge industries and changing our way of life. The ability to develop AGI may well be among the areas of most dramatic study in the next decade or so, considering that it can be responsible for solving difficult global problems.

AI Research

IIT (ISM) Dhanbad will, all the more, become a premier center for AI research by building on advanced computational infrastructure. On these lines, some of the critical investments are in the shape of putting up specialized AI GPUs, expanding the HPC infrastructural facilities, and opening up databases for their usage. This will be the surest way to keep on the tradition of innovation held by IIT(ISM) Dhanbad, allow the students to take advantage of the latest technologies driving innovation, and to remain a leader in the rapidly changing AI world.

Open Source Frameworks and Tools for Research and Development

Students and professionals use a plethora of free open-source tools which form the foundation of AI during research and development. These encompass but are not limited to the following:

TensorFlow and PyTorch: These are important frameworks when developing or deploying machine learning models. They have strong libraries and tools supporting a variety of AI applications, mainly from deep learning to reinforcement learning.

Hugging Face: One of the world's best platforms for providing access to pre-trained and fine-tuned models in natural language processing. Hugging Face greatly simplifies the process of implementing an NLP task, for instance, text generation, translation, and sentiment analysis. In this direction,

LangChain: It provides an easy way for the developers implementing big language models in their applications, especially for complex workflows with the intention of creating more sophisticated AI applications.

These tools enable students to participate in state-of-the-art research, experiment with AI models, and come up with innovative solutions for real-life problems.

Career Opportunities

The rise in AI brings several career paths for students:

Research and Development: AI research careers open the gates for working on pioneer technologies either in academia or research labs and tech companies. Some such opportunities revolve around the industries—namely, health, finance, manufacturing, and software development—that place demands on the expertise in artificial intelligence, and equal the promising career development to such professions as AI engineer, data scientist, machine learning specialist, etc.

Entrepreneurship: The area at the intersection of artificial intelligence and entrepreneurship creates a great breeding ground for innovative startups driven by problems from the real world and is a place for major change from such AI-driven products or services as are more likely to disrupt industries.

Consulting and advisory positions: With the wide adoption of AI, there comes an increasing need for practitioners to take lead and guide organizations on how to perfect and get the best from the process in a way that will both impact business and adhere to all ethics.

Public sector and policy: careers of AI policy shape regulations and frameworks of using responsible AI in order for tech tools to benefit society and be beyond criticism of national security reasons.

Conclusion

AI is more than just a technology is a paradigm shift—changing and redefining many industries by creating new opportunities. In that sense, understanding and engaging with these developments is so critical for future success. Leveraging the institution's resources and focusing on innovation can enable IIT students to place themselves in an advanced position to lead in the AI-driven world of tomorrow.

DEPARTMENT HIGHLIGHTS

The Computer Science & Engineering department was officially set up in 1997. Since then, the department has been continuously providing quality education in the field of Computer Science to the brightest minds in the country. The astounding success of our alumni in the field of Computer Science and Information Technology speaks volume about the contribution, the department has made over the years.

Let's take a quick look at what's going on in the department lately.

CSE Society Executive Committee



President : Prof. Chiranjeev Kumar
Vice President : Shubham Varshney, M. Tech 2025
Faculty In Charge : Prof. Dharavath Ramesh
Treasurer : Prof. Pranay Kumar Saha
Secretary : Spandan Kundu, B. Tech 2025
Joint Secretary : Ram Krishna, B. Tech 2026

Faculty Change

Welcome of Dr. Mauajama Firdaus



Dr. Mauajama Firdaus recently joined the CSE department as Assistant Professor. Before joining IIT (ISM), she was a Postdoctoral Researcher in the Department of Computing Science at the University of Alberta, Canada. She earned her Ph.D. from the Indian Institute

of Technology Patna, India, in 2021.

Her research primarily focuses on NLP and Dialogue Generation. Her work has been presented at prestigious conferences, including AAAI, IJCAI, ACL, EMNLP, COLING, and NAACL, and published in renowned journals such as Expert Systems with Applications, Knowledge-Based Systems, ACM Transactions, and IEEE Transactions on Affective Computing.

Farewell of Dr. Monidipa Das



Dr. Monidipa Das, a former assistant professor in the Computer Science and Engineering department at IIT(ISM) Dhanbad, recently left the institution. Her academic background includes a Ph.D. from IIT Kharagpur and master's from IIEST.

Her research interests include spatial data analysis, time-based data mining, and various computational techniques. Her research has been featured at renowned conferences such as TENCON, INDICON, ICDM, IJCNN, IGARSS, and ICAPR. She expressed her appreciation for her time at IIT(ISM) Dhanbad and the opportunities it provided. While acknowledging the challenges of teaching and research, she emphasized the valuable experiences she gained.

CodeISM

Faculty In-Charge: Prof. Dharavath Ramesh
Student Coordinator: Srikant Agrawal
Student Co-Coordinator: Pratham Aggarwal
Executive Members: Rudraksh Sachin Joshi, Aadhy Jain, Karthik Mohan, Nikhil Kumar

Members: Yushae Hasan Hashmi, Ganesh Talwar, Yash Sharma, Pratyush Kumar Chaturvedi, Ayanak Mishra, Ozair Malakji, Aadhy Jain, Marmick Mathur, Kollakata Siva Sai, Ravi Raj, Gaurav Kumar

Sarswati Puja



The CSE department celebrated Saraswati Puja on the auspicious occasion of Basant Panchami (14th February 2024). The day also marked the arrival of spring, the season of rejuvenation.

The celebration witnessed active participation from faculty members, staff, and students, who gathered to seek blessings from the Goddess of Knowledge. The department was beautifully decorated with vibrant flowers and traditional motifs, adding to the festive atmosphere. The event highlighted the department's commitment to upholding cultural values and traditions, reminding us of the importance of knowledge in our lives.

Foreign Visit

Prof. Dharavath Ramesh



Prof. Dharavath Ramesh visited University Of Aberdeen, Scotland as a visiting researcher for collaborative works from 5th June - 5th July of 2024. During his visit, he attended discussion on Potential synergies between Digital Twins and Blockchain.

A Digital Twin is like having a virtual copy of something real, such as a car, or even a whole city. This virtual copy behaves just like the real thing because it's constantly updated with the real time data from sensors attached to the real object. This is a futuristic technology which is mainly used for simulation, analysis and optimization of the real-world equivalent of the digital twin.

As discussed at the University of Aberdeen, the potential applications of this combination are vast, and as the technology matures, it will undoubtedly play a pivotal role in the digital transformation journey of many sectors.

Prof. Sachin Tripathi



Prof. Sachin Tripathi visited ZHAW School of Engineering, Zurich, Switzerland where he was invited as a subject expert by Dr Joseph Spillner who is a senior researcher at ZHAW. The 3 week visit from 26th May - 13th June of 2024 involved discussions over the agenda of distributed systems research and explored academic and research

collaborations between the two institutes.

He also interacted with Mr. Piyush Harsh who is the CEO and MD of Terraview GmbH regarding prospects of collaboration between IIT (ISM) Dhanbad and the industry.

Fresher's Induction

The Freshers' Induction began with an overview of the CSE Society's history, current standing, and future plans. This also included the potential addition of new divisions like app development, machine learning, and more. Following this, there was a brief introduction to the professors who head each division within the society.



The importance of coding and development was highlighted, emphasizing the role of CodeISM in enhancing placement and internship opportunities. Discussion then shifted to WebCSE, where the significance of development was underlined. Plans for upcoming sessions and events under CSES calendar were then shared.

Further, there was introduction to other key initiatives such as **BufferedReader**, ACM Student Chapter, and alumni meetups, along with the various events planned for the future. The session concluded with the professors encouraging freshers to actively participate in the society's activities along with providing necessary information on subscriptions and memberships.



Achievements 2024

Hackathons' Success Stories



Team **Eniac**, led by **Alok Raj**, B.Tech 2026, and **Aman Anand**, B.Tech 2026, recently won the regional finale of **NXP-AIM 2024** (Artificial Intelligence in Mobility). The competition was hosted at Jaypee Institute of Information Technology, Noida by NXP semiconductors.



Team **The Tripacket Pushers**, led by **Dhruvil Patel**, B.Tech 2025, emerged victorious in the Code with **Cisco CODE-A-THON '24**. The competition unfolded in two stages: beginning with a pre-placement talk and a 90-minute online assessment featuring two coding challenges and 40 MCQs. Out of 30,000 participants from across India, only 75 advanced to the final stage—a challenging CODEATHON held at Cisco's Bangalore campus. In the final stage, Dhruvil's team tackled a complex problem statement and their innovative solution impressed the judges with its effectiveness and clarity, ultimately leading them to win the Grand Finale



Team **2023_it_was**, led by **Kriti Thawaria**, B.Tech 2025 and **Kashish**, B.Tech 2025, secured the runner-up position in the **ServiceNow Code to Win** Hackathon. The competition had three stages: an online coding assessment consisting of two DSA questions, followed by an ideathon round, and the Grand Finale presentations. A total of 32,750 teams registered, with each team consisting of three members. Out of these, only 10 teams advanced to the third stage, the Grand Finale, which was held at ServiceNow's Hyderabad office.

ICPC Success Stories



The International Collegiate Programming Contest (ICPC), one of the most illustrious programming contests in the world, serves as a benchmark for showcasing programming expertise.

Representing our institution at the **46th ICPC World Finals** held in **Luxor, Egypt**, was a team of three exceptional students from our department: **Abhishek Kumar Jain (19JE0032)**, **Yash Daga (19JE0934)**, and **Jay Sharma (19JE0398)**. **Prof. Annavarapu Chandra Sekhara Rao**, an esteemed Associate Professor of our department, also accompanied them as the Team Coach.

This is a significant milestone for our institution and is a testament to our commitment to excellence.

PHD Awarded

The department has produced **165 PhDs** to date and latest additions to the list have been mentioned below:

- **Rakesh Salam** : Design of efficient algorithms for distributed controller architectures in software-defined networks
- **Sanjeev Kumar** : Low cost effective and intelligent authentication protocol for RFID
- **Dilip Kumar Sharma** : Study and development of optimized query expansion techniques for document retrieval
- **Diksha Rangwani** : Development and analysis of secure authentication protocols
- **Naveen Chauhan** : Performance analysis of computational algorithms in fog computing environment
- **Nand Kumar Jyotish** : A quantitative approach for dependability evaluation of safety-critical system
- **M. Sushilata Devi** : Designing data clustering algorithms for outlier detection using optimization techniques
- **Usha Sharma** : Audio-visual feature modeling for Hindi speech recognition
- **Amit Soni Arya** : Harnessing sparse representation for image restoration & adv. classification with deep dictionary learning
- **Debadatta Naik** : Study and design of computational strategies for social network analysis
- **Manali Roy** : Development of image fusion algorithms in spatial and transform domains

Ongoing Projects

Title of the Project	Sanction Amount	Funding Agency	Principal Investigator
Information Security Education and Awareness Project Phase III	₹ 2.016 Crores	Ministry of Communication & Information Technology	Prof. Sachin Tripathi
Cloud based Smart Video Surveillance System with Application Layer Cyber Physical Systems Security	₹31.28 Lakhs	C3iHOB (IIT Kanpur)	Prof. Arup Kumar Pal
A cross-lingual study of neuron-level explainability of deep natural language processing models and its application in framework building for cross-lingual natural language processing systems	₹30.06 Lakhs	DST New Delhi	Prof. Ayan Das
Sensor-based Dust Suppression System for Haul Roads in Opencast Coal Mines	₹ 21.54 Lakhs	TexMin (ITISM Dhanbad)	Prof. P. K. Jana
Adaptive Re-purposing of Second-life Electric Vehicle Batteries for Diverse Applications	₹ 16.94 Lakhs	FRS, IIT(ISM), Dhanbad	Prof. Pranay Kr. Saha
Security enhancement of Fog-enabled IoT network	₹ 12.03 Lakhs	FRS, IIT(ISM), Dhanbad	Prof. Pranav Bisht
Development of Machine Learning and Blockchain-Based methods for Business Enhancement	₹ 10.12 Lakhs	Aeroqube Technologies Pvt. Ltd	Prof. Rajendra Pamula

Upcoming International Conference



The 6th conference on RAIT will be held from 6th March to 8th March 2025.

Recent Advances in Information Technology(RAIT) is an international conference organised by IIT(ISM) Dhanbad and co-sponsored by IEEE Kolkata that aims to bridge the gap between academia and industry.

The conference hosts panel discussions, keynotes, invited talks and industry exhibits, where academia is exposed to the state of the art practices from large scale interoperability experiments. And Industry, in turn, benefits from interacting with academia by gaining insights into advanced research and applying them to real world problems.

Visit: <https://people.iitism.ac.in/~rait/> for more information

New Programme

Commencement of the new **Executive M.Tech.** program in AI and Data Science. The programme duration can be 2 or 3 years, depending on the student's choice, with 1 year dedicated to the course project. This will be beneficial for individuals who wish to improve their academic profile while pursuing their corporate jobs.

Upcoming CSE Events



1st Sept 2024

Udbhav
The CSES Annual Day



Last week of Sept 2024

Codessey
The ultimate Competitive Programming Showdown



Mid - October

Agglomeration 1.0
A Hackathon with a hack!



First week of November

Wire your success 1.0
A hardware fest

AND
MORE...

Students' Contributions



-by Rudraksh Joshi
B.Tech, 2026



-by Abhishek Prasad Das
M.Tech, 2025



My College life experience

“ My college life is the best part of my life, I will thank IIT(ISM) for everything. It has shown me ups and downs, and taught me many lessons in life. Unfortunately, my first 3 sems were in covid, but yeah I really miss those online days, those online meets, classes, exams and friends too. I am really proud that I passed out from CSE department of IIT(ISM) Dhanbad. I worked as a Class Representative of my batch for 3 years and it helped me get connections with professors. This POR taught me lots of things about how to deal with everyone, how to manage responsibilities and work on my skills parallelly. This experience made me realize that having PORs is really important and they do help in corporate life in dealing with trolls and negativity.

Furthermore, internship preparation and cracking a good internship in my 5th semester and similarly, placements in my 7th semester are really memorable. Those days were full of stress and uncertainty but I finally overcame it with help of my friends, seniors and juniors. Last semester is really memorable for me, close to my heart. The feeling of “I'm going to leave this place” always hit me hard. The memories I spent with juniors, seniors and batchmates, I'll carry them with me throughout my life. And about the department and its professors, they have taught me many things, from academics to life lessons, from their experiences. Most importantly, I've learnt discipline from them to apply in work life. All the labs, assignments, classes and final year projects, how can someone forget that. I am grateful to all my professors and my campus. I am very proud of my department. CSE department to be precise, has the most encouraging professors and opportunities to excel in our goals. So, make full use of the available resources and do your best!

To all the juniors out there! College life is the most amazing part of life and you'll soon realize that corporate life is too hectic. So enjoy your college days as much as you can and of course! Don't forget to focus on your CGPA and career goals !!

-by Odnam Sahithi,
B.Tech, 2024

CALYPSO

Her father bears the weight of earth
She bears the weight of her heart
And yet, the balance dips her way
Let her story start.

Rising from the bleak horizon,
Aimed towards her heart;
Devastation walks nearer
For the cursed cycle restarts.

Devastated, she hears
Those selfish approaching steps.
Lost in her ancient tears,
The Hero seeks her help.

Imprisoning her withered heart
In the fortress of her chest;
Our dear Calypso, helps the man
Restraining her heart best.

But stubborn were they, the threads of fate
They needled through her chest.
Out poured her long bruised heart,
Helpless, in the palms of the uninvited guest.

For she'd fallen, yet again,
Betrayed by her older ties;
Impending doom she sees ahead
Heavens mocking her cries.

Accepting fate, she pours her heart
In the moulds of grief-and-despair.
Such is the curse of the grieving nymph
To bear a heart beyond repair.

As she confesses, away he sails
Continuing his heroic quest.
Screams Calypso at the heavens above
To just give her heart its final rest.

Again and again her heart is gouged,
Forsaken she is left.
Oh! Great Gods, bestow thy mercy
Since no promises are kept.

-by Shashwat Nautiyal
B.Tech, 2027

CONTEXT: Calypso is the daughter of the Titan Atlas, who was condemned by the gods to bear the weight of heaven on his shoulders. After the first Titan war, as punishment for supporting her father, Calypso was imprisoned in the mystical island of Ogygia, along with the cruellest of the curses. That only lost souls shall ever stumble upon the island, and they shall leave only when Calypso loses her heart to them. Every thousand years or so, the greatest of the Heroes would wash up on the island during their quests, stay until she falls for them, leave with a promise to break her free from the curse and then never return.



COMPUTER SCIENCE AND ENGINEERING BACHELOR OF TECHNOLOGY (2024)



COMPUTER SCIENCE AND ENGINEERING MASTER OF TECHNOLOGY (2024)



COMPUTER SCIENCE AND ENGINEERING DUEL DEGREE & DOUBLE MAJOR (2024)



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Shreyansh Shandilya
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Shashwat Nautiyal
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Anirban Das
Buffered Dev

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