TECHCHAPLET

2023-24



GURU NANAK INSTITUTE OF TECHNOLOGY

Department of Computer Science & Engineering

VISION OF THE DEPARTMENT

To produce proficient professionals of global standard with respect to industry, academia, and entrepreneurship who can play a key role in their respective domain and become a responsible citizen for the society.

MISSION OF THE DEPARTMENT

DM-1: To impart quality education with holistic development to produce professionals with leadership traits.

DM-2: To impart knowledge on emerging technologies and entrepreneurship skills to produce technocrats of global standard and entrepreneurs.

DM-3: To promote interdisciplinary work culture and opportunity to work in a team through collaborative research and project work.

DM-4: To inculcate professional ethics and moral responsibility for a better society.

PEO

PEO 1: Our graduates will establish themselves as effective professionals in industry, academia and entrepreneurship.

PEO 2: Our graduates will become profound researchers in multiple domains.

PEO 3: Our graduates will act as a leader in society.

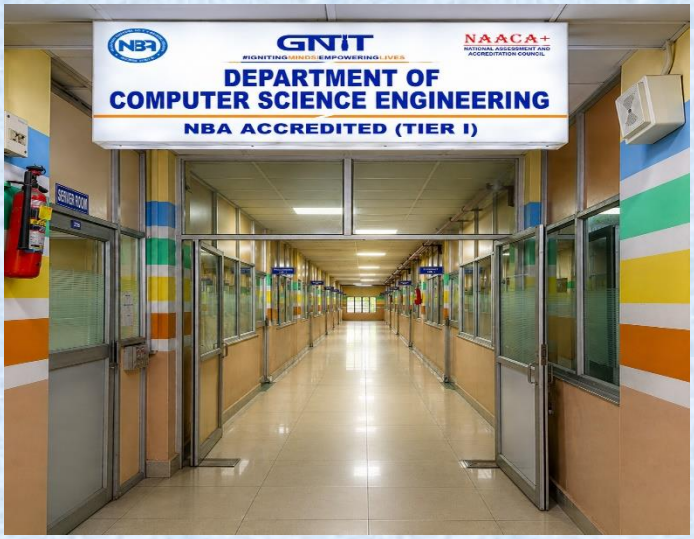
PROGRAMME SPECIFIC OUTCOMES (PSOS)

PSO 1: Ability to use efficient algorithm for designing and developing software applications and products.

PSO 2: Ability to correlate computer science and core engineering subjects to solve real life problems across multiple domains.

PSO 3: Ability to write code efficiently in competitive environment in national and international platform.

ABOUT THE DEPARTMENT



The Department of Computer Science and Engineering, established in 2003, stands out as a premier destination for academic excellence and research-driven learning. Widely recognized as a B.Tech in Computer Science College in Kolkata, the department offers a vibrant environment where students receive top-tier technical education alongside holistic personal development through various co-curricular and extra-curricular activities.

Ranked among the Top B.Tech CSE Colleges in Kolkata, the department provides students with a strong foundation in both theoretical knowledge and practical skills. Focus areas include the latest technologies such as Artificial Intelligence, Machine Learning, Cybersecurity, Cloud Computing, and Data Science. Students benefit from advanced laboratories, live projects, and industry collaborations, ensuring hands-on learning experiences. The department also fosters a robust research culture, encouraging students to publish research papers, work on innovative projects, and participate in departmental newsletters and technical magazines to enhance their analytical and communication skills.

As one of the Top Computer Science Engineering Colleges in Kolkata and counted among the best colleges for B.Tech CSE in India, the department is committed to producing graduates who are not only academically proficient but also equipped with leadership qualities, entrepreneurial mindsets, and a global perspective. Whether you are searching for the best colleges for B.Tech CSE, reputable B.Tech CSE colleges near you, or simply looking for a college that combines academic rigor with industry relevance, this department stands as a trusted choice.

MESSAGE FROM PRINCIPAL'S DESK



Guru Nanak Institute of Technology (GNIT), established in 2003 under the Guru Nanak Educational Trust, is a premier institution of the JIS Group Educational Initiatives. Affiliated with Maulana Abul Kalam Azad University of Technology (MAKAUT) and approved by AICTE, UGC, NAAC (A+), and NBA, GNIT offers undergraduate, postgraduate, and doctoral programmes in engineering and technology. The institute became autonomous in 2016 and is the first private engineering college in West Bengal to achieve NAAC A+ accreditation. Located in North Kolkata, GNIT provides a modern, student-friendly campus with advanced laboratories, smart classrooms, digital library facilities, sports infrastructure, and innovation centres. The institute promotes an eco-friendly, plastic-free, smoking-free, and ragging-free environment that supports the holistic development of students. With around 2,000 students, GNIT combines strong academic foundations with practical learning through project-based education, internships, industry collaborations, cloud computing, High Performance Computing (HPC), and state-of-the-art research facilities.GNIT actively promotes research and innovation through AICTE MODROB, DST, SERB, and MOFPI funded projects, along with entrepreneurship initiatives under the Institution's Innovation Council (IIC).

With its emphasis on academic excellence, research, innovation, and professional development, GNIT continues to prepare competent engineers, researchers, and future leaders capable of meeting global challenges.

Prof. (Dr.) Swarup Kumar Mitra

Principal, Guru Nanak Institute of Technology, Kolkata

MESSAGE FROM HOD'S DESK



It gives me immense pleasure to present **TECHCHAPLET**, the annual student magazine of the Department of Computer Science & Engineering, Guru Nanak Institute of Technology. This magazine is a celebration of the creativity, imagination, and intellectual spirit of our students. TECHCHAPLET provides a platform where students can express their ideas, share their experiences, showcase their literary and artistic talents, and present their perspectives on technology, innovation, and society. Every article, poem, story, artwork, and creative contribution reflects the enthusiasm and potential of our young minds. I congratulate all the students whose contributions have made this edition possible. I also appreciate the dedicated efforts of the editorial team and faculty members for encouraging and guiding our students in this creative endeavor.

I hope TECHCHAPLET inspires every student to think creatively, write confidently, and continue exploring new ideas beyond the classroom. May this magazine motivate our students to develop not only as skilled professionals but also as thoughtful, responsible, and innovative individuals.

Prof. (Dr.) Suman Bhattacharya

Head of the Department

Department of Computer Science & Engineering

Guru Nanak Institute of Technology

MESSAGE FROM EDITOR'S DESK



Dear Readers,

Welcome to the Editor's Desk of **TECHCHAPLET**, the esteemed technical magazine of the Department of Computer Science & Engineering at Guru Nanak Institute of Technology. We are thrilled to present our latest edition, filled with captivating articles from our talented students and accomplished alumni. TECHCHAPLET serves as a platform to explore the recent trends and advancements in Computer Science and Engineering.

In this edition, our contributors delve into a diverse range of topics, including artificial intelligence, machine learning, data science, cybersecurity, and software engineering. The articles provide valuable insights into emerging technologies, industry best practices, and groundbreaking research, offering a glimpse into the forefront of our field. We take pride in the intellectual prowess of our students and alumni, who continually push the boundaries of knowledge and contribute to the growth of the industry. As you embark on this enriching journey through the pages of TECHCHAPLET, we invite you to immerse yourself in the thought-provoking ideas and innovative concepts presented within. We hope that the articles inspire you, stimulate discussions, and foster a passion for lifelong learning in the dynamic landscape of Computer Science and Engineering.

Thank you for your continued support, and we hope you enjoy this edition of TECHCHAPLET!

Sincerely,
Ms. Sayani Chandra
Editor-in-Chief, TECHCHAPLET
Department of Computer Science and Engineering
Guru Nanak Institute of Technology

SOME MORE DETAILS...

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Alyvia Biswas, 2nd Year, CSE, Graphic Designer

Adarsh Agarwal, 3rd Year, CSE Technical Content Scrutinizers

Dia Nandy, 3rd Year, CSE, Technical Content Scrutinizers

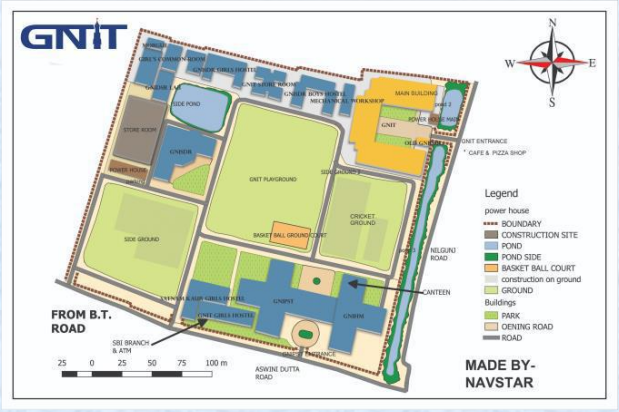
Soumyanil Dey, 3rd Year, CSE, Technical Content Scrutinizers

Courses Offered (CAY: 2023-24)

Course Name	Duration	Intake
B.Tech	4 years	180
M.Tech	2 years	18

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Generative AI: Transforming the Future of Creativity

Generative Artificial Intelligence (Generative AI) emerged as one of the most influential technological breakthroughs of **2023**, revolutionizing the way people create, communicate, and innovate. Unlike conventional Artificial Intelligence systems that primarily analyze or classify data, Generative AI can generate entirely new content—including text, images, music, videos, software code, and even 3D designs—based on user instructions. The rapid adoption of tools such as ChatGPT, Google Bard (now Gemini), GitHub Copilot, Midjourney, and DALL·E demonstrated the enormous potential of AI-assisted creativity across education, business, healthcare, research, and entertainment.

At the heart of Generative AI are Large Language Models (LLMs) and Generative Adversarial Networks (GANs), which are trained on vast datasets to understand patterns and produce human-like outputs. These models can answer questions, summarize documents, write computer programs, design graphics, compose emails, generate marketing content and assist in scientific research. By automating repetitive tasks and accelerating creative workflows, Generative AI has become a powerful productivity tool for professionals and students alike.



The impact of Generative AI is visible across numerous industries. In education, intelligent tutors and AI-powered assistants help students understand complex concepts, prepare study materials, and enhance programming skills. Healthcare professionals use AI to support medical documentation, drug discovery, and clinical research. Software developers leverage AI coding assistants to improve efficiency, while designers and content creators utilize AI to generate images, animations, and multimedia content. Businesses are increasingly integrating Generative AI into customer service, digital marketing, and decision-making processes, enabling faster and more personalized services.

Despite its transformative capabilities, Generative AI also raises important challenges. Issues such as misinformation, copyright infringement, data privacy, algorithmic bias, and ethical use

of AI require careful consideration. As AI-generated content becomes increasingly realistic, it is essential to establish responsible guidelines, transparency, and human oversight to ensure that these technologies are used ethically and for the benefit of society.

For Computer Science and Engineering students, Generative AI presents exciting opportunities for learning, innovation, and research. Developing expertise in Artificial Intelligence, Machine Learning, Natural Language Processing, and Prompt Engineering can open doors to careers in software development, research, healthcare, finance, and entrepreneurship. As technology continues to evolve, engineers must combine technical knowledge with ethical responsibility to build intelligent systems that enhance human creativity rather than replace it.

Generative AI represents a new era where humans and intelligent machines work together to solve problems, inspire creativity, and drive innovation. The future belongs not only to those who use Artificial Intelligence but also to those who understand, improve, and apply it responsibly to create meaningful solutions for a better world.

BRISTIDEV BURMAN
3rd Year, CSE

Cyber Security in the Digital Era

The rapid growth of digital technologies has transformed the way people communicate, work, learn, and conduct business. With the increasing use of cloud computing, online banking, social media, e-commerce, and Internet of Things (IoT) devices, cyber security has become one of the most critical aspects of the digital world. Cyber security refers to the practice of protecting computer systems, networks, applications, and digital information from cyber threats, unauthorized access, and malicious attacks. As organizations continue their digital transformation, ensuring the confidentiality, integrity, and availability of information has become a top priority.

Cyber threats have evolved significantly over the past decade. Common cyberattacks include malware, ransomware, phishing, identity theft, denial-of-service (DoS) attacks, and data breaches. These attacks can result in financial losses, disruption of business operations, theft of confidential information, and damage to an organization's reputation. Individuals are equally vulnerable, making cyber awareness and safe online practices essential for everyone.

To combat these threats, organizations employ multiple layers of security, including firewalls, antivirus software, intrusion detection systems, encryption techniques, multi-factor authentication, and regular software updates. Ethical hackers and cyber security professionals continuously monitor networks, identify vulnerabilities, and implement preventive measures to protect digital assets. Artificial Intelligence and Machine Learning are also playing an increasingly important role in detecting suspicious activities, predicting cyber threats, and automating security responses.



Cyber security is especially important in sectors such as banking, healthcare, education, government, and e-commerce, where sensitive personal and financial information is stored and transmitted. As remote work and cloud-based services become more common, organizations are investing heavily in cyber resilience, secure cloud infrastructure, and employee awareness programs to reduce security risks.

For Computer Science and Engineering students, cyber security offers exciting opportunities in ethical hacking, digital forensics, network security, cloud security, penetration testing, and cyber threat intelligence. Certifications such as CEH (Certified Ethical Hacker), CompTIA Security+, and CISSP further enhance career prospects in this rapidly growing field. With the increasing demand for skilled cyber security professionals worldwide, the field continues to offer excellent opportunities for innovation, research, and employment.

In the digital era, cyber security is not merely a technological requirement but a shared responsibility. By adopting secure digital practices, promoting cyber awareness, and developing innovative security solutions, we can build a safer and more resilient digital ecosystem for future generations.

MIULEE MANDAL
2nd Year, CSE

Data Science: The Power Behind Intelligent Decisions

Data has become one of the most valuable resources in the modern world. Every click on a website, online purchase, social media interaction, financial transaction, and sensor reading generates enormous amounts of information. Data Science is the interdisciplinary field that transforms this raw data into meaningful insights, enabling organizations to make informed and intelligent decisions. By combining statistics, mathematics, programming, machine learning, and domain knowledge, Data Science has become the driving force behind innovation in business, healthcare, education, finance, and government.

The Data Science process begins with collecting data from multiple sources, followed by cleaning, organizing, and analyzing it. Advanced techniques such as Machine Learning, Artificial Intelligence, Data Visualization, and Predictive Analytics help identify hidden patterns and trends that would otherwise remain unnoticed. Popular programming languages such as Python and R, along with tools like SQL, Tableau, Power BI, and Apache Spark, enable data scientists to process large volumes of structured and unstructured data efficiently.



Today, Data Science influences nearly every aspect of our daily lives. Online shopping platforms recommend products based on customer preferences, streaming services suggest movies and music according to viewing habits, and navigation applications provide the fastest routes using real-time traffic analysis. In healthcare, Data Science supports disease prediction, medical imaging analysis, and personalized treatment planning. Financial institutions use predictive models to detect fraud, evaluate credit risk, and improve investment decisions, while governments utilize data analytics for smart city planning, disaster management, and public policy.

One of the greatest strengths of Data Science is its ability to support data-driven decision-making. Instead of relying on intuition alone, organizations can analyze historical data, predict future trends, and optimize their strategies. Businesses leverage customer analytics to improve marketing campaigns, manufacturers use predictive maintenance to reduce equipment failures, and educational institutions analyze student performance to enhance learning outcomes.

Despite its immense benefits, Data Science also presents several challenges. Ensuring data quality, maintaining privacy, addressing algorithmic bias, and protecting sensitive information are essential responsibilities for data professionals. Ethical use of data and compliance with privacy regulations have become increasingly important as organizations continue to collect and analyze vast amounts of personal information.

For Computer Science and Engineering students, Data Science offers exciting career opportunities in data analytics, machine learning, business intelligence, artificial intelligence, and research. With the growing demand for skilled professionals across industries, expertise in Data Science has become one of the most valuable assets in the digital economy. As technology continues to evolve, Data Science will remain the foundation of intelligent systems, empowering organizations to solve complex problems, improve decision-making, and create a smarter, data-driven future.

UNNATI NARAYAN
2nd Year, CSE

Intellectual Property Rights: Protecting Innovation

Innovation is the driving force behind technological advancement and economic growth. Every invention, creative work, software application, research discovery, or brand identity represents intellectual effort that deserves legal protection. Intellectual Property Rights (IPRs) are legal rights granted to creators and inventors, enabling them to protect their original ideas, innovations, and creative works from unauthorized use. By encouraging creativity and rewarding innovation, IPRs play a vital role in promoting research, entrepreneurship, and technological development.

Intellectual Property includes a wide range of creations such as inventions, literary works, artistic designs, software, logos, trademarks, and industrial designs. The major forms of Intellectual Property Rights include Patents, Copyrights, Trademarks, Industrial Designs, Geographical Indications, and Trade Secrets. A patent protects a novel invention, while copyright safeguards books, software, music, films, and other creative works. Trademarks help distinguish the identity of businesses through names, logos, or symbols, whereas industrial designs protect the visual appearance of products.

For startups and technology companies, Intellectual Property has become one of the most valuable business assets. A well-protected innovation can provide a competitive advantage, attract investors, increase market value, and generate revenue through licensing or commercialization. Many successful companies such as Apple, Google, Microsoft, and Samsung invest heavily in research and patent protection to secure their technological innovations and maintain their leadership in the global market.



In academic institutions, Intellectual Property Rights encourage students and researchers to develop innovative solutions to real-world problems. Universities actively promote patent filing, technology transfer, startup incubation, and entrepreneurship by creating awareness about the importance of protecting research outcomes. Engineering students working on software applications, Artificial Intelligence models, mobile applications, or innovative hardware solutions should understand the significance of securing their intellectual creations before public disclosure.

Despite its numerous benefits, Intellectual Property protection also presents challenges. Rapid technological advancement, digital piracy, software plagiarism, copyright infringement, and unauthorized copying of innovations require stronger legal frameworks and ethical practices. It is therefore essential for innovators to understand national and international Intellectual Property laws and adopt responsible practices while creating and sharing knowledge.

For Computer Science and Engineering students, awareness of Intellectual Property Rights is an important aspect of professional development. Whether developing software, conducting research, creating digital content, or launching a technology startup, understanding IPR helps transform innovative ideas into protected assets with commercial and societal value. By respecting intellectual property and encouraging original thinking, future engineers can contribute to a culture of innovation, entrepreneurship, and sustainable technological growth.

SIDDHARTA BHATTACHARYYA
2nd Year, CSE

Ethical Hacking: Protecting the Digital World

The rapid expansion of the internet and digital technologies has transformed every aspect of modern life. From online banking and e-commerce to cloud computing and smart devices, digital systems have become an essential part of our daily activities. However, this digital revolution has also increased the risk of cyberattacks, making cybersecurity a global priority. Ethical Hacking has emerged as one of the most effective approaches to protecting computer systems, networks, and sensitive information from cyber threats.

Ethical hacking is the practice of legally identifying and fixing security vulnerabilities before malicious hackers can exploit them. Ethical hackers, also known as White Hat Hackers, use the same techniques and tools as cybercriminals but operate with the permission of organizations to strengthen their security. Their objective is to discover weaknesses, assess security risks, and recommend effective solutions to safeguard digital assets.

Ethical hackers perform activities such as penetration testing, vulnerability assessment, network security analysis, web application testing, and wireless security evaluation. They simulate real cyberattacks to identify flaws in operating systems, applications, databases, and network infrastructures. Organizations use these security assessments to improve their defenses, protect confidential information, and comply with cybersecurity standards and regulations.



Ethical hacking plays a crucial role across various sectors, including banking, healthcare, government, education, and e-commerce. Financial institutions rely on ethical hackers to secure online transactions and prevent fraud, while hospitals protect sensitive patient records through regular security audits. Government agencies safeguard critical infrastructure, and businesses strengthen customer trust by ensuring the security of their digital platforms. As cyber threats continue to evolve, ethical hacking has become an indispensable component of modern cybersecurity strategies.

For Computer Science and Engineering students, ethical hacking offers exciting career opportunities in Cyber Security, Penetration Testing, Digital Forensics, Network Security, Cloud Security, and Cyber Threat Intelligence. Industry-recognized certifications such as Certified Ethical Hacker (CEH), CompTIA Security+, and Offensive Security Certified Professional (OSCP) provide valuable credentials for aspiring cybersecurity professionals. A strong foundation in networking, operating systems, programming, and security principles is essential for building a successful career in this field.

Ethical hacking is not merely about identifying vulnerabilities—it is about promoting responsible technology, protecting digital privacy, and creating a safer cyberspace. As cybercrime becomes increasingly sophisticated, ethical hackers will continue to play a vital role in defending organizations and individuals against emerging digital threats. By combining technical expertise with professional ethics, they contribute to building a secure and trustworthy digital future.

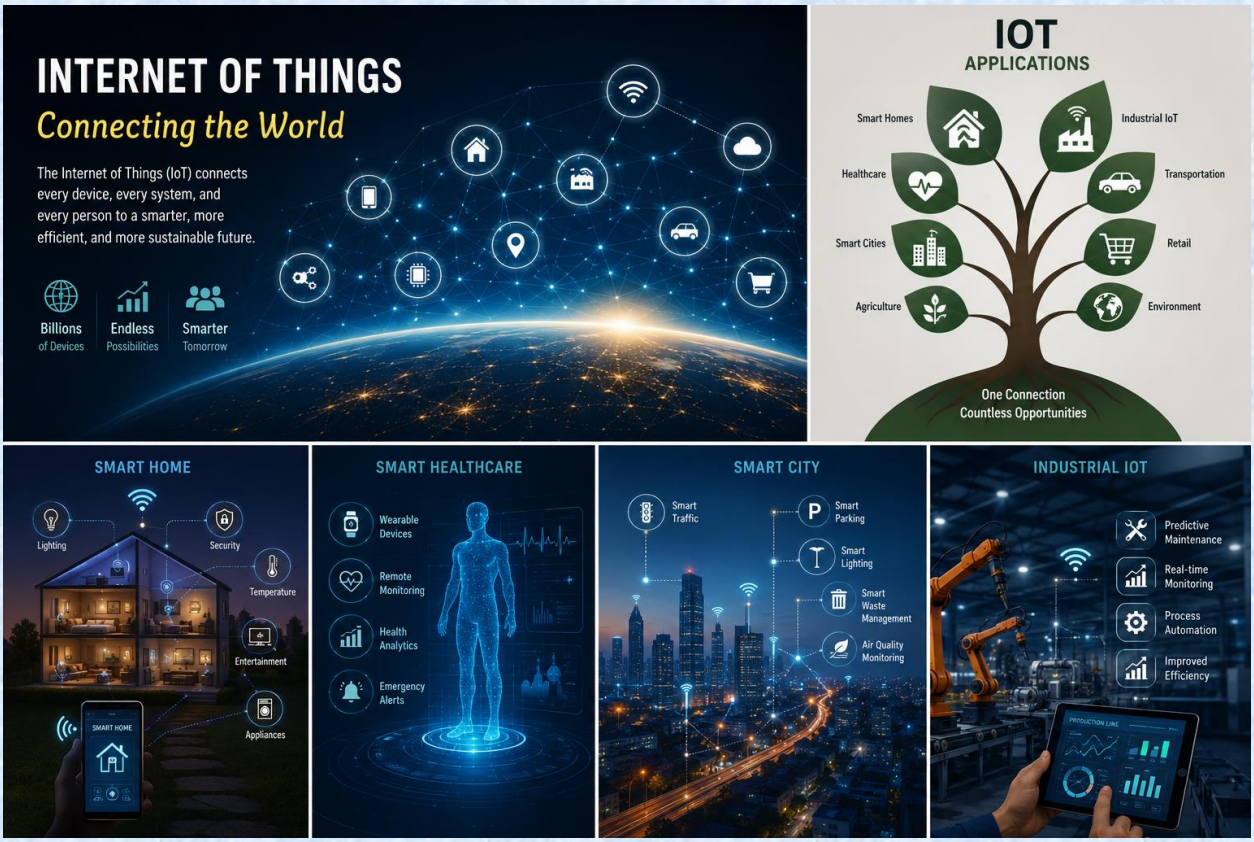
SRINJAY FADIKAR
3rd Year, CSE

Internet of Things: Connecting the World

Imagine waking up in the morning and finding that your alarm has adjusted itself according to your sleep pattern, the lights have switched on automatically, and your smartwatch has already recorded your heart rate and activity. This is not science fiction anymore; it is becoming part of our everyday lives through the Internet of Things (IoT). The Internet of Things refers to a network of physical objects connected to the internet and equipped with sensors, software, and communication technologies that allow them to collect, exchange, and process data. These objects

can range from smartphones and smart watches to household appliances, vehicles, medical equipment, industrial machines, and agricultural sensors. By connecting the physical world with the digital world, IoT is creating a new environment where devices can communicate with each other and respond intelligently to changing situations.

The basic idea behind IoT is simple but powerful. Sensors embedded in devices collect information from the surrounding environment and transmit it through communication networks. The collected data can then be processed using cloud computing, edge computing, or artificial intelligence. Based on the analysis, the system can take appropriate actions automatically. For example, a smart thermostat can detect the temperature of a room and adjust the cooling system accordingly. Similarly, a smart security camera can detect unusual movement and immediately send an alert to the user's smartphone. This continuous cycle of sensing, communicating, processing, and responding allows ordinary objects to become intelligent and interactive.



IoT has become an important part of modern homes. Smart lights, smart televisions, smart refrigerators, security cameras, smart locks, and voice-controlled assistants can communicate through connected networks. A person can control many household devices remotely using a smartphone. Smart devices can also learn from user behavior and automate routine activities. For example, lights can be switched off when a room becomes empty, while a smart energy-management system can monitor electricity consumption and help reduce unnecessary energy

usage. Such applications demonstrate how IoT can make everyday life more convenient, efficient, and secure.

The healthcare sector is also experiencing significant changes through IoT. Wearable devices such as smart watches and fitness trackers can continuously collect information about physical activity, heart rate, sleep patterns, and other measurements. Connected medical devices can help healthcare professionals monitor patients remotely and receive important information without requiring the patient to remain in a hospital. When combined with artificial intelligence, IoT-generated data can help identify unusual patterns and support faster decision-making. In the future, connected healthcare systems may play an even greater role in preventive and personalized healthcare.

IoT is also helping to transform cities into smarter and more sustainable environments. Smart traffic systems can collect information about road conditions and traffic flow, while connected streetlights can adjust their operation according to surrounding conditions. Sensors can also be used for monitoring air quality, water consumption, waste management, parking availability, and energy usage. By collecting real-time information from different parts of a city, authorities can make better decisions and improve public services. The concept of the smart city therefore depends heavily on the ability of connected devices to continuously sense and communicate information.

Agriculture is another field where IoT has enormous potential. Farmers can use connected sensors to monitor soil moisture, temperature, humidity, crop conditions, and weather information. When the soil becomes too dry, an automated irrigation system can supply water according to the required level. This can help reduce water wastage and support precision agriculture. Similarly, IoT is transforming industries by connecting machines, sensors, robots, and production systems. Industrial equipment can continuously report information about its condition, allowing organizations to identify possible problems before a major breakdown occurs. This approach, known as predictive maintenance, can reduce downtime and improve productivity.

Although IoT offers tremendous benefits, it also creates new challenges. As billions of devices become connected, the amount of data generated by these devices will continue to increase. Managing, storing, processing, and protecting this data will require advanced computing infrastructure. Security and privacy are particularly important because a poorly protected IoT device can become a potential entry point for cyberattacks. Strong authentication, encryption, secure communication, regular software updates, and responsible data management are therefore essential for building trustworthy IoT systems. Another challenge is interoperability because devices from different manufacturers may use different technologies and communication standards.

The future of IoT will be closely connected with emerging technologies such as Artificial Intelligence, 5G, edge computing, cloud computing, robotics, and advanced sensors. The

combination of artificial intelligence and IoT can create systems that are not only connected but also capable of learning and making intelligent decisions. Instead of simply collecting information, future IoT devices will increasingly be able to understand their surroundings, predict events, and respond automatically. Smart vehicles may communicate with roads and other vehicles, factories may become increasingly autonomous, and homes may automatically manage energy and security according to the needs of their occupants.

The Internet of Things is therefore much more than simply connecting devices to the internet. It represents a transformation in the way people, machines, and information interact with one another. From smart homes and wearable devices to healthcare, agriculture, transportation, industries, and smart cities, IoT is gradually becoming an essential part of the digital world. Its greatest strength lies in connecting individual devices and allowing them to work together as part of a larger intelligent system. As technology continues to advance, IoT has the potential to create a world that is more connected, efficient, responsive, and intelligent. The future may not simply be a world where people use smart devices, but a world where everything around us can sense, communicate, learn, and respond.

SARANNYA SAHA
3rd Year, CSE

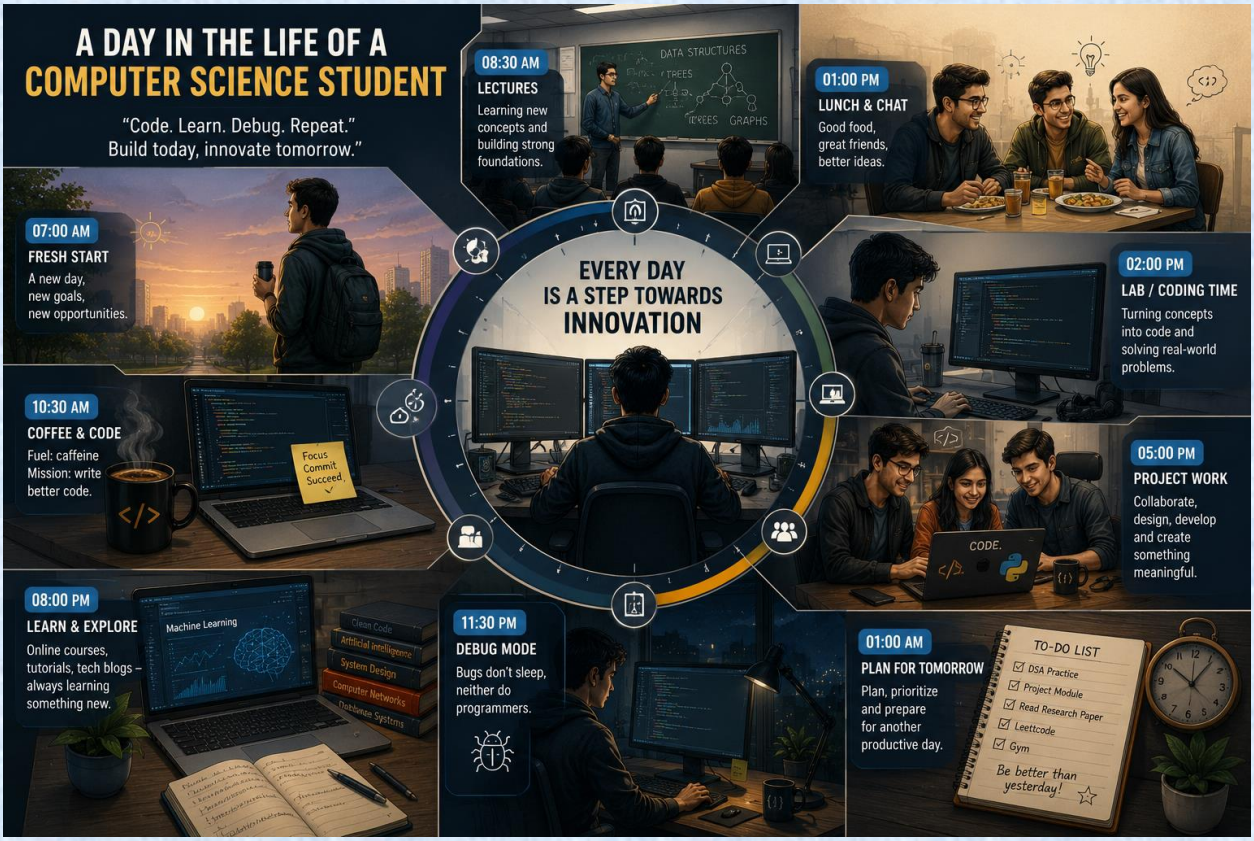
A Day in the Life of a Computer Science Student

For a Computer Science student, every day is a combination of learning, experimenting, problem-solving, and discovering something new. Unlike many academic disciplines, Computer Science is not limited to textbooks and classrooms. It is a field where ideas come alive through code, algorithms, applications, and technology. A typical day may begin with a quick look at messages, assignments, or upcoming deadlines before heading to college. The laptop is often one of the most important companions throughout the day, carrying programming environments, lecture notes, project files, research papers, and sometimes a few unfinished lines of code from the previous night.

The morning usually begins with lectures that introduce students to the concepts behind modern computing. Subjects such as Data Structures, Operating Systems, Database Management Systems, Computer Networks, Artificial Intelligence, Machine Learning, or Software Engineering may appear on the timetable. Listening to a lecture is only the beginning because Computer Science requires students to think beyond memorizing concepts. When a teacher explains an algorithm, students often begin imagining how it can be implemented. When learning about databases, they may think about how applications store millions of records. When studying artificial intelligence, they may wonder how machines learn to recognize images, understand language, or make predictions.

After lectures comes one of the most exciting parts of the day—the programming laboratory. This is where theoretical knowledge meets reality. A program that looks perfectly correct on paper

may suddenly produce an unexpected error when it is executed. A missing semicolon, incorrect variable, wrong condition, or logical mistake can turn a simple programming task into a challenging puzzle. Students spend time reading error messages, searching for the cause of a problem, testing different solutions, and running the program repeatedly. When the program finally works, the satisfaction is often greater than simply completing an assignment because the student has solved a problem independently.



The Computer Science laboratory is also a place where collaboration naturally develops. Students often discuss programming problems with classmates, compare different approaches, and help one another understand difficult concepts. One student may discover a simpler algorithm while another may suggest a better way to organize the code. These interactions teach an important lesson: technology may be built using code, but successful technology is created through ideas, communication, teamwork, and creativity.

As the semester progresses, assignments and projects become an important part of student life. A simple project may begin with a basic idea and gradually turn into something much larger. Students may develop a website, mobile application, database system, machine-learning model, chatbot, game, or IoT-based solution. The process is rarely straightforward. Requirements change, code fails, datasets create unexpected problems, and deadlines approach faster than expected. Yet these challenges are valuable because they teach students how real-world software

development works. The experience of turning an idea into a working system can be one of the most rewarding parts of studying Computer Science.

A Computer Science student's learning does not end when college hours are over. Technology changes rapidly, and students often explore new programming languages, frameworks, artificial intelligence tools, cybersecurity concepts, cloud platforms, or emerging technologies outside the classroom. Online tutorials, technical blogs, research papers, coding platforms, and open-source projects become additional learning resources. Sometimes an evening that begins with the intention of studying for an hour can unexpectedly turn into several hours of debugging because one small programming problem refuses to cooperate.

There are also moments of frustration. A program may fail repeatedly, an algorithm may seem impossible to understand, or a project may not work just before a demonstration. Computer Science teaches students to become comfortable with failure because errors are not necessarily signs of defeat; they are opportunities to understand what went wrong. Debugging gradually develops patience, logical thinking, and persistence. With every solved error, students become slightly better problem-solvers.

Beyond academics, college life adds another dimension to the day. Conversations with friends, technical competitions, coding contests, hackathons, seminars, workshops, cultural events, and student clubs provide opportunities to learn outside the syllabus. A hackathon may introduce students to teamwork under pressure, while a technical competition may encourage them to develop innovative solutions to real-world problems. These experiences can help transform a student from someone who simply writes programs into someone who can identify problems and design meaningful technological solutions.

By the end of the day, a Computer Science student may have attended lectures, written code, fixed errors, worked on a project, discussed ideas with friends, and learned something completely unexpected. The journey can sometimes be exhausting, but it is also exciting because every day brings a new problem to solve and a new technology to explore. More importantly, Computer Science teaches a mindset rather than just a collection of technical skills. It encourages curiosity, creativity, logical thinking, experimentation, and the confidence to ask, **"Can this be done differently?"**

A day in the life of a Computer Science student is therefore much more than spending hours in front of a computer. It is a journey of transforming ideas into solutions, mistakes into lessons, and curiosity into knowledge. Behind every line of code is a student learning to think, create, experiment, and innovate. And perhaps that is what makes Computer Science so exciting—the next day always brings another problem waiting to be solved.

SHAMPURNA RAKSHIT
2nd Year, CSE

Dear Future Engineer...

Dear Future Engineer,

There will be days when you feel that your journey is moving too slowly. There will be difficult subjects, confusing concepts, unfinished assignments, failed programs, rejected ideas, and moments when you may wonder whether you are really good enough. When those moments arrive, remember that becoming an engineer was never supposed to be an easy journey. It is a journey of learning how to face problems, experiment with possibilities, make mistakes, and try again.

You may enter college thinking that engineering is mainly about marks, examinations, programming languages, formulas, laboratories, and technical skills. Gradually, you will discover that engineering is much more than that. It is about learning how to look at a problem from a different perspective. It is about asking questions when others accept things as they are. It is about transforming an idea into something useful and finding solutions where none seem obvious.

As a Computer Science student, you will spend countless hours looking at screens, writing code, correcting errors, designing algorithms, and wondering why a program that worked perfectly five minutes ago has suddenly stopped working. You will learn that a single missing symbol can consume an entire evening. You will also learn that the most satisfying moment is often the moment when the code finally runs successfully. Do not underestimate these small victories. They are building your confidence one problem at a time.

Do not be afraid of failure. A failed project does not make you a failure. An incorrect answer does not define your intelligence. A difficult examination does not determine your future. Failure is often the place where real learning begins. Every error teaches you something about what does not work, and every attempt brings you closer to understanding what might work. The engineers who create extraordinary things are not those who never fail; they are the ones who continue learning after failure.

Technology will change faster than you can imagine. The programming language you learn today may be replaced or transformed tomorrow. Artificial intelligence, robotics, cloud computing, cybersecurity, quantum computing, biotechnology, and other emerging technologies will continue to reshape the world. Do not try to memorize every technology. Instead, develop the ability to learn continuously. Your greatest technical skill will be your ability to learn new skills.

Do not become so focused on technology that you forget the people who will use it. Behind every application, machine, algorithm, and digital system is a human being with a problem, a need, or a dream. The best engineers are not simply those who build powerful technology; they are those who build technology that makes people's lives better. Let empathy guide your innovation.

Learn to work with people. Your college years will introduce you to classmates with different ideas, abilities, backgrounds, and ways of thinking. Some of your greatest lessons may come not from textbooks but from conversations with friends, teamwork during projects, late-night discussions before competitions, and solving problems together. One day, you may realize that the ability to communicate an idea clearly is just as important as the ability to create it.

Do not measure your journey against someone else's. Someone may write better code than you, another person may score higher marks, and someone else may already have an impressive project or internship. That is their journey. Your responsibility is to become better than the person you were yesterday. Progress does not always happen dramatically. Sometimes it is simply understanding a concept that confused you last week, solving a problem without help, speaking confidently during a presentation, or having the courage to try something new.

There will also be moments when you have to choose between what is easy and what is right. Remember that engineering carries responsibility. The systems you design may influence people's privacy, safety, opportunities, and lives. Use technology responsibly. Build with integrity. Never allow the pursuit of success to become more important than the impact of your work on society.

One day, you will leave your college campus. The classrooms that once seemed ordinary may become memories. The laboratory where you spent hours debugging programs may become a place you remember with a smile. Friends who once sat beside you may begin careers in different cities and countries. Your student identity will slowly become a professional identity. When that day comes, you may realize that your education was not only about preparing for a job. It was preparing you to face an unpredictable world.

So, Dear Future Engineer, dream beyond your first job. Do not limit yourself to what already exists. Imagine what could exist. Build something that solves a problem. Create something that inspires others. Use your knowledge to make technology more accessible, sustainable, secure, and meaningful. Perhaps your idea will become a product, your research will become a discovery, or your small college project will someday become something that changes lives.

And when you finally achieve something you once thought was impossible, remember the student who struggled at the beginning. Remember the unfinished assignments, the confusing concepts, the failed experiments, the late nights, the small victories, and the people who encouraged you along the way.

The world does not simply need more engineers. It needs engineers who can think, create, question, care, and make a difference.

Your degree will tell the world what you studied.

Your work will tell the world who you became.

Keep learning. Keep questioning. Keep creating.

The future is waiting for you.



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2nd Year, CSE

Human Creativity vs. Artificial Intelligence

Creativity has always been one of the defining characteristics of human beings. From the earliest paintings on cave walls to modern scientific discoveries, music, literature, architecture, and technological inventions, humans have continuously demonstrated the ability to imagine something that did not previously exist. Today, however, humanity has created a new kind of creative partner: **Artificial Intelligence (AI)**. AI systems can generate images, compose music, write text, create designs, analyze information, and produce solutions within seconds. This has created an interesting question for the modern world: **Can artificial intelligence truly be creative, or is human creativity something that machines can never completely reproduce?**

Human creativity begins with experiences, emotions, curiosity, imagination, and the desire to communicate an idea. A human artist may create a painting because of a personal memory, a particular emotion, a social experience, or a vision of the future. A scientist may develop a new theory because of curiosity about something that has not yet been explained. A writer may create

a story inspired by relationships, dreams, struggles, or observations of everyday life. Human creativity is therefore deeply connected to consciousness and lived experience. People do not simply combine existing information; they attach meaning and emotion to what they create.

Artificial intelligence approaches creativity differently. AI systems learn patterns from large collections of existing information and use those patterns to generate new outputs. A generative AI model can produce an image from a written description, create a piece of music based on a particular style, or generate a story from a few instructions. The speed and scale of this process are remarkable. What might take a human hours or days to create can sometimes be generated by AI within seconds. AI can also explore thousands of possible variations, allowing people to experiment with ideas that would otherwise require enormous amounts of time and effort.

However, creativity is not simply the ability to produce something new. Creativity also involves **intention, context, meaning, and originality**. When a human creates something, there is usually a reason behind the creation. A song may express sadness, a painting may represent hope, and a scientific invention may attempt to solve a problem that affects society. AI can generate an impressive output, but questions remain about whether the system itself understands the emotional or social meaning of what it produces. This difference makes human creativity fundamentally interesting.

At the same time, it would be incorrect to view AI only as a competitor to human creativity. AI can become a powerful creative collaborator. A student can use AI to brainstorm ideas for a project, a designer can explore multiple visual concepts, a researcher can identify patterns in large datasets, and a programmer can use AI to explore different approaches to solving a coding problem. In these situations, the human provides the purpose and direction while AI expands the range of possibilities. Instead of replacing imagination, technology can sometimes give imagination more tools with which to work.

The relationship between humans and AI is particularly important in education and research. Students can use AI to explore unfamiliar concepts, generate ideas, simulate problems, and receive assistance while developing projects. Researchers can use AI to analyze large amounts of information and identify patterns that might be difficult to discover manually. However, these tools should support thinking rather than replace it. A student who simply accepts an AI-generated answer without questioning it may complete an assignment but lose an opportunity to develop independent reasoning. True learning occurs when technology becomes a tool for exploration rather than a substitute for curiosity.

There are also ethical questions surrounding AI-generated creativity. When an AI creates an image, article, song, or design, questions arise about authorship, originality, copyright, bias, and responsible use of existing creative works. Society must therefore develop appropriate principles for using generative AI while protecting human creators and encouraging innovation. The goal should not be to stop technological progress but to ensure that progress remains responsible and beneficial.

Perhaps the most productive way to understand the relationship between human creativity and artificial intelligence is not as a competition but as a collaboration. Humans possess imagination, emotion, intuition, experience, values, and purpose. AI provides speed, computational power, pattern recognition, and the ability to explore enormous possibilities. When these strengths are combined, they can produce results that neither could achieve as effectively alone.

The future of creativity may therefore belong to **human-AI collaboration**. An architect may imagine a revolutionary building while AI generates and evaluates possible designs. A filmmaker may develop a story while AI helps visualize different scenes. A scientist may propose a hypothesis while AI searches through vast datasets for supporting patterns. A student may have a simple idea while AI helps transform that idea into a working prototype. In each case, the human remains the source of purpose and judgment while AI becomes an amplifier of creative possibility.

Ultimately, artificial intelligence challenges us to rethink what creativity means. AI may be capable of generating remarkably original-looking outputs, but human creativity remains deeply connected to consciousness, emotion, experience, and the desire to give meaning to the world. The most important question may not be whether humans or AI are more creative. Instead, it may be **what humans can create when their imagination is enhanced by intelligent machines**.

The future does not necessarily have to be a choice between human creativity and artificial intelligence. It can be a future where **human imagination provides the vision and AI provides new ways to bring that vision to life**. The greatest innovation may emerge not when humans compete against machines, but when humans learn how to create *with* them.

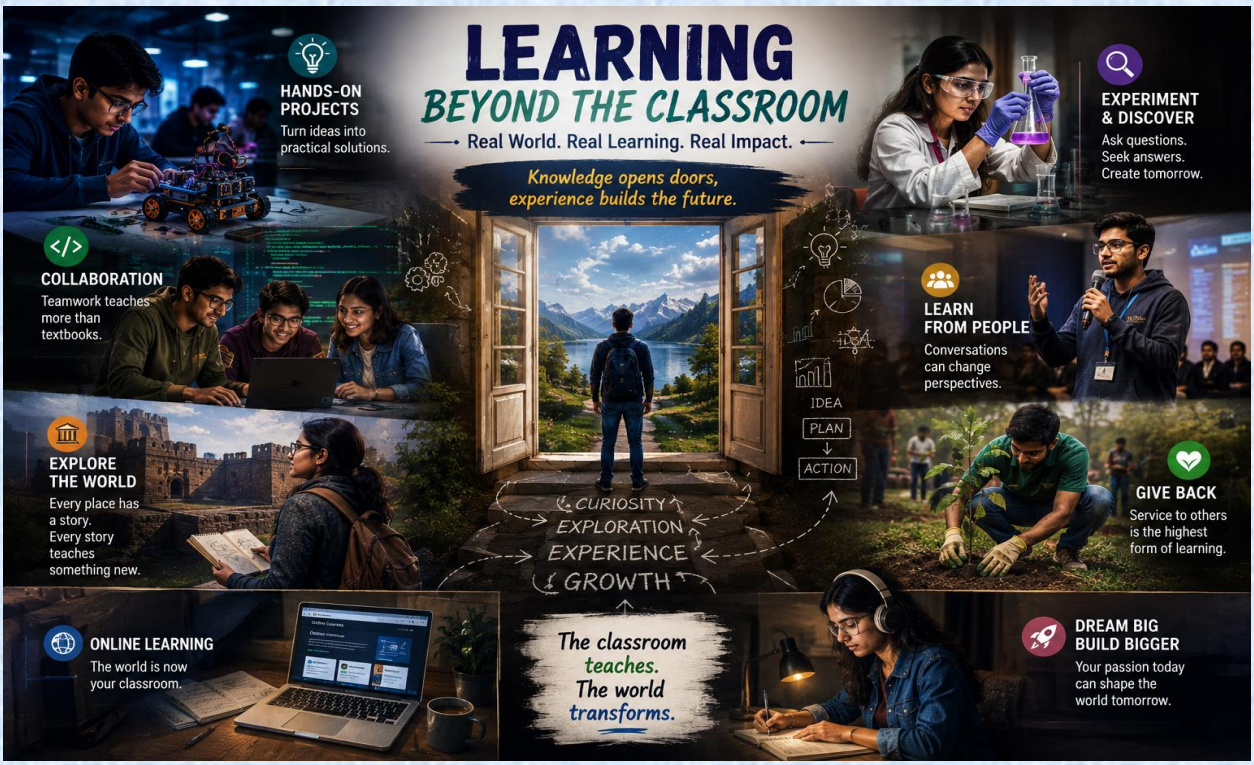


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Learning Beyond the Classroom

Learning does not begin when a teacher enters a classroom, and it certainly does not end when the bell rings. The world itself is a vast classroom, filled with experiences, questions, challenges, people, and opportunities waiting to teach us something new. For students, some of the most valuable lessons are discovered outside textbooks and lecture halls. A classroom can provide knowledge, but experiences beyond the classroom help students understand how that knowledge can be applied in the real world.

Learning beyond the classroom can take many forms. A visit to an industry can show students how concepts learned in college are used in professional environments. A workshop can introduce them to technologies that may not yet be part of their regular curriculum. A seminar can expose them to new ideas and perspectives, while a technical competition can teach them how to transform an idea into a practical solution. Even a conversation with someone working in a different field can provide insights that cannot easily be found in a textbook.



For a Computer Science student, learning beyond the classroom is particularly important because technology changes continuously. Programming languages, artificial intelligence tools, cybersecurity techniques, cloud platforms, and software frameworks are constantly evolving. Students who depend only on classroom lessons may know what is currently taught, but students who explore beyond the syllabus develop the ability to keep learning throughout their careers. Online courses, coding platforms, open-source projects, research papers, technology communities, hackathons, and personal projects can turn curiosity into practical knowledge.

Projects are among the most powerful forms of learning outside traditional classrooms. When students build something themselves, they encounter problems that cannot always be predicted in advance. A software project may produce unexpected errors, a robot may fail to respond correctly, or a machine-learning model may not perform as expected. Solving these problems teaches patience, creativity, critical thinking, and problem-solving. More importantly, students begin to understand that failure is not the opposite of learning; it is often an essential part of learning.

Learning also happens through people. Working with classmates on a project teaches collaboration, communication, leadership, and responsibility. Participating in student clubs allows individuals to discover interests beyond their academic subjects. Meeting professionals, researchers, entrepreneurs, and alumni can provide valuable insights into different career paths. These interactions can help students understand that success is rarely based on technical knowledge alone. The ability to communicate ideas, work with others, adapt to change, and approach problems creatively is equally important.

Travel and exploration can also become powerful learning experiences. Visiting historical places can connect students with culture and heritage, while observing different communities can broaden their understanding of society. Nature can teach lessons about sustainability and balance, and volunteering can help students understand social responsibility. Every new environment creates an opportunity to observe, question, and learn. Sometimes, a single experience outside familiar surroundings can change the way a student thinks about a problem.

The digital world has expanded the meaning of a classroom even further. A student sitting in a college hostel or at home can attend a lecture delivered by an expert from another country, participate in an international coding competition, collaborate with students from different parts of the world, or access research published by leading scientists. Technology has made knowledge more accessible than ever before. The challenge is no longer simply finding information; it is learning how to identify reliable information, think critically about it, and transform it into meaningful knowledge.

Learning beyond the classroom also encourages students to become independent learners. Instead of waiting for someone to provide answers, they learn to ask their own questions and search for solutions. This habit becomes extremely valuable after graduation because professional life rarely provides a complete textbook solution to every problem. Engineers, researchers, entrepreneurs, and professionals must continuously learn, adapt, experiment, and improve. The habit of self-directed learning developed during student life can therefore become one of the most valuable skills a person carries into the future.

Ultimately, education is not limited to classrooms, examinations, grades, or certificates. True education is the ability to understand the world, question what we know, learn from experience, and use knowledge to create something meaningful. The classroom provides the foundation, but the world provides the laboratory.

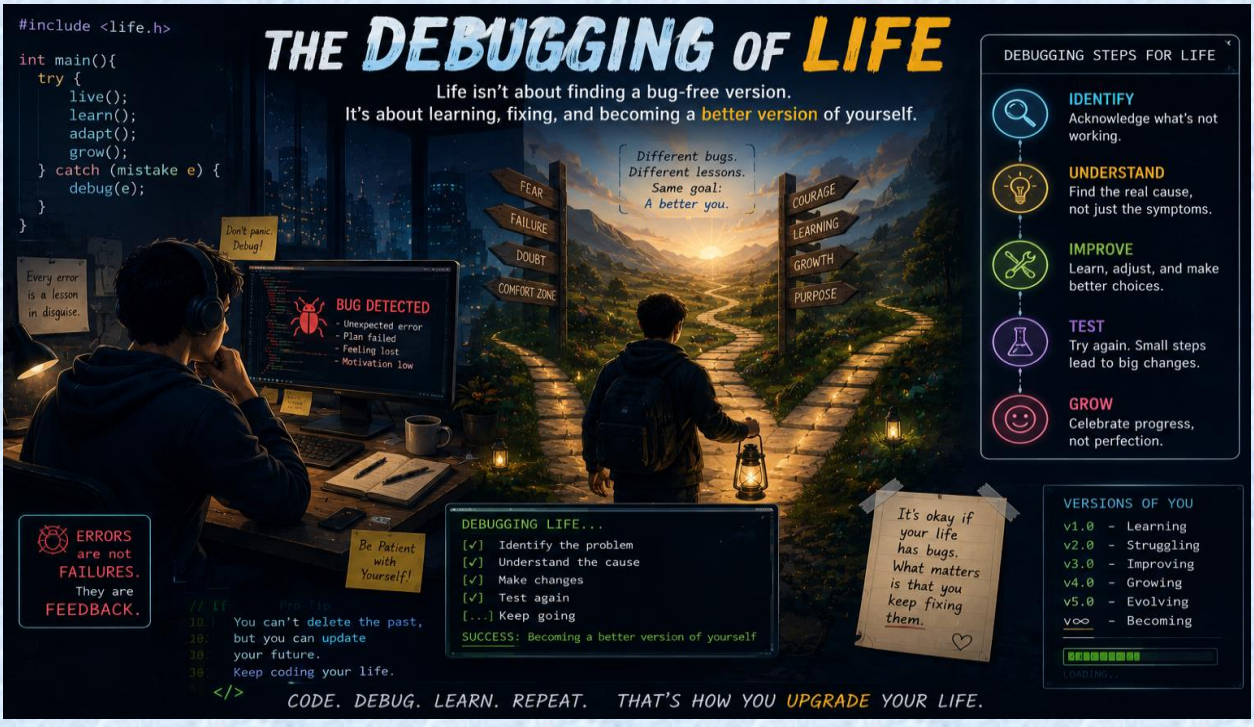
Step outside the classroom. Ask questions. Explore. Experiment. Meet people. Build something. Make mistakes. Try again. Because sometimes the most important lessons are waiting just beyond the classroom door.

ZISHAN KHAN CHOWDHURY
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The Debugging of Life

Life is a lot like writing a program. We begin with an idea of how everything should work, create our plans, set our goals, and expect the journey to follow a predictable sequence. But just like a program, life rarely runs perfectly on the first attempt. Unexpected errors appear, plans fail, people change, and situations arise that we never anticipated. These moments can feel frustrating, but perhaps they are not failures at all. Perhaps they are simply bugs waiting to be understood and fixed.

Every person carries a personal version of source code. Our experiences, decisions, relationships, education, successes, and failures continuously shape who we become. Sometimes the code works beautifully. We achieve something we worked hard for, receive appreciation, make meaningful connections, or discover a new opportunity. At other times, something goes wrong. We make the wrong decision, misunderstand someone, fail an examination, lose an opportunity, or find ourselves uncertain about the future. These situations can make us believe that something is fundamentally wrong with us. But a programmer does not throw away an entire program because of one error. They investigate the problem, understand its cause, modify the code, and try again. Life deserves the same patience.



Debugging teaches us an important lesson: an error is information. When a program crashes, the error message tells the programmer that something needs attention. In life, disappointment can play a similar role. A failed attempt may reveal that our approach needs to change. A difficult experience may show us a weakness that we can work on. A rejection may encourage us to develop new skills or explore a different direction. Instead of asking only, "Why did this happen to me?" we can also ask, "What is this experience trying to teach me?"

Sometimes the hardest bugs are the ones we cannot immediately identify. We may feel unhappy without understanding why, become exhausted despite working hard, or lose motivation even when everything appears normal from the outside. Just as programmers examine a system carefully to find hidden errors, we sometimes need to pause and examine our own lives. Are we following our own goals or someone else's expectations? Are we spending our time on things that truly matter to us? Are we learning from our mistakes, or repeating the same patterns? Self-reflection is a form of debugging because it allows us to understand what needs to change.

Another important part of debugging is patience. Some errors disappear quickly, while others require hours of investigation. Life works in much the same way. Some problems have simple solutions, while others take months or even years to understand. We should not expect ourselves to solve every problem immediately. Progress can be slow, and that does not mean it is absent. Sometimes simply continuing to learn, adapt, and move forward is progress.

There is also an important difference between debugging code and debugging life. A programmer usually knows what the correct output should be, but life rarely provides a predefined answer. There may be several possible paths, and what is right for one person may not be right for another. We cannot always optimize our lives according to someone else's definition of success. Sometimes we need to experiment, take risks, learn from the results, and create our own definition of what a meaningful life looks like.

Technology also teaches us the value of iteration. Software developers rarely create a perfect application in a single attempt. They build a version, test it, identify problems, improve it, and repeat the process. Our lives can follow the same philosophy. We do not need to become perfect overnight. We can become slightly better every day. Learn something new, correct one mistake, improve one habit, strengthen one relationship, or take one step toward a goal. Small improvements accumulate into significant transformation.

The most successful programmers are not those who never encounter bugs. They are the ones who become good at finding and solving them. Similarly, a successful life is not one without difficulties. It is a life in which we develop the courage to face difficulties, the wisdom to learn from them, and the resilience to try again. Every challenge becomes an opportunity to improve the next version of ourselves.

Perhaps we should stop thinking of ourselves as finished products. We are constantly evolving systems. Every experience adds something to our knowledge. Every mistake changes our

understanding. Every challenge strengthens our ability to handle the next one. We are continuously writing, testing, modifying, and improving our personal code.

So, when life does not work according to plan, do not immediately assume that you have failed. Pause. Analyze. Learn. Modify. Try again. The error may be temporary, the solution may be closer than you think, and the next version of your life may be better than the one you originally planned.

Because just like in programming, life is not about writing perfect code on the first attempt. It is about having the courage to keep debugging until you discover what works.

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Life Without the Internet: A Thought Experiment

Imagine waking up tomorrow and discovering that the internet has completely disappeared. No Wi-Fi, no mobile data, no social media, no online shopping, no streaming platforms, no instant messaging, and no search engines. At first, it might feel like an ordinary day, but within a few hours we would realize how deeply the internet has become a part of our lives. Communication would immediately change. Instead of sending instant messages, we would make phone calls, write letters, or meet people face-to-face. Waiting for a response would once again become normal, and conversations might become more deliberate and meaningful.

Education would also look very different. Students would no longer be able to search for answers within seconds or attend online classes from anywhere in the world. Physical books, libraries, teachers, and classroom discussions would become more important. Research would take longer, but students might also develop greater patience and independent thinking. For Computer Science students, the absence of online resources, coding platforms, cloud services, and digital collaboration tools would create a completely different learning environment.

The workplace would face even greater challenges. Emails, video conferences, cloud storage, online banking, digital payments, and many business platforms would stop working. Companies would have to depend more on physical documents, telephone calls, face-to-face meetings, and local computer systems. Online shopping and food delivery would disappear, while entertainment would return to television, books, physical games, music, outdoor activities, and social gatherings.

Yet a world without the internet might also have unexpected advantages. There would be fewer notifications, fewer distractions, and less pressure to remain constantly connected. People might spend more time talking with family, meeting friends, reading books, exploring nature, or simply enjoying moments without a screen. We might rediscover the value of patience, face-to-face communication, and being present in the real world. At the same time, we would lose many of

the internet's benefits, including instant access to knowledge, global communication, online education, digital services, and opportunities to connect with people across the world.

This thought experiment does not suggest that we should live without the internet. Instead, it encourages us to think about how dependent we have become on constant connectivity. The internet is one of the most powerful tools created by humanity, but it should remain a tool rather than becoming something that controls every part of our lives. Perhaps imagining a world without the internet can help us appreciate what technology gives us while reminding us not to forget the world that exists beyond the screen.

The internet connects us to almost everything, but sometimes disconnecting from it can help us reconnect with ourselves, our surroundings, and the people beside us.



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