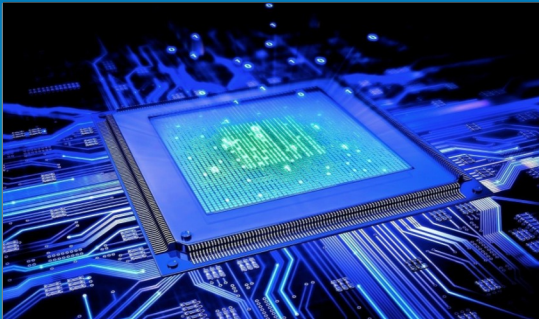


ACE

TECHIE TALK

VOL.13 NO. 3, 2023



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

MEENAKSHI SUNDARARAJAN ENGINEERING

COLLEGE, CHENNAI - 24

FROM THE HOD'S DESK

- Dr. B. MONICA JENEFER, HOD, DEPT. OF CSE

Greetings!

It gives me immense pleasure in releasing the Nov-Dec edition (Vol. 13 NO. 3) of "Techie Talk" - a newsletter from our department through the ACE - Association of Computer Engineering.

Techie Talk aims to keep students informed of the latest technologies through a plethora of articles contributed by the students and faculty members of our department. My heartfelt congratulations to those who have contributed articles and strived to make this newsletter a big success. I would also like to appreciate the Editorial Board for their sincere efforts.

My best wishes to all the students for their academic pursuits.

FROM THE EDITOR'S DESK

- Dr. M SUMITHRA, ASST. PROFESSOR, DEPT. OF CSE

Dear Readers,

Greetings!

I'm extremely happy to release the Nov-Dec edition (Vol. 13 NO. 3) of Techie Talk. This newsletter presents a wide range of articles on the latest technologies along with snippets of information. This issue highlights the interest, skill and creativity of the students.

It is really heart-warming to see all the contributions from students amidst their busy schedules. The Editorial Board appreciates the time and effort that has been devoted by the different contributors. Suggestions to improve the newsletter format and content are always welcome.

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VISION AND MISSION OF THE INSTITUTE

Vision: To impart state-of-the art technical education, including sterling values and shining character, producing engineers who contribute to nation building thereby achieving our ultimate objective of sustained development of an unparalleled society, nation and world at large.

Mission: Meenakshi Sundararajan Engineering College, Chennai constantly strives to be a Centre of Excellence with the singular aim of producing students of outstanding academic excellence and sterling character to benefit the society, our nation and the world at large.

To achieve this, the college ensures

- Continuous upgradation of its teaching faculty to ensure a high standard of quality education and to meet the ever-changing needs of the society.
- Constant interaction with its stakeholders.
- Linkage with other educational institutions and industries at the national and international level for mutual benefit.
- Provision of research facilities and infrastructure in line with global trends.
- Adequate opportunities and exposure to the students through suitable programs, to mould their character and to develop their personality with an emphasis on professional ethics and moral values.

VISION OF DEPARTMENT :

To achieve academic excellence in Computer Science and Engineering by imparting quality training, encouraging research activities and innovation, inculcating ethical values and preparing the students to face industrial demands, societal needs and technical challenges.

MISSION OF DEPARTMENT :

- To provide quality education in theory and application of Computer Science and Engineering.
- To inculcate analytical thinking and innovation within students to become technically competent professionals.
- To prepare students to excel in competitive and challenging careers.
- To generate socially responsible citizens with ethical values for facing industrial and societal challenges.
- To promote research in the emerging areas of technology convergence.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

- Apply the technical competence in computer science to solve real world problems, with technical and people leadership.
- Conduct cutting edge research and develop solutions on problems of social relevance.
- Work in a business environment, exhibiting team skills, work ethics, adaptability and lifelong learning.

PROGRAM OUTCOMES:

The graduates in Computer Science and Engineering will:

- **PO1 : Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and engineering specialization to the solution of complex engineering problems.
- **PO2 : Problem analysis:** Identify, formulate, review, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **PO3 : Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **PO4 : Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **PO5 : Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- **PO6 : The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **PO7 : Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **PO8 : Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **PO9 : Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

- **PO9 : Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PO10 : Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO11 : Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **PO12 : Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

- Exhibit design and programming skills to build and automate business solutions using cutting edge technologies.
- Strong theoretical foundation leading to excellence and excitement towards research, to provide elegant solutions to complex problems.
- Ability to work effectively with various engineering fields as a team to design, build and develop system applications



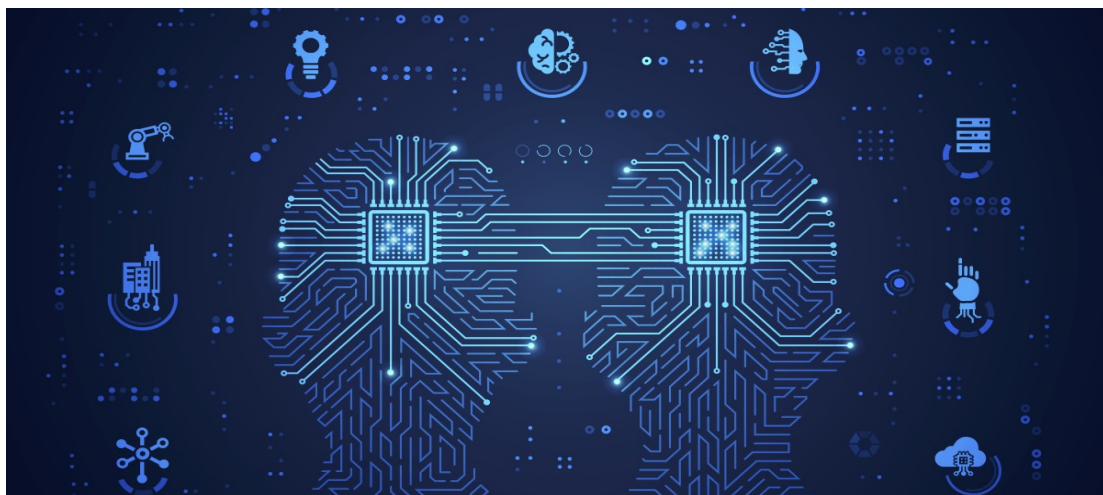
WHAT IS A DIGITAL TWIN?

-ABHINAYA B (III YR CSE)

A digital twin is a virtual representation of a physical object or system that extends across its entire lifecycle. This virtual model is continually updated with real-time data and employs simulation, machine learning, and reasoning to aid in decision-making processes. Created to mimic its real-world counterpart, a digital twin offers a host of advantages across various industries. Here's an in-depth exploration of digital twins:

A digital twin starts with the creation of a virtual model designed to faithfully replicate a physical object or system. This physical entity, such as a wind turbine, is equipped with a network of sensors that collect data on its performance. These sensors monitor critical parameters like energy output, temperature, weather conditions, and more. The data gathered by these sensors is then transmitted to a central processing system, where it is integrated into the digital twin.

Once infused with real-world data, the digital twin becomes a powerful tool for analysis. It can run simulations, identify performance issues, and propose potential improvements. The primary objective is to derive valuable insights from the digital twin, which can subsequently be applied to enhance the performance of the actual physical object or system.



Digital twins come in various forms, each offering a different level of detail and functionality: Component Twins/Parts Twins are the most basic digital twins, representing individual components or parts of a larger system. Parts twins are similar but focus on less critical components. When multiple components work together, they form an asset. Asset twins allow for the study of component interactions, generating valuable performance data that can inform decision-making. Moving up in complexity, system or unit twins illustrate how different assets collaborate to create a functional system. They provide insights into asset interactions and may suggest performance enhancements. At the highest level of magnification, process twins reveal how entire systems harmonize to operate within a production facility. They help assess the synchronization of systems and their impact on overall efficiency.

The idea of digital twin technology was first voiced in 1991, with the publication of *Mirror Worlds*, by David Gelernter. However, Dr. Michael Grieves (then on faculty at the University of Michigan) is credited with first applying the concept of digital twins to manufacturing in 2002 and formally announcing the digital twin software concept. Eventually, NASA's John Vickers introduced a new term—"digital twin"—in 2010.

However, the core idea of using a digital twin as a means of studying a physical object can actually be witnessed much earlier. In fact, it can be rightfully said that NASA pioneered the use of digital twin technology during its space exploration missions of the 1960s, when each voyaging spacecraft was exactly replicated in an earthbound version that was used for study and simulation purposes by NASA personnel serving on flight crews.

Digital twins facilitate more effective research and product design by generating vast amounts of data on potential performance outcomes, enabling refinements before production begins. Throughout the product lifecycle, digital twins can mirror and monitor production systems, striving for peak efficiency in manufacturing processes. Digital twins assist in decision-making regarding products that reach the end of their lifecycle. They help determine which materials can be harvested through recycling or other sustainable measures.

Digital twins have evolved from a concept introduced in the early 1990s to a critical technology with diverse applications today. Their ability to replicate, analyze, and optimize real-world objects and systems offers substantial benefits across industries, from manufacturing and engineering to space exploration.

THE QUANTUM FRONTIER: A NEW ERA OF UNBREAKABLE ENCRYPTION

-SULAKSHA B K(III YR CSE)

Quantum Computing is a new kind of computing technology that uses the principles of Quantum Mechanics, a branch of physics that deals with atomic particles and photons. Though being on the verge of revolutionizing the world of technology as it is known by the day, the cognition of Quantum Computing seems obscure to many.

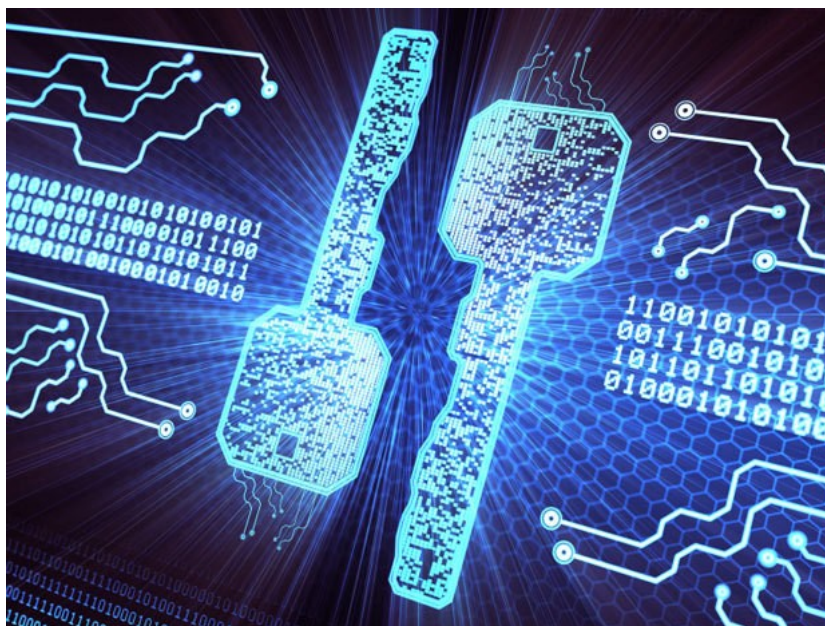
To speculate classical computers as a light switch, where the light can be either on or off, where each state represents a binary code (0s or 1s). Quantum computers, resemble a dimmer switch that can exist in many positions between the state of being completely off and completely on using the superposition property. This allows quantum bits or "qubits" to represent not just 0 or 1, but any combination of 0 and 1 simultaneously. This property enables quantum computers to perform certain calculations much faster than classical computers.

In the constantly changing realm of cybersecurity, the advent of quantum computing presents a dual scenario of potential peril and promise. On one hand, the formidable computational capabilities of quantum machines loom as a menacing threat to established encryption techniques. On the other hand, they simultaneously open new avenues towards achieving unassailable data security. Code-Based Cryptography, Multivariate Polynomial Cryptography, Isogeny-Based Cryptography, Quantum Digital Signatures, Post-Quantum Secure Protocols are some of the distinguished encryption techniques related to quantum computing.

Quantum-Secure Communication Networks, established on Quantum Key Distribution (QKD), works by sending photons between parties. If an eavesdropper attempts to intercept these particles, quantum mechanics dictates that their state will be altered, alerting the sender and receiver to the intrusion. This property ensures that cryptographic keys exchanged via QKD are secure. These keys, which are used for encrypting and decrypting data, are then employed in conventional encryption methods for secure communication. Even the most advanced classical or quantum computers cannot decipher the encrypted information without the shared key, making it virtually impossible to compromise the security of the network.

Quantum Digital Signatures (QDS) for instance, relies on two fundamental concepts: quantum entanglement and the no-cloning theorem. When a digital signature is created, they generate an entangled pair of photons. One of these photons, known as the signatory photon, is kept unrevealed, while the other, known as the verification photon, is sent to the recipient. The sender manipulates the state of the signatory photon based on the message they want to sign. This manipulation is unique to the message, making the signatory photon's state a one-time-use signature. The recipient receives the verification photon and uses it to verify the signature. If the signature is genuine, the verification photon's state will be altered due to the entanglement, confirming the authenticity of the message. These features collectively establish QDS as a highly secure method for preserving the integrity and authenticity of digital signatures, particularly in the era of quantum computing.

The quantum frontier opens scope to both unprecedented challenges and remarkable opportunities in the realm of encryption. While the emergence of quantum computing presents a formidable threat to traditional encryption methods, it also catalyzes the development of quantum-safe cryptographic solutions. The birth of Quantum Key Distribution (QKD) offers an unassailable path to secure communication, underpinned by the very laws of quantum mechanics. As we stand on the precipice of this new era, the fusion of quantum technology and cryptography promises not just unbreakable encryption but also a profound transformation in how we safeguard our digital world. The journey to the quantum frontier is one of innovation, adaptation, and the relentless pursuit of security, ensuring that data remains shielded in an age where the quantum realm reigns supreme.



THE FUTURE OF WORK: ADAPTING TO A DIGITAL AND REMOTE LANDSCAPE

- SHRUTHI PRIYAA GK(III YR CSE)

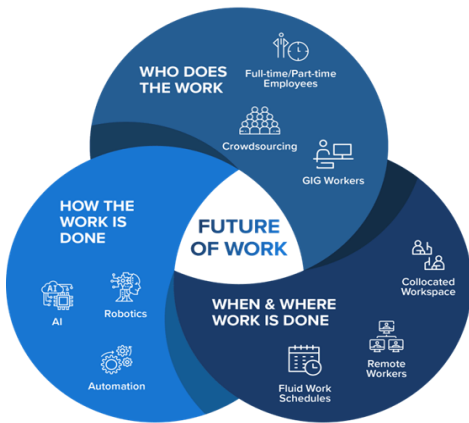
The concept of work has undergone a dramatic transformation in recent years. Accelerated by technological advancements, the future of work is marked by profound shifts in how, when, and where we work. This article delves into the evolving landscape of work, exploring the trends, challenges, and opportunities that define the workplace of tomorrow.

The world of work is changing. Artificial intelligence and automation will make this shift as significant as the mechanization in prior generations of agriculture and manufacturing. While some jobs will be lost, and many others created, almost all will change. The COVID-19 crisis accelerated existing trends and caused organizations to reevaluate many aspects of work. This regularly updated collection of articles draws together our latest perspectives on the future of work, workforce, and workplace.

While no one can predict the future with absolute certainty, it's clear that the world of work is changing, just as the world itself is. Looking ahead at how work will shift, along with trends affecting the workforce and workplaces, can help you or your organization prepare for what's next. The future of work was shifting even before COVID-19 upended lives and livelihoods. But the pandemic accelerated three broad trends that will continue to reshape work as the effects of the crisis recede:

Remote work and virtual meetings are likely to continue, although less intensely than at the pandemic's peak. E-commerce soared, growing at two to five times the pre-COVID-19 rate, and other kinds of virtual transactions such as telemedicine, online banking, and streaming entertainment took off. And shifts to digital transactions also propelled growth in delivery, transportation, and warehouse jobs. The pandemic propelled faster adoption of digital technologies, including automation and AI.

Our analysis of the potential for remote work to persist looked at 2,000 tasks used in roughly 800 jobs in eight focus countries. It showed that 20 to 25 percent of workforces in advanced economies could work from home in the range of three to five days a week—which is four to five times more remote work than pre-COVID-19.



While much focus is placed on technology in future-of-work discussions, other factors, such as remote employment and the gig economy, play a large role in not only how work will be done, but who will be doing it and from where.

Organizations exploring the post-COVID-19 future of work will need to tailor their approach to their unique context. Balancing three symbiotic elements can provide a

holistic understanding of the forces shaping the future of work: The nature of work, The workforce of the future and The workplace of the future

"The future of work is not a destination; it's a journey. It's not a one-time event; it's an ongoing evolution. Embrace change, adapt, and thrive in this ever-shifting landscape."

The future of work is a dynamic and evolving landscape shaped by technology, societal changes, and organizational strategies. As we adapt to this new era of work, it's crucial for individuals and organizations to embrace innovation, prioritize well-being, and prepare for the challenges and opportunities that lie ahead. By doing so, we can build a future of work that is more flexible, inclusive, and sustainable.

The future of work is undergoing a profound transformation, driven by technological advancements, shifting demographics, and evolving societal expectations. As we move forward, the workplace will continue to evolve in unprecedented ways. Automation and artificial intelligence will reshape job roles, demanding new skill sets and fostering innovation in various industries. Remote and flexible work arrangements will likely become more commonplace, offering greater work-life balance but also raising questions about employee well-being and the future of office spaces.

This last point reflects a core tenet of the Future of Jobs Report since its inception: that the future of work can be shaped for better outcomes and that it is the policy, business and investment decisions made by leaders today that will determine outcomes and the future space for action.

PROGRAMMING LANGUAGE COMPARISON: UNVEILING THE POWER OF LANGUAGES -HARINI ESWARI V (IV YR CSE)

In the vast landscape of computer science, programming languages serve as the building blocks upon which we construct our digital creations. Selecting the right programming language is akin to choosing the perfect tool for a specific job. Each language comes with its own set of strengths and weaknesses, making it imperative for developers to be well-versed in these nuances to make informed decisions. In this essay, we embark on a comprehensive journey to compare and contrast some of the most popular programming languages, shining a light on their unique characteristics and the scenarios in which they truly shine.

Python, often referred to as the Swiss Army knife of programming languages, has gained immense popularity in recent years. Its strengths lie in its readability and simplicity. Python's clean and concise syntax makes it an excellent choice for beginners and rapid prototyping. Moreover, Python boasts an extensive ecosystem of libraries and frameworks for tasks ranging from data analysis to web development. It finds its best fit in web development through frameworks like Django and Flask, data analysis and manipulation through Pandas and NumPy, and machine learning and artificial intelligence with TensorFlow and PyTorch.

However, Python's Achilles' heel lies in its performance. Due to its interpreted nature, Python can be slower compared to low-level languages like C++. Additionally, the Global Interpreter Lock (GIL) can hinder multi-threading performance for CPU-bound tasks. Thus, while Python is incredibly versatile, it may not be the best choice for performance-critical applications. Java, often celebrated for its platform independence, is a stalwart in the world of programming languages. "Write once, run anywhere" epitomizes Java's capability to run on multiple platforms, making it indispensable for large-scale enterprise applications. It offers strong typing, reducing errors at compile-time, and a robust ecosystem with extensive libraries and frameworks like Spring for web development. Nevertheless, Java's verbosity can be a hurdle for some developers, and its slower development pace due to explicit declarations might not suit all projects.

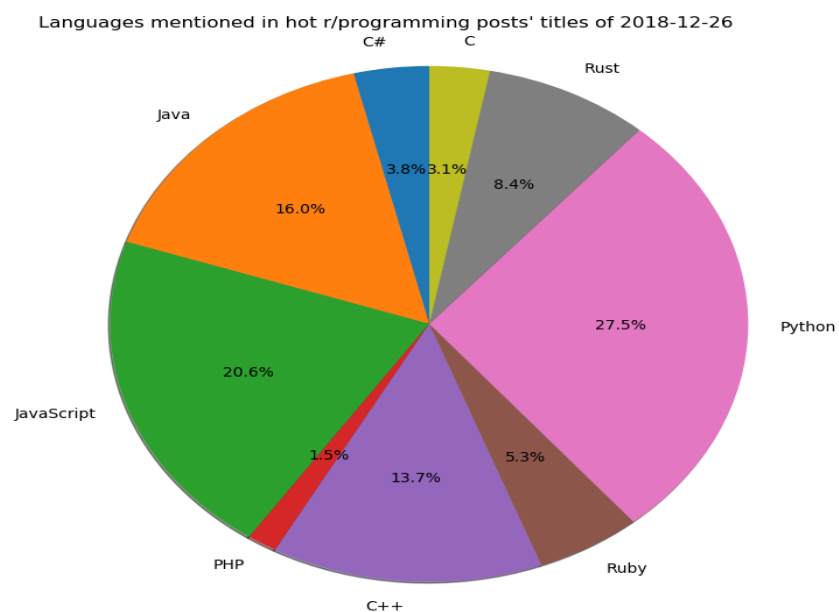
Java finds its best fit in large-scale enterprise applications, Android app development, and real-time systems. Its ability to run on virtually any platform and its strict typing system make it a top choice for projects where reliability and portability are paramount.

JavaScript, often regarded as the language of the web, enjoys ubiquity like no other language. Its strengths lie in its ability to create interactive and responsive web applications. JavaScript's support for asynchronous programming is pivotal for achieving non-blocking operations, a crucial aspect of modern web development. With an extensive community and a plethora of libraries and frameworks such as React, Angular, and Vue.js, JavaScript remains at the forefront of web development.

Nonetheless, JavaScript comes with its own set of challenges. Inconsistent browser compatibility can be a source of frustration for developers, and its single-threaded nature may limit its application in CPU-bound tasks. JavaScript's best-fit scenarios are undoubtedly in front-end web development, building interactive web applications, and even server-side development with Node.js.

C++ is a language synonymous with speed and low-level memory control. Its strengths lie in its performance, versatility, and the Standard Template Library (STL), which offers a rich set of data structures and algorithms. C++ excels in domains like game development, with engines like Unreal Engine relying heavily on it. It's also a popular choice for operating systems and embedded systems, where performance and low-level control are essential.

However, C++ is not without its challenges. Its complexity can be a barrier to entry for some developers, and its manual memory management can lead to memory leaks and bugs. As such, C++ is best suited for performance-critical applications where control over hardware resources is paramount.



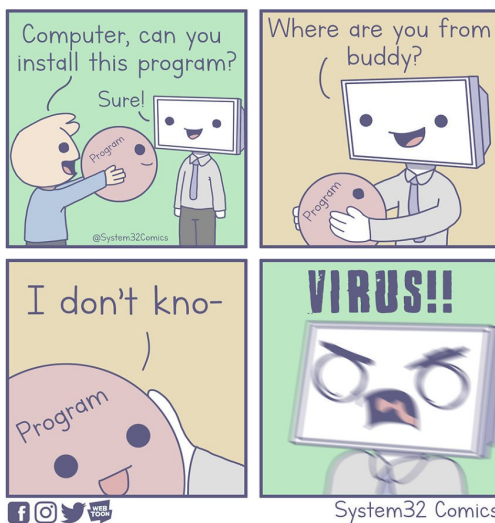
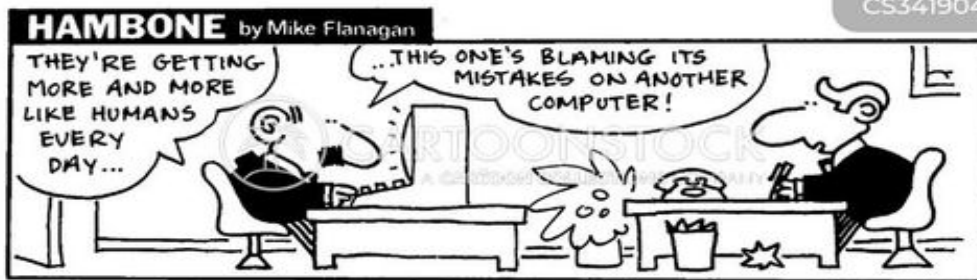
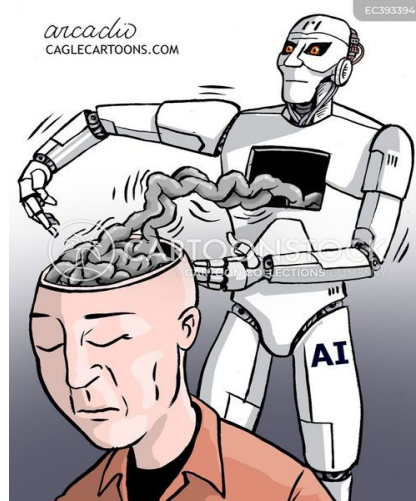
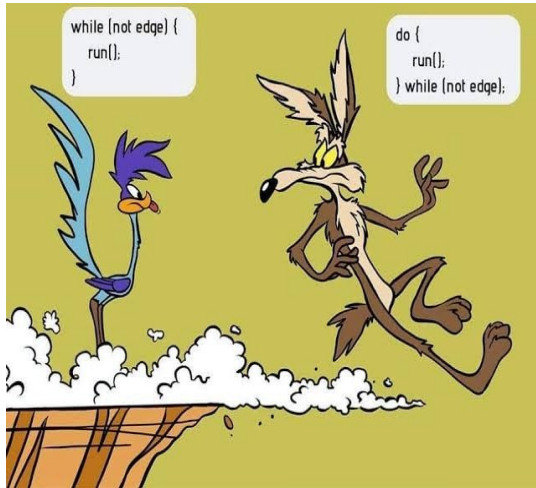
Ruby is celebrated for its elegant syntax, which emphasizes readability and developer happiness. Ruby on Rails, a powerful web development framework, exemplifies its strengths. The Ruby community is passionate, fostering continuous improvement in the language and its ecosystem. However, Ruby's performance can be a concern, as it may be slower compared to other languages like Python. Additionally, Ruby on Rails may not be the best choice for highly scalable applications.

Ruby's best-fit scenarios include web development with Ruby on Rails, prototyping, and small to medium-sized projects. Its simplicity and readability make it a delightful choice for projects where speed of development and developer satisfaction are paramount.

In the realm of computer science, selecting the right programming language is a nuanced art. While there is no one-size-fits-all language, understanding the strengths, weaknesses, and best-fit scenarios of popular programming languages is essential for developers and project managers alike. Whether your priority is readability, performance, or versatility, there exists a programming language tailored to your needs. As we navigate the ever-evolving landscape of technology, making informed choices about programming languages remains at the core of successful software development. This essay has unveiled the power and potential of some of the most popular languages, offering a foundation for making those crucial decisions. Stay tuned for more insights and updates from the dynamic world of computer science!

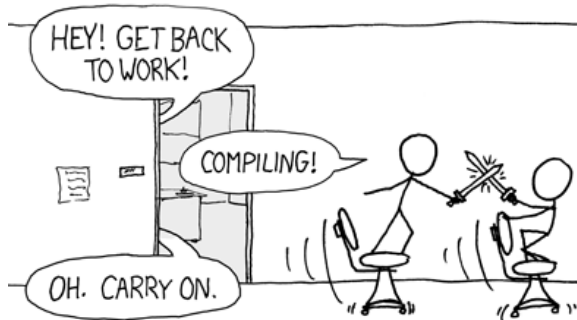


CODE AND CHUCKLES



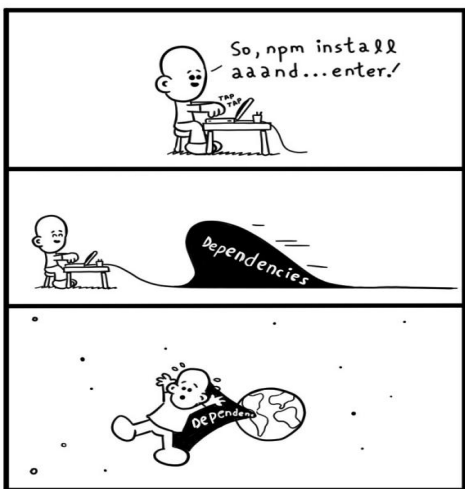
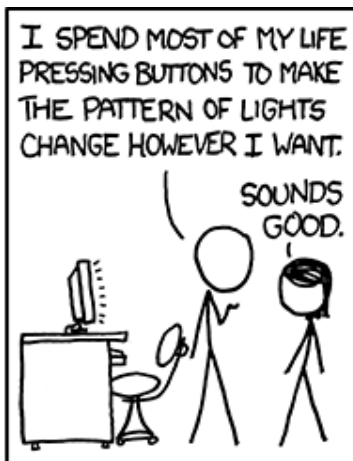
THE #1 PROGRAMMER EXCUSE FOR LEGITIMATELY SLACKING OFF:

"MY CODE'S COMPILING."

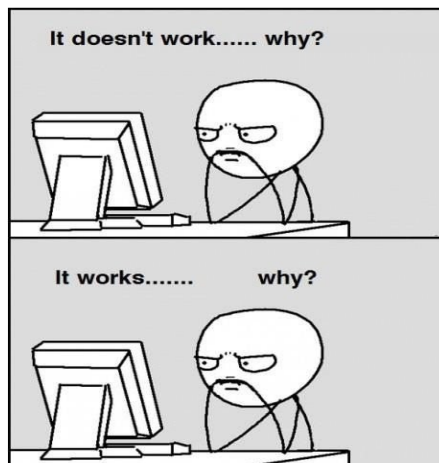


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PROBLEM OF THE PROGRAMMERS:



BOOK RECOMMENDATIONS

Dear MSEC CSE Community,

It is a fantastic time to delve into books that can expand your horizons, inspire creativity, and deepen your understanding of the world of computer science and engineering. Whether you're looking for technical insights, career advice, or simply an entertaining read related to your field, we've got you covered with this month's book recommendations:

- **"Clean Code: A Handbook of Agile Software Craftsmanship" by Robert C. Martin**

A classic in the world of software development, this book provides essential guidance on writing clean, maintainable code. Perfect for anyone looking to improve their coding practices.

- **"The Pragmatic Programmer: Your Journey to Mastery" by Andrew Hunt and David Thomas**

A must-read for aspiring software engineers, this book offers practical advice and timeless principles for becoming a more effective and efficient programmer.

- **"Algorithms to Live By: The Computer Science of Human Decisions" by Brian Christian and Tom Griffiths**

Explore the intersection of computer science and daily life. This book illustrates how algorithms and computational thinking can help you make better decisions in various aspects of your life.

- **"Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems" by Martin Kleppmann**

Dive deep into the world of data-intensive applications. This book is a treasure trove of knowledge on designing robust, scalable systems.

- **"You Don't Know JS (book series)" by Kyle Simpson**

If you want to master JavaScript, this series is a must-read. It provides an in-depth exploration of the language and its nuances.

- **"The Phoenix Project: A Novel About IT, DevOps, and Helping Your Business Win" by Gene Kim, Kevin Behr, and George Spafford**

This engaging novel introduces the principles of DevOps through a compelling story. A great read for those interested in the intersection of technology and business.

- **"Grokking Algorithms: An Illustrated Guide for Programmers and Other Curious People" by Aditya Bhargava**

For those who prefer a visual approach to learning algorithms, this book offers clear explanations with helpful illustrations.

- **"Cracking the Coding Interview: 189 Programming Questions and Solutions" by Gayle Laakmann McDowell**

If you're preparing for technical interviews, this book is an invaluable resource. It provides a wide range of coding questions and solutions to help you ace your interviews.

- **"Code: The Hidden Language of Computer Hardware and Software" by Charles Petzold**

Take a journey through the history and inner workings of computers, from logic gates to high-level programming languages.

- **"Zero to One: Notes on Startups, or How to Build the Future" by Peter Thiel and Blake Masters**

While not strictly a computer science book, this work provides valuable insights into entrepreneurship and innovation in the tech world.

PLACEMENT DETAILS



BATCH 2020-2024

Kaar Technologies	7
EmbedUR	1
JMAN Groups	1

BATCH 2021-2025

Kaar Technologies Intern	3
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PLACEMENT BULLETIN

Total number of students	60
Total number of students placed	9
Placement Percentage till August 2023 (Batch : 2020 - 2024)	15%

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