GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY
(AUTONOMOUS)
Gangavaram (V), Kovur (M), S.P.S.R. Nellore – 524137
Accredited with NAAC 'A' Grade & NBA (B. Tech - ECE, EEE & MECH)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

TECHNICAL MAGAZINE

TECH SPARK

VOLUME 1 / ISSUE 1
(JUL-DEC)
ACADEMIC YEAR : 2023-24

TECH SPARK

CSE

HALF YEARLY COMPUTER SCIENCE ENGINEERING MAGAZINE

AY: 2023-24 VOLUME: 1 ISSUE: JULY-DEC

GEETHANJALI INSTITUTE OF SCIENCE AND TECHNOLOGY

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Editorial Message

Well-written technical articles contribute to the total body of knowledge for the engineering community and will potentially help many engineers. Articles do not need to be detailed “academic-level” work. In fact, some of the most popular articles are “down to earth” practical applications of existing or new technology.

Editorial Board

VISION-MISSION

VISION

To evolve as a leading computer science and engineering centre producing competent technocrats to meet the demands of ever-changing industry and society.

MISSION

DM1: Impart quality education through innovative teaching learningprocesses

DM2: Motivate the learners to upgrade technical expertise by promotinglearner centric activities.

DM3: Inculcate values and interpersonal skills in the learners towards overalldevelopment.

DM4: Upgrade knowledge in cutting edge technologies keeping pace withindustrial standards through collaborations.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates of B. Tech in Computer Science and Engineering program shall able to

PEO1: Outperform in professional career or higher learning by upgradingskills in Computer Science and Engineering stream.

PEO2: Provide computing solutions for complex problems to meetindustry demands and societal needs.

PEO3: Offer ethical, socially sensitive solutions as professionals and asentrepreneurs in Computer Science and other engineering disciplines.

PEO4: Leverage new computing technologies by engaging themselves inperpetual learning.

EXPLORING EDGE COMPUTING: FASTER, SMARTER AND CLOSER TO THE SOURCE

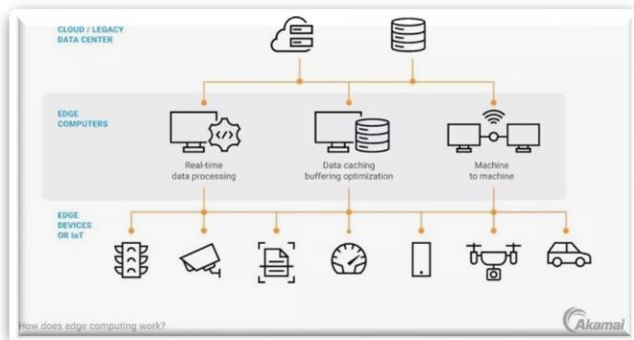
Edge computing:

The process of bringing information storage and computing abilities closer to the devices that produce that information and the users who consume it.
Edge computing is a distributed computing paradigm that brings computation and data storage closer to the location where it is needed, improving response times and saving bandwidth.
Unlike traditional cloud computing architectures where data is transmitted to a centralized data center, edge computing processes data locally "at the edge" of thenetwork, near the source of the data.

Importance of edge computing:

Edge computing is important because it creates new and improved ways for industrial and enterprise-level businesses to maximize operational efficiency, improve performance and safety, automate all core business processes, and ensure“always on” availability. It is a leading method to achieve the digital transformation of how you do business.

Working of edge computing:



The network edge is where the physical and digital world interact — where data is input into or captured by devices that are connected to the internet or a network, and where devices receive data that users and applications rely on for decision- making and insights. Edge computing brings data, insights, and decision-making closer to users and devices, rather than processing data in a central location that may be thousands of miles away. By managing processing at the edge of the network, edge computing ensures that data — especially real-time data — doesnot suffer latency issues that can impact the purpose or performance of an application.

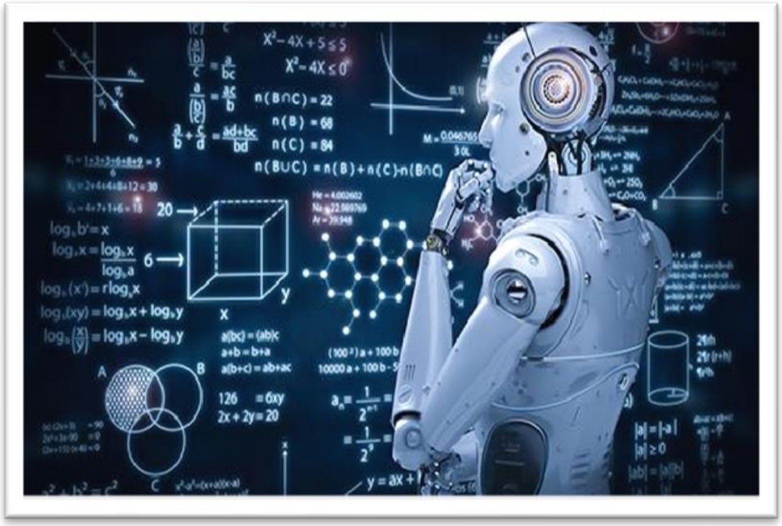
Benefits of edge computing:

- Improved Bandwidth Efficiency: Optimizes data transmission and saves costs.
- Enhanced Security and Privacy: Less data exposure and reduced breach risk.
- Reliability and Resilience: Independent operation during network failures.
- Scalability: Easily scales operations with distributed processing.
- Cost Savings: Reduces infrastructure and data transmission expenses.
- Support for IoT: Efficiently handles large volumes of IoT data.

222U1A05B2
PATNAM ROJA HASINI

ROBOTICS

Robotics Aspects



Mechanical Construction

The mechanical aspect of a robot helps it complete tasks in the environment forwhich it's designed. For example, the Mars 2020 Rover's wheelshttps://mars.nasa.gov/mars2020/mission/rover/wheels/https://mars.nasa.gov/mars2020/mission/rover/wheels/https://mars.nasa.gov/mars2020/mission/rover/wheels/https://mars.nasa.gov/mars2020/mission/rover/wheels/https://mars.nasa.gov/mars2020/mission/rover/wheels/https://mars.nasa.gov/mars2020/mission/rover/wheels/https://mars.nasa.gov/mars2020/mission/rover/wheels/ are individuallymotorized and made of titanium tubing that help it firmly grip the harsh terrainof the red planet.

Electrical Components

Robots need electrical components that control and power the machinery. Essentially, an electric current — a battery, for example — is needed to power a large majority of robots.

Software Program

Robots contain at least some level of computer programming. Without a set of code telling it what to do, a robot would just be another piece of simple machinery. Inserting a program into a robot gives it the ability to know when andhow to carry out a task.

Robotics Applications

Manufacturing: Industrial robots can assemble products, sort items, performwelds and paint objects. They may even be used to fix and maintain other machines in a factory or warehouse.

Home Use: Consumers may be most familiar with the Roomba and other robot vacuum cleaners. However, other home robots include lawn-mowing robots and personal robot assistants that can play music, engage with children and help with household chores.

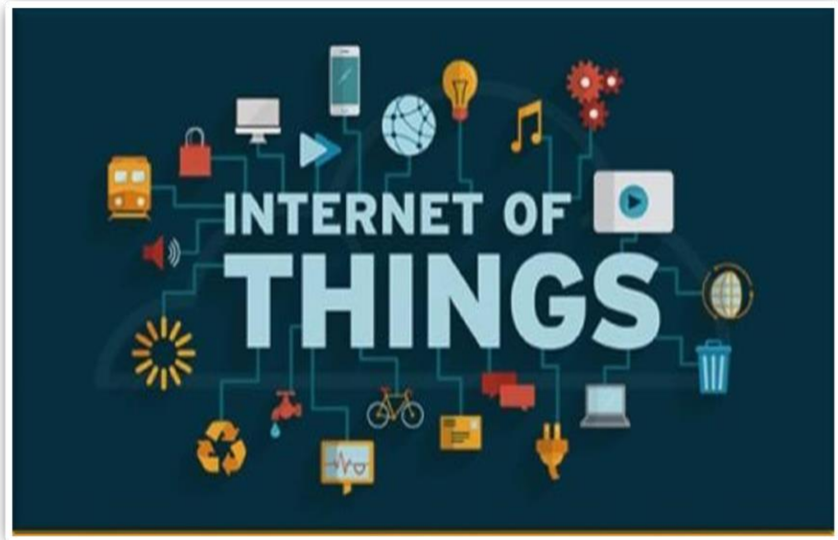
Future of Robotics

The evolution of AI has major implications for the future of robotics. In factories, AI can be combined with robotics to produce digital twins and design simulations tohelp companies improve their workflows. In addition, robots could be outfitted with generative AI tools like ChatGPT, resulting in more complex human-robot conversations.

222U1A05G8
SYED MUJAKEER

Internet of Things

INTRODUCTION:



IoT stands for Internet of Things. It refers to the interconnectedness of physical devices, such as appliances and vehicles, that are embedded with software, sensors, and connectivity which enables these objects to connect and exchangedata. This technology allows for the collection and sharing of data from a vast network of devices, creating opportunities for more efficient.

key Components IoT:
End-User Interface 2.Data Processing 3.Application 4.Security
Challenges in IoT Deployments:

Lack of encryption:

Although encryption is a great way to prevent hackers from accessing data, it is also one of theleading IoT security challenges.

Insufficient testing and updating:
With the increase in the number of IoT(internet of things) devices, IoT manufacturers are more eager to produce and deliver their device as fast as they can without giving security too much of although.

IoT solutions:

IoT solutions are software programs that leverage data captured using Internet of Things (IoT) devices. Some IoT solutions are “point solutions” that specialize in the data from one type of sensor, others integrate multiple sensors to identify a broader range of insights.

Pros & Cons of Internet of Things:

Environmental Benefits: The Internet of Things can help with sustainability efforts byoptimizing resource consumption. Smart grids can distribute energy more efficiently, reducing waste and greenhouse gas emissions.

Concerns: The risk of data breaches and privacy violations increases as more interconnected devices collect sensitive data. Hackers may take advantage of flaws in IoT devices to gain access to personal information or even take control of critical infrastructure.

222U1A05F7
SHAIK NAYEEM

NEUROMORPHIC COMPUTING

What Is Neuromorphic Computing?

Neuromorphic computing is an emerging process that aims to mimic the structure and operation of the human brain, using artificial neurons and synapses to process information.

The field of neuromorphic computing is still relatively new.it has very few real-world applications beyond the research being carried out by universities, governments and large tech companies like IBM and Intel Labs.

How Does Neuromorphic Computing Work?

Neurons and Synapses Simulation: Neuromorphic systems simulate neurons andsynapses using electronic circuits or software models.
Parallel Processing: Emphasizes simultaneous computation across multiple channels,akin to the brain's parallel information processing.
Spiking Neural Networks (SNNs): Networks that communicate through spikes ofactivity, mimicking neural signaling for efficiency.
Low Power Consumption: Achieved through analog circuits and specialized hardware,mirroring the brain's energy-efficient processing.

BENEFITS OF NEUROMORPHIC COMPUTING

Energy Efficiency: Mimics the brain's low-power consumption with analog circuits andevent-driven processing.
Parallel Processing: Enables simultaneous data handling, speeding up computations forreal-time applications.
Real-Time Processing: Ideal for tasks needing rapid responses and decision-making, suchas autonomous systems.
Adaptability and Learning: Supports self-learning and improvement through synapticplasticity, without explicit programming.
Fault Tolerance: Offers resilience against component failures, enhancing reliability incritical applications.

CHALLENGES OF NEUROMORPHIC COMPUTING

- Limited hardware and software availabilityDifficult to learn and apply
- Reduced precision and accuracy in comparison to similar neural networks

222U1A0596
MOHAMMED YOUNUS

Digital Twins: Bridging Virtual and Physical Worlds

Digital Twins:

Digital twins are virtual models that replicate physical assets or systems. They arecreated using data from sensors, IoT devices, and other sources to mirror the real- world counterpart in a digital environment. This digital representation allows for continuous monitoring, analysis, and optimization, enhancing decision-making processes and operational efficiencies.

Usage of Digital Twins:

Digital twins are used because they create virtual copies of real-world objects or systems. These copies help in several ways:

Predicting Behavior: They simulate how things will work in different situations, helping us plan better.
Monitoring: They let us keep an eye on how things are doing in real-time, which is useful for maintenance and efficiency.
Improving Designs: By testing ideas digitally first, we can make better products faster.
Saving Costs: They help us find problems early and make things run smoother, which saves money in the long run. Overall, digital twins help industries work smarter and make things work better.

Working of Digital Twins:

A digital twin works by digitally replicating a physical asset in the virtual environment, including its functionality, features, and behavior. A real-time digital representation of the asset is created using smart ssensors that collect datafrom the product. You can use the representation across the lifecycle of an asset,from initial product testing to real-world operating and decommissioning.

Applications across industries:

Digital twins optimize manufacturing processes, improve urban infrastructuremanagement, personalize healthcare treatments, and enhance performance monitoring in aerospace and defense, showcasing their transformative impact across industries.

222U1A05A9
PANDITI RAMYA

UX DESIGN

WHAT IS MEANT BY UX DESIGN?

User experience (UX) refers to the user's journey when interacting with a product or service. UX design is the process of creating products or services that provide meaningful experiences for users, involving many different areas of product development including branding, usability, function, and design.

Skills Required for Becoming a UX Designer

User research: User research is the key responsibility of a UX designer. A UX designer has to prepare for the research, write the interview guidelines and scripts, and create documents that outline how research should be conducted step by step. A UX designer also then has to conduct the research therefore, interviewing people in-person or remotely is also the task of a UX designer. This makes user research a very important skill that companies look for.

Research analysis and presentation: For becoming a good UX designer, youmust be proficient at analysis and presenting data. This is because it is theresponsibility of a UX designer to take detailed notes of the research. there's alot of information that will be gathered so the role of UX developers is to analyzethe information, understand the trend, and organize data using tools to identify trends and patterns in that data. Then the UX designer has to create reports and presentations to present that complex information to other people in the team.

Collaborating with the stakeholders and analyzing the customer: Collaboration an empathy is another important skill for a UX designer. This is because the role of a UX developer is primarily a people-focused role. Therefore, UX designers work with lots of other teams – business stakeholders, developers and visual designers for conducting research, running workshops, analyzing data, running tests and experiments and doing a lot of communication with presentations and creating diagrams. A UX developer also acts like a connection between the users or the customers and the business.

Communication skills (Conducting workshops): In most of the companies, workshops are a responsibility for a UX designer where people from different areas of the business to come together and generate ideas and decide where thefocus should be. For this a UX designer is expected to have decent Communication skills.

Wireframing and Prototyping: As a UX designer, you are expected to be proficient at Wireframing and Prototyping. Wireframes are detailed structural sketches that illustrate a concept. A wireframe for a digital product is similar to a blueprint for a house. Wireframe clearly illustrates how the product functions and the core elements of its design.

222U1A0512
BATREDDY VISHNU KOUSHIK

222U1A05F0
SHAIK ISHAQ

222U1A0505
ATLURU RUCHITHA

POTHULURU PENCHALA GANESH

222U1A05C0

222U1A05H4
THALISETTY MOHANA LAKSHMI

222U1A0525
CHENTHATI SHARON ROJ

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

PO1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, andan 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 diverseteams, 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

PSO 1: Apply the expertise in adaptive algorithms to develop quality software applications.

PSO 2: Demonstrate the capabilities in basic and advanced technologies towards getting employed or tobecome an entrepreneur.