PRAGATI ENGINEERING COLLEGE (AUTONOMOUS)

Approved by ACITE,New Delhi & Permanently Affilicated to JNTUK,Kakinada
&Accredited By NAAC with 'A' Grade

SUTANTRA

- INFORMATION FOR ENLIGHTENING

DEPARTMENT OF INFORMATION TECHNOLOGY

About IT department

The Department of IT was established in the year 2001 to groom the students for the requirements of IT industry. The Department has emerged as a reputed center of learning in the coastal districts of Andhra Pradesh. Footprints of the department´s students can be found in most of the local and global software majors. Student of this department mainly, brought glory to the college by securing University Rank.

The department strives to empower the students, to achieve the demanding standards of IT industry, by bringing about a synergistic academic environment wherein cutting edge technologies, industry experts, faculty and students are engaged in a sustained interaction.

Vision of the College

To Emerge as a Premier Institution for Technical Education in the Country through Academic Excellence and to be Recognized as a Center for Excellence in Research & Development, catering to the needs of our Country.

Mission of the College

To realize a strong Institution by consistently maintaining State-of-art-infrastructure and building a cohesive, World Class Team and provide need based Technical Education, Research and Development through enhanced Industry Interaction.

Department Vision

To attain academic excellence in the field of Information Technology and research serving to the needs of the society through technological developments.

Department Mission

- To create stimulating learning ambiance by providing state-of-art infrastructure and to induce innovative and problem-solving capabilities to address societal challenges.
- To impart quality technical education with professional team to make the graduates globally competent to IT Enabled Services.
-To strengthen industry-academia relationship for enhancing research capabilities.

PEOs for B.Tech IT Programme

PEO1:

Students will have successful career in IT as researchers, entrepreneurs and IT professionals satisfying the needs of the society.

PEO2:

Students will exhibit inclination towards higher education and continuous learning process.

PEO3:

Students will practice ethical behavior in IT industry with effective soft skills essential to work in teams.

PSOs for B.Tech IT Programme

PSO1:

Develop software programs in various programming languages learnt to create the software applications to solve the real life problems of the society.

PSO2:

Excel in emerging software tools and technologies.

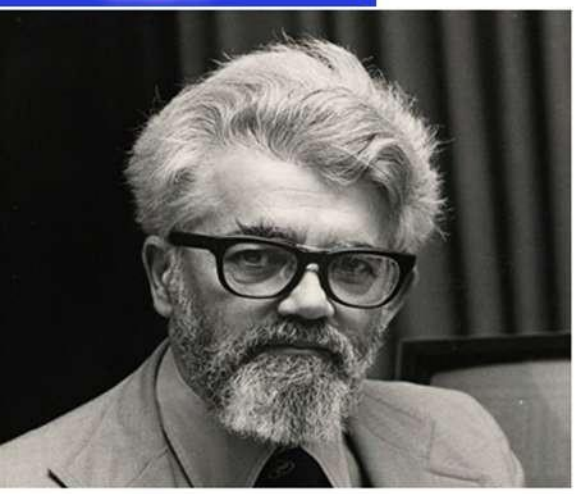
PSO3:

Effectively transform their ideas and bring consensus for the transformation of the idea into a usable software product / application.

Program Outcomes (POs)

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

John McCarthy



John McCarthy (September 4, 1927 – October 24, 2011) was an American computer scientist and cognitive scientist. McCarthy was one of the founders of the discipline of artificial intelligence He co-authored the document that coined the term "artificial intelligence" (AI), developed the Lisp programming language family, significantly influenced the design of the ALGOL programming language, popularized time-sharing, invented garbage collection, and was very influential in the early development of AI.

He received many accolades and honors, such as the 1971 Turing Award for his contributions to the topic of AI, the United States National Medal of Science, and the Kyoto Prize.

McCarthy often commented on world affairs on the Usenet forums. Some of his ideas can be found in his sustainability Web page, which is "aimed at showing that human material progress is desirable and sustainable". McCarthy was a serious book reader, an optimist, and a staunch supporter of free speech.

McCarthy saw the importance of mathematics and mathematics education. His Usenet .sig for years was, "He who refuses to do arithmetic is doomed to talk nonsense"; his license plate cover read, similarly, "Do the arithmetic or be doomed to talk nonsense."

His 2001 short story "The Robot and the Baby" farcically explored the question of whether robots should have (or simulate having) emotions, and anticipated aspects of Internet culture and social networking that have become increasingly prominent during ensuing decades.

Honors and awards of John McCarthy

1. Turing Award from the Association for Computing Machinery (1971).
2. Kyoto Prize (1988).
3. National Medal of Science (USA) in Mathematical, Statistical, and Computational Sciences (1990).
4. Inducted as a Fellow of the Computer History Museum "for his co-founding of the fields of Artificial Intelligence (AI) and timesharing systems, and for major contributions to mathematics and computer science". (1999)
5. Benjamin Franklin Medal in Computer and Cognitive Science from the Franklin Institute (2003).
6. Inducted into IEEE Intelligent Systems' AI's Hall of Fame (2011), for the "significant contributions to the field of AI and intelligent systems".
7. Named as one of the 2012 Stanford Engineering Heroes.

5G Technology

In today's world, sustainability has become an increasingly important topic as we strive to protect the environment and create a better future for generations to come. This magazine aims to inspire and educate readers on adopting eco-friendly habits and practices in their daily lives. From practical tips for reducing waste and conserving energy to highlighting innovative green technologies and showcasing sustainable initiatives, "Green Living" will serve as a comprehensive guide for individuals who wish to make a positive impact on the planet.

1. "Simple Steps Towards a Greener Home":
   Explore practical ways to make homes more eco-friendly, such as energy-efficient appliances, sustainable building materials, and eco-conscious interior design.

2. "The Rise of Renewable Energy":
   Dive into the advancements in solar, wind, and hydroelectric power, highlighting the benefits of renewable energy sources and their potential to reduce carbon emissions.

3. "Embracing a Zero-Waste Lifestyle":
   Provide tips on reducing waste, composting, recycling, and adopting sustainable alternatives to single-use plastics in everyday life.

4. "Sustainable Fashion: Dressing with a Conscience":
   Shed light on the importance of ethical and sustainable fashion, featuring eco-friendly clothing brands, upcycling, and second-hand fashion trends.

5. "Green Travel: Exploring Eco-Tourism and Sustainable Destinations":
Showcase destinations that prioritize eco-tourism, sustainable transportation options, and tips for responsible travel.

6. "Food for Thought:
   Nourishing Ourselves and the Planet": Highlight the benefits of organic farming, plant-based diets, and sustainable food choices, along with delicious and

sustainable recipes.

7. "Conservation Success Stories:
   Protecting Wildlife and Natural Habitats": Spotlight organizations and initiatives making a difference in wildlife conservation and habitat preservation.

8. "Building Sustainable Communities:
   Urban Planning for a Greener Future": Explore sustainable city designs, smart technologies, and community initiatives that promote eco-conscious living.

9. "Green Innovations: Breakthrough Technologies for Sustainability":
   Showcase innovative technologies addressing environmental challenges, such as clean energy solutions, waste management innovations, and sustainable transportation.

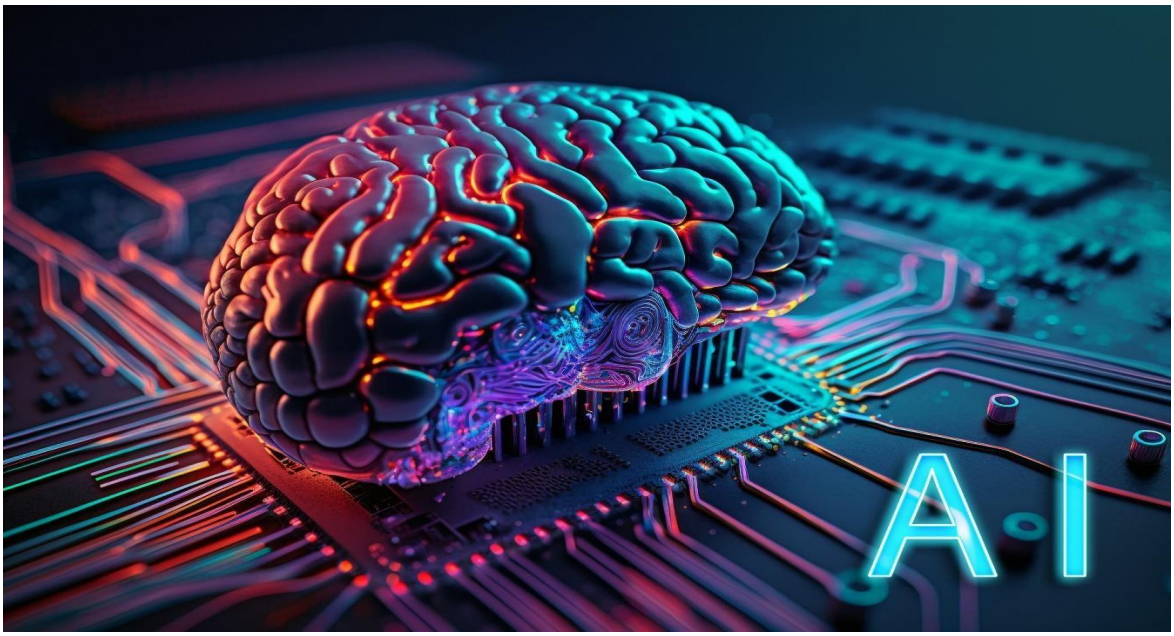
10. "Creating a Sustainable Future:
How Individuals and Businesses Can Make a Difference": Feature inspiring stories of individuals, businesses, and organizations leading the way in sustainability and offer practical advice for taking action.

QUANTUM COMPUTING

A quantum computer is a computer that exploits quantum mechanical phenomena. At small scales, physical matter exhibits properties of both particles and waves, and quantum computing leverages this behavior using specialized hardware. Classical physics cannot explain the operation of these quantum devices, and a scalable quantum computer could perform some calculations exponentially faster than any modern "classical" computer. In particular, a large-scale quantum computer could break widely used encryption schemes and aid physicists in performing physical simulations; however, the current state of the art is largely experimental and impractical.

The basic unit of information in quantum computing is the qubit, similar to the bit in traditional digital electronics. Unlike a classical bit, a qubit can exist in a superposition of its two "basis" states, which loosely means that it is in both states simultaneously. When measuring a qubit, the result is a probabilistic output of a classical bit. If a quantum computer manipulates the qubit in a particular way, wave interference effects can amplify the desired measurement results. The design of quantum algorithms involves creating procedures that allow a quantum computer to perform calculations efficiently and quickly. Physically engineering high-quality qubits has proven challenging. If a physical qubit is not sufficiently isolated from its environment, it suffers from quantum decoherence, introducing noise into calculations. National governments have invested heavily in experimental research that aims to develop scalable qubits with longer coherence times and lower error rates. Two of the most promising technologies are superconductors (which isolate an electrical current by eliminating electrical resistance) and ion traps (which confine a single atomic particle using electromagnetic fields).

Artificial intelligence (AI)



Artificial intelligence (AI) is intelligence—perceiving, synthesizing, and inferring information—demonstrated by machines, as opposed to intelligence displayed by humans or by other animals. Example tasks in which this is done include speech recognition, computer vision, translation between (natural) languages, as well as other mappings of inputs.

AI applications include advanced web search engines (e.g., Google Search), recommendation systems (used by YouTube, Amazon, and Netflix), understanding human speech (such as Siri and Alexa), self-driving cars (e.g., Waymo), generative or creative tools (ChatGPT and AI art), automated decision-making, and competing at the highest level in strategic game systems.

As machines become increasingly capable, tasks considered to require "intelligence" are often removed from the definition of AI, a phenomenon known as the AI effect.For instance, optical character recognition is frequently excluded from things considered to be AI, having become a routine technology.

Brain–Computer Interface: Bridging Minds and Machines

Introduction

A brain–computer interface (BCI), sometimes referred to as a brain–machine interface (BMI), represents a direct communication link between the brain's electrical activity and an external device, typically a computer or robotic limb. This technology has profound implications for research, cognitive and sensory-motor function augmentation, and medical assistance. BCIs bypass traditional body movements, raising the intriguing possibility of merging human brains with machines.

Types of BCIs

BCIs can be categorized based on the invasiveness of the technology. **Non-invasive BCIs** use techniques like electroencephalography (EEG), magnetoencephalography (MEG), and magnetic resonance imaging (MRI) to measure brain activity. **Partially invasive BCIs**, such as electrocorticography (ECoG) and endovascular methods, place electrodes closer to the brain surface. **Invasive BCIs** involve surgically implanting microelectrode arrays directly into the brain tissue, offering high accuracy at the cost of surgical risks and potential scar tissue development.

Historical Development

Research on BCIs began in the 1970s with Jacques Vidal at the University of California, Los Angeles (UCLA). Funded by the National Science Foundation and later by DARPA, Vidal's pioneering work introduced the term "brain–computer interface" into scientific literature. By the mid-1990s, after extensive animal experimentation, the first neuroprosthetic devices were implanted in humans, marking a significant milestone in BCI technology.

Animal Research

Animal studies have been pivotal in the development of BCIs. Several laboratories have successfully read signals from monkey and rat cerebral cortices to operate BCIs, enabling these animals to perform movements purely by thought. Notably, monkeys have moved computer cursors and controlled robotic arms, demonstrating the potential of BCI translating thought into action.

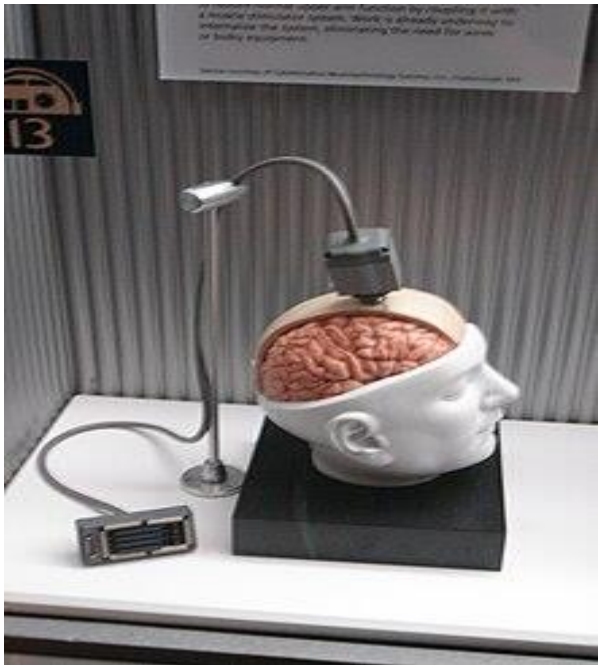
In 2008, images of a monkey at the University of Pittsburgh Medical Center operating a robotic arm through thought were widely published. Additionally, sheep have been used to evaluate BCI technologies, such as Synchron's Stentrode. In recent years, Elon Musk's Neuralink has gained attention for its successful implantation of devices in pigs and enabling a monkey to play video games using its technology.

Human Research

Invasive BCIs

Invasive BCIs, which require surgery to implant electrodes under the scalp, offer high accuracy by placing sensors close to brain tissue. These devices are particularly promising for restoring sight and motor functions in paralyzed individuals. However, the surgical risks and potential for scar tissue buildup, which can obstruct brain signals, remain significant challenges.

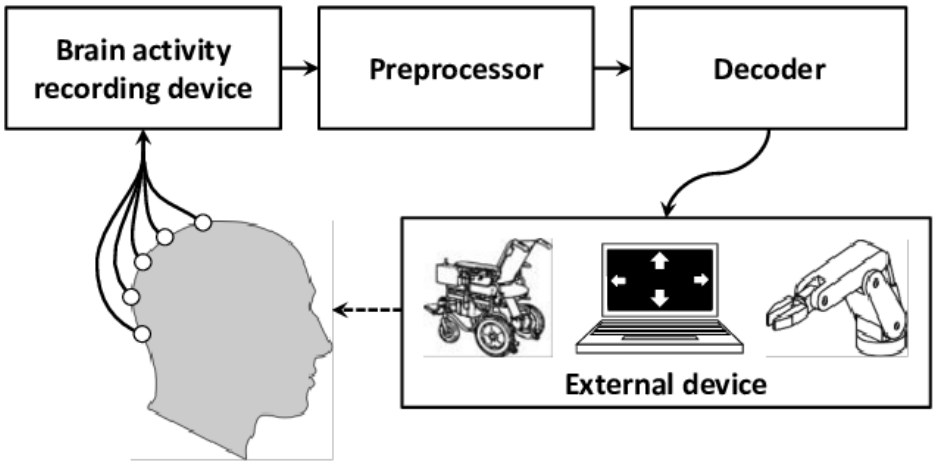
Vision and Movement



Invasive BCIs have targeted the restoration of vision and movement. These devices are implanted directly into the brain's grey matter, producing high-quality signals but also facing issues with scar tissue. The first human brain implant, conducted by Kennedy and Bakay, enabled a patient with 'locked-in syndrome' to control a computer cursor. Tetraplegic Matt Nagle became the first person to control an artificial hand using a BCI in 2005. Implanted with Cyberkinetics's BrainGate chip, Nagle could control a robotic arm, a computer cursor, lights, and a TV by thought alone. Following this, the BrainGate group and researchers at the University of Pittsburgh Medical Center demonstrated control of prosthetic limbs with multiple degrees of freedom using direct neural connections.

Communication

BCIs have also made significant strides in communication for paralyzed patients. In May 2021, a Stanford University team enabled a quadraplegic participant to produce English sentences at about 18 words per minute by imagining hand movements to write letters. Another 2021 study demonstrated that a paralyzed patient could communicate 15 words per minute using a brain implant analyzing vocal tract motor neurons. Recent advancements in 2023 saw BCIs using recurrent neural networks to decode speech at record rates of 62 and 78 words per minute, suggesting a promising future for BCI-facilitated communication.



First Successful Human Trial

The first human trials of BCI technology have been conducted, but the major difficulty has been the wires that limit its use. Recently, a team at Brown University conducted a full human trial of a high-bandwidth wireless neural interface. The progress made with the intracortical BCI device, which involves implanting electrodes in the brain and sending signals to a computer via wires, has shown numerous successful applications such as writing, moving paralyzed limbs, or controlling robotic prostheses. However, the limitation lies in the lack of mobility due to the wires connected to a computer.

The Brown University team developed a wireless BCI device capable of detecting neural signals for 24 hours in a patient's everyday life. This wireless system is functionally equivalent to the standard wired systems but allows for greater mobility. The system was designed to work with an interface called BrainGate, involving two electrodes implanted under the patient's skull. The transmitter, about two inches wide, connects to the same port as a wired system and transmits signals to antennas around the user's environment.

The first test involved two patients with spinal cord injuries, both able to move a cursor at home rather than in a research facility. One patient recorded up to 24 hours of neural activity, demonstrating the battery's 3-6 hour life. This wireless BCI is the first successful demonstration leading to the potential use of fully-implanted high-performance neural interfaces. Consequently, companies like Neuralink and Kernel may show great interest in this breakthrough, although challenges like the bulky transmitter and invasive procedures remain.

Future Directions

The future of BCI technology holds vast potential. A consortium of 12 European partners completed a roadmap to guide the European Commission's funding decisions for the Horizon 2020 framework program. This project, which began in 2013, reviewed BCIs and their applications, explored recent trends, discussed ethical issues, and evaluated future directions. Other recent publications have also explored BCI applications for new groups of disabled users.

Functional Brain Mapping

In 2014, approximately 400,000 people underwent brain mapping during neurosurgery, a procedure

necessary for patients who do not respond to medication. Electrodes placed on the brain during these procedures help identify precise locations of functional areas, allowing surgeons to remove diseased tissue while sparing critical regions. Researchers continue to improve neurosurgical mapping techniques, focusing on detecting high gamma activity, which is challenging to measure non-invasively. These advancements enhance the precision of neurosurgical interventions, minimizing the risk of permanent damage while maximizing treatment efficacy.

Conclusions

The development of neural interfaces represents a significant improvement in the daily lives of many patients. Major companies like Facebook and Neuralink are investing heavily to turn this technology into common consumer use. The market is expected to grow significantly, potentially reaching $15 billion by 2024. Neuralink, co-founded by Elon Musk, aims to achieve major advances in technology for everyday use, including Deep Brain Stimulation (DBS) and BCI technology, though its tests are still experimental. Facebook supports researchers at the University of California in developing powerful algorithms for interpreting neural signals related to speech and listening. Brown University succeeded in the first human trials of wireless BCI devices. Despite current challenges such as complex configurations and invasive procedures, great advancements and improvements are anticipated in the near future.