Fabtech College of Engineering & Research
An Autonomous Institute

Quarterly Scientific News Bulletin "Fabtech SciConnect"

3rd ISSUE -Aug 2026

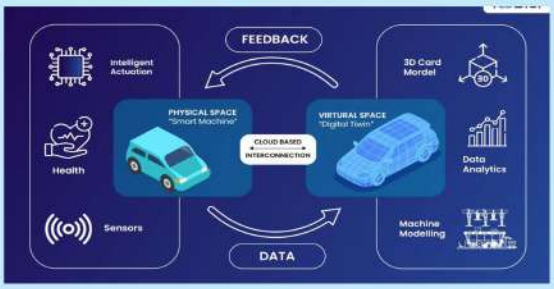
Message from the Campus Director

It gives me great pleasure to present the 3rd issue of FabTech SciConnect, released during the 80th Independence Day. India has made remarkable progress in science, technology, education, healthcare, space exploration, digital transformation, and sustainable development. Initiatives such as Digital India, Startup India, Make in India, and the vision of Viksit Bharat 2047 continue to inspire young minds to contribute towards national development through innovation, research, and entrepreneurship. The 2026 Independence Day celebrations emphasize the vision of "Naya Bharat", encouraging every citizen to participate in building a developed and inclusive nation. Educational institutions play a vital role in shaping responsible citizens.

Editorial

I Dr. Vidyarani Kshirsagar editor of this bulletin glad to present before you that the first edition of Fabtech SciConnect on 79th Independence Day. The quarterly news bulletin ' Fabtech SciConnect ' strives to spread the updates in the field of Science and Technology to the readers. The highlights of activities at institute and department levels have been presented. I hope the readers will get some quality content related to various disciplines of Engineering and Technology.
Thank you.

Digital Twins in Engineering: Smarter Technology for the Future



Digital Twin technology is becoming one of the most exciting innovations in engineering. In July 2026, researchers Nuocheng Yang, Sihua Wang, Zihan Chen, Tony Q. S. Quek, and Changchuan Yin presented a new AI-powered Digital Twin framework. Their research focuses on making smart engineering systems more efficient by improving communication, reducing delays, and supporting faster decision-making. This development is expected to benefit smart factories, industrial automation, and future engineering applications.

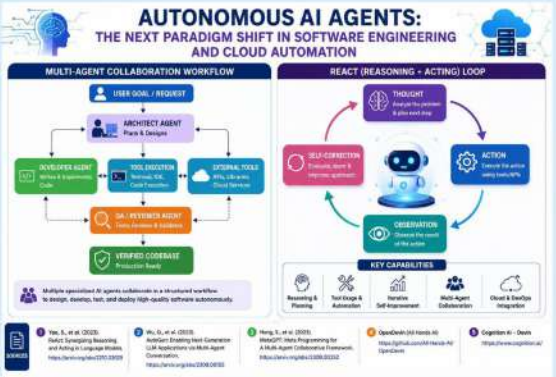
Index

A Digital Twin is a virtual copy of a real machine, product, or system. It collects real-time data from sensors and shows how the actual system is performing. Engineers can use this digital model to test ideas, identify faults, and improve designs before making changes to the real machine. This saves time, reduces costs, and increases safety. The new AI-powered Digital Twin uses Artificial Intelligence (AI) to analyze large amounts Of data and predict possible problems before they occur. This helps engineers plan maintenance, reduce machine breakdowns, and improve productivity. Digital Twin technology is already being used in mechanical, civil, electrical, automobile, aerospace, and manufacturing engineering. For engineering students, Digital Twin technology offers excellent learning opportunities.Students can learn simulation, 3D modelling, AI, the Internet of Things (IoT), cloud computing, and data analysis through online courses, virtual laboratories, mini projects, internships, and workshops. They can also explore software such as Siemens NX, MATLAB,ANSYS, and Unity to understand how Digital Twins are used in real engineering applications.As industries move towards Industry 4.0, Digital Twin technology will become an important engineering skill. Learning this technology today will help students build successful careers and contribute to the development of smarter and more sustainable engineering solutions.

Sources: July 2026 AI-powered Digital Twin research (arXiv) • Researchers: Nuocheng Yang, Sihua Wang, Zihan Chen, Tony Q. S. Quek, and Changchuan Yin • Siemens – Digital Twin applications

- Contributed by: Mr. Sandeep P. Kale Assistant Professor
Basic Science and Humanities.

"Fabtech SciConnect" is Co-ordinated by Prof. Chaitrali A. Naikude



Title: Autonomous AI Agents: The Next Paradigm Shift in Software Engineering and Cloud Automation

Autonomous Artificial Intelligence (AI) agents are revolutionizing software engineering by moving beyond traditional Large Language Models (LLMs) that only generate text or code. Unlike conventional AI chatbots, autonomous agents can reason, plan, execute tasks, utilize external tools, and continuously improve their outputs with minimal human intervention.They are capable of writing and debugging code, executing terminal commands, interacting with cloud services, integrating APIs, and automating complex software development workflows. One of the key innovations enabling this transformation is ReAct (Reasoning and Acting) framework, which combines logical reasoning with real-world actions. Instead of producing a single response, autonomous agents repeatedly think, act, observe outcomes, and refine their approach until the objective is achieved. This iterative capability significantly enhances reliability, productivity, and automation.Modern multi-agent frameworks such as AutoGen, MetaGPT, OpenDevin, and Devin demonstrate how specialized AI agents can collaborate as software architects, developers, testers, reviewers, and DevOps engineers. Together, they can design applications, generate code, perform automated testing, deploy cloud infrastructure, and manage Continuous Integration/Continuous Deployment (CI/CD) pipelines. These technologies are already reducing development time while improving software quality.Although challenges such as security, contextual memory, transparency, and ethical governance remain, autonomous AI agents are rapidly transforming the future of software engineering. Rather than replacing human engineers, they will serve as intelligent collaborators, allowing professionals to focus on innovation, system architecture, strategic decision-making, and responsible AI oversight. As AI technology continues to evolve, autonomous agents are expected to become an integral part of next-generation software development and cloud automation.

Source 1. Yao, S., et al. (2023). ReAct: Synergizing Reasoning and Acting in Language Models. https://arxiv.org/abs/2210.03629

2. Wu, Q., et al. (2023). AutoGen: Enabling Next-Generation LLM Applications via Multi-Agent Conversation. https://arxiv.org/abs/2308.08155

3.Hong, S., et al. (2023). MetaGPT: Meta Programming for A Multi-Agent Collaborative Framework. https://arxiv.org/abs/2308.00352

-Contributed by : Prof. Chaitrali A. Naikude Dept. of Computer Science and Engineering

Title :Renewable energy saves day in energy crises

As global energy markets continue to face uncertainty, renewable energy is emerging as a dependable solution for countries struggling with fuel shortages and rising electricity costs. Governments around the world are increasing investments in solar, wind, hydroelectric, and other clean energy sources to strengthen energy security and reduce dependence on imported fossil fuels. Experts say renewable energy has played a crucial role in keeping electricity supplies stable during recent energy disruptions. Unlike coal, oil, and natural gas, renewable resources rely on naturally available sources such as sunlight, wind and water making them less vulnerable to international supply chain issues and price fluctuations. Many countries have expanded solar farms, offshore wind projects, and battery storage systems to ensure a more reliable power supply. In addition, households and businesses are installing rooftop solar panels, enabling them to generate their own electricity and reduce pressure on national power grids during peak demand. Environmental groups have also welcomed the shift toward renewable energy, noting that it helps lower greenhouse gas emissions while supporting efforts to combat climate change. The transition is creating new employment opportunities in manufacturing, construction, installation, and maintenance of clean energy systems. However, experts caution that challenges remain. Expanding renewable energy requires significant investment in modern power grids, energy storage, and transmission infrastructure to ensure consistent electricity supply, especially when weather conditions affect solar and wind generation. Despite these hurdles, analysts believe the growing adoption of renewable energy marks a major step toward a more resilient and sustainable future. As nations continue to diversify their energy sources, renewable power is expected to play an increasingly important role in protecting economies from future energy crises while ensuring cleaner and more affordable electricity for millions of people.

Source:- 1. International Energy Agency (IEA). (2024). Renewables. https://www.iea.org/energysystem/renewables.

2.International Renewable Energy Agency (IRENA). (2026). International Renewable Energy Agency. https://www.iea.org/energy-system/renewables

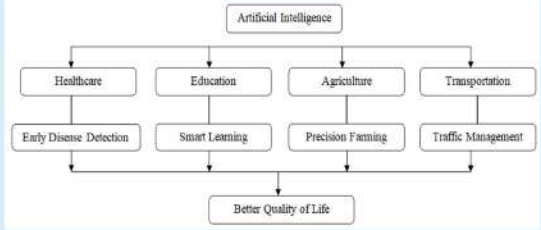
3. United Nations. (2024). Climate Action – Renewable Energy. https://www.un.org/en/climatechange.

4. World Bank. (2024). Energy Overview. https://www.worldbank.org/en/topic/energy

- Contributed by: Prof. Rupali T. Bansode, Department of Electrical Engg.

Title :Artificial Intelligence for Society: Transforming Lives for a Better Future

Introduction: AI (Artificial Intelligence) is changing the manner in which people are living, working, learning, and accessing important services. With the help of AI, it becomes possible for machines to learn from data and make intelligent decisions which have helped in solving real-life problems in areas such as health care, education, agriculture, transportation, disaster management, and public services. The increasing use of AI is making it one of the most revolutionary technologies of the 21st century.



Applications of AI in Health Care Sector: In the health care sector, AI is helping doctors diagnose various diseases like cancer and heart diseases from medical images, facilitates early diagnoses, and also helps in managing patient care in hospitals. AI is also important in agriculture where it analyzes the quality of soils, helps in forecasting weather and advises on appropriate irrigation and fertilization schedule. This is meant to ensure that the farmers get increased yields of crops without using too much water or making production expenses. AI also improves traffic management and safety in transport as well as develops autonomous cars. In addition to the above sectors, artificial intelligence also assists in forecasting natural disasters, monitoring the environment, detecting frauds, smart cities and good governance. It does so through chatbots and virtual assistants that provide quick and necessary information to citizens.

Sources • Russell, S., & Norvig, P., Artificial Intelligence: A Modern Approach, 4th ed., Pearson, 2021. • World Health Organization (WHO), Ethics and Governance of Artificial Intelligence for Health, 2021. • UNESCO, Recommendation on the Ethics of Artificial Intelligence, 2021. • K. G. Liakos et al., "Machine Learning in Agriculture: A Review," Sensors, vol. 18, no. 8, 2018.

-Contributed by: Mr. Vinayak Macchindra Sale Department: Artificial Intelligence & Data Science

Title : AI-Powered 6G Networks Set to Transform Future Telecommunications

Researchers and leading telecommunications companies are accelerating the development of 6G wireless communication technology, which is anticipated to be commercially available by the early 2030s. Unlike 5G, 6G aims to deliver data transmission speeds of up to 1 terabit per second (Tbps), ultra-low latency below 0.1 milliseconds, and seamless connectivity for billions of smart devices, marking a substantial leap in wireless capabilities. One of the most significant innovations in 6G is the integration of Artificial Intelligence (AI) directly into the communication network. AI-enabled networks can automatically optimize bandwidth, predict network congestion, detect faults, and improve energy efficiency without human intervention. This breakthrough aims to inspire researchers and industry professionals by showcasing the transformative potential of AI in future networks.Another major advancement is the use of the Terahertz (THz) frequency bands, which offer significantly greater bandwidth than 5G's millimeter-wave frequencies. These frequencies will enable applications such as holographic communication, immersive AR/VR, autonomous vehicles, remote robotic surgery, and advanced industrial automation, expanding the possibilities of wireless technology.Researchers are also exploring Reconfigurable Intelligent Surfaces (RIS), which use programmable electromagnetic surfaces to reflect and direct wireless signals efficiently. RIS technology can improve signal strength, reduce power consumption, and enhance coverage in densely populated urban areas.For Electronics and telecommunications engineers, these advancements create exciting opportunities in wireless communication, semiconductor design, antenna engineering, embedded systems, Aldriven networking, and cybersecurity. As global research on 6G continues, engineers will play a vital role in designing intelligent communication systems that support future smart cities, healthcare, education, and Industry 5.0 applications, empowering them to lead innovation.
Source:International Telecommunication Union (ITU), IEEE Communications Society, Nokia 6G Research Reports

-Contributed by: Mrs. Jyoti Shinde, Assistant Professor, Department of Basic Sciences and Humanities,

Title :Recent Trends in Cryptography: The Rise of Post-Quantum Security

Cryptography is undergoing a major transformation due to rapid advancements in quantumcomputing and artificial intelligence. Traditional public-key cryptographic algorithms such asRSA and Elliptic Curve Cryptography (ECC), which currently secure online banking, ecommerce, digital signatures, and government communications, may become vulnerable oncelarge-scale quantum computers are available. As a result, Post-Quantum Cryptography (PQC)has become one of the most significant recent trends in cybersecurity. To address this challenge, the National Institute of Standards and Technology (NIST) has standardized several quantum-resistant algorithms, including ML-KEM (formerly CRYSTALS-Kyber) for secure key exchange and ML-DSA (formerly CRYSTALS-Dilithium) for digital signatures. Highlighting NIST leadership can make the audience feel confident and included in the ongoing efforts to secure digital infrastructure. Furthermore, industries such as finance, healthcare, cloud computing, blockchain, and 6G communication networks are actively evaluating the performance and deployment of PQC to safeguard sensitive information. Highlighting these efforts can make the audience feel part of a proactive movement toward a secure digital future. As cyber threats continue to evolve, post-quantum cryptography is expected to become the foundation of next-generation secure communication within the next few years.

Source: National Institute of Standards and Technology (NIST), Post-Quantum Cryptography (PQC) Project, and What Is Post-Quantum Cryptography?

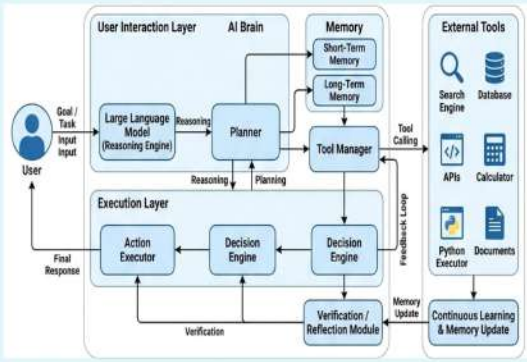
-Contributed by: Dr S M Shinde, Assistant Professor, Artificial Intelligence and Data Science Department,

Transforming Smartphones into Learning, GATE, Placement and Earning Platforms

martphones are no longer merely devices for communication and entertainment; they have become essential tools for learning, skill development, and career growth. With purposeful use and proper guidance, a mobile phone can serve as a personal classroom, laboratory, examination-preparation centre, career mentor, and source of income. The "Mobile-to-Career: Learn–Practice–Perform–Earn" concept encourages students to transform everyday smartphone usage into productive, career-oriented activities.Students can access digital textbooks, recorded lectures, NPTEL and SWAYAM courses, coding platforms, technical tutorials, and previous-year question papers anytime and anywhere. AI-powered learning tools can personalize study plans and help students identify areas requiring improvement. For GATE preparation, mobile applications provide subject-wise resources, practice questions, mock tests, revision materials, and performance analytics.Smartphones also support placement preparation through aptitude tests, coding challenges, communication-skill activities, technical interview questions, mock interviews, resume-building tools, and professional certifications.

-Contributed by: Dr. Somnath Thigale, Dean – R&D | Professor & HoD – AI & DS

Agentic AI: The Next Generation of Artificial Intelligence



From intelligent assistants to autonomous problem-solvers shaping the future of computing Artificial Intelligence is entering a new era where systems are no longer limited to generating content—they can understand goals, make decisions, and carry out complex tasks with minimal human guidance. This shift has given rise to Agentic AI, one of the most significant advances in modern AI, with the potential to reshape the way people work, learn, and solve real-world problems. Agentic AI refers to AI systems that can independently understand objectives, create plans, reason through challenges, use external tools, execute actions, and improve their performance from feedback. Unlike traditional Generative AI, which mainly responds to prompts by producing text, images, or code, Agentic AI actively works toward achieving a defined goal. It behaves more like an intelligent collaborator than a conventional AI assistant. An AI agent begins by interpreting the user's goal, then develops an execution plan and breaks it into manageable tasks. It retrieves relevant information, reasons through available options, selects appropriate tools, makes decisions, performs the required actions, and evaluates the outcome before refining its approach based on feedback. This capability is powered by technologies such as Large Language Models (LLMs), Retrieval-Augmented Generation (RAG), tool calling, memory, multi-agent systems, and autonomous planning.

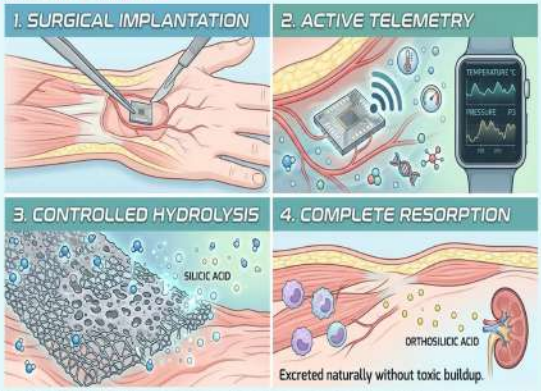
Source:1. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, 4th ed. Hoboken, NJ, USA: Pearson, 2021.

Link: Pearson – Artificial Intelligence: A Modern Approach (4th Edition)

2. L. Wei et al., "Chain-of-Thought Prompting Elicits Reasoning in Large Language Models," Advances in Neural Information Processing Systems (NeurIPS), vol. 35, 2022.Link: NeurIPS Paper – Chain-of-Thought Prompting Elicits Reasoning in Large Language Models

-Contributed by: Sumant Mahesh Khatave, Class :- B.tech (CSE) Div :- A , Roll no. 06

Silicon In Bio: The Era of Dissolving Microchips

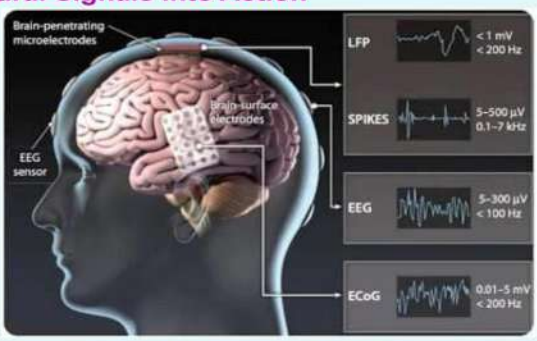


For decades, biomedical devices were engineered under a single golden rule: permanent durability. Implantable devices like pacemakers and intracranial sensors relied on heavy titanium shells to withstand bodily fluids indefinitely. However, for post-operative monitoring or temporary therapeutic treatments, permanent implants carry significant risks, requiring high-risk removal surgeries and increasing the likelihood of chronic infection. A major revolution in biomaterials is now turning this paradigm upside down through Transient Electronics— high performance microchips designed to perform critical physiological tasks and then harmlessly dissolve directly inside the human body. At the core of this breakthrough are ultra-thin monocrystalline silicon nanomembranes. While standard silicon wafers remain solid in water for years, reducing silicon to a thickness of under 300 nanometers triggers a controlled chemical reaction known as hydrolysis when exposed to bio-fluids.The device gradually breaks down into orthosilicic acid (\text{Si(OH)}_4), a non-toxic compound naturally present in human tissue that is safely excreted through renal filtration. By pairing these silicon membranes with bioresorbable magnesium wiring and natural silk or PLGA polymer substrates, engineers can precisely tune an implant's lifespan from a few days to several weeks. In clinical settings, transient sensors are transforming neurosurgery and cardiology. Patients recovering from traumatic brain injuries can have wireless pressure and temperature sensors implanted directly into cortical tissue.

Source- Kang, S. K., et al. (2016). Bioresorbable silicon electronic sensors for the brain. Nature, 530(7588), 71–76. Hwang, S. W., et al. (2012). A physically transient form of silicon electronics. Science, 337(6102), 1640–1644. Choi, Y. S., et al. (2021). Fully implantable, programmable, bioresorbable cardiac pacemakers. Nature Biotechnology, 39(10), 1228–1238.

-Contributed by: Pratibha Vishnupant Dhage, Class :- B.tech (CSE) Div :- B , Roll no. 09

DECODING THOUGHT:Beyond the Screen: How Brain-Computer Interfaces Are Turning Neural Signals into Action



Imagine typing an email, operating a motor vehicle, or controlling a prosthetic limb without moving a single muscle—simply by intending the action. What was long restricted to science fiction has now firmly crossed into clinical and engineering reality. At any given moment, the human brain contains approximately 86 billion neurons communicating through micro-electrical impulses. When an individual intends to move or speak, specific neuronal clusters fire in structured spatial and temporal patterns across the motor cortex. High-density Brain-Computer Interfaces (BCIs) record these subtle voltage fluctuations using a spectrum of modalities, ranging from non-invasive surface Electroencephalography (EEG) and semi-invasive Electrocorticography (ECoG) to invasive, brain-penetrating microelectrodes.While non-invasive EEG captures broader Local Field Potentials (LFP) under 100 Hz, intra cortical microelectrodes pinpoint individual neural spikes (5–500 µV at 0.1–7 kHz) directly at the cellular level.

Source- Willett, F. R., et al. (2023). A high-performance neuroprosthesis for speech decoding. Nature, 620(7976), 1031–1036. Metzger, S. L., et al. (2023). A high-performance neuroprosthesis for speech decoding and avatar control. Nature, 620(7976), 1037–1043. Musk, E., & Neuralink. (2021). An Integrated Brain-Machine Interface Platform With HighBandwidth Kapton Microelectrodes. Journal of Medical InternetResearch, 21(10).

-Contributed by: Prathamesh Milind Potdar, Class :- B.tech (CSE) Div :- B , Roll no. 22