SIPNA SHIKSHAN PRASARAK MANDAL'S
SIPNA COLLEGE OF ENGINEERING AND TECHNOLOGY, AMRAVATI
ESTD-1999
An Autonomous Institute
(Affiliated to Sant Gadge Baba Amravati University)
Accredited by NAAC with grade A+ | Accredited by NBA |Accredited by IAO

TECHNOCRAT

The Newsletter

Department of Information Technology

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or

Inside This Issue

Editor

Ms. P. S. Sherekar

Asst. Professor
Information Technology

or

About Department

Department of Information Technology

Information Technology plays a pivotal role as the backbone of the digital era, shaping and influencing nearly every aspect of human life. With the advent of computers, the business world has undergone a transformational shift, impacting organizations from multinational corporations to small enterprises.

The Department of Information Technology is dedicated to nurturing talented engineers with strong technical and practical knowledge. The department offers a student-centric learning environment with advanced laboratories and experienced faculty.

Students are trained in modern technologies such as Artificial Intelligence, Data Science, Cybersecurity, and Cloud Computing. Regular workshops, seminars, and technical events enhance practical exposure and innovation.

With excellent placement support and industry interaction, the department ensures students are well-prepared for successful careers in the IT sector.

Shaping Skilled Engineers for a Digital Future!

The Department of Information Technology admits 120 students annually to its undergraduate (B.E./ BTech) program and 18 students to its full-time postgraduate (M.E./ MTech) program. In addition, the department houses an approved research laboratory for Ph.D. studies. Notably, it is the only IT branch in the Vidarbha region accredited Three times by the NBA (National Board of Accreditation).

The department is equipped with state-of-the-art laboratories and advanced computing facilities, supported by three internet lines with a total bandwidth of 620 Mbps and campus-wide Wi-Fi connectivity.

DEPARTMENT OF INFORMATION TECHNOLOGY

Prof. Dr. V. S. Gulhane

H.O.D

Email :

hodit@sipnaengg.ac.in

Vision of the Department

- To be a recognized leader in quality education, research and development in Information Technology by adapting to the rapid technological advancement.

Mission of the Department

- To Provide learning ambience to impart quality technical education for students to develop into globally competent technology professionals.
- To Prepare the students with strong fundamental concepts, analytical capability and problem-solving skills.
- To become centre of excellence by providing conducive teaching & research environment thet responds swiftly to the challenges of ever changing world.
- To prepare graduates to be industry ready with ethical values and spirit of social commitment.

Program Educational Objectives

Engineering Graduates will be able to:

- **PEO1**: Analyze and develop effective solutions for real-world challenges by leveraging critical thinking, problem-solving skills, and innovative approaches while fostering a scholarly and research-oriented mindset.
- **PEO2**: Develop and implement cutting-edge solutions using contemporary technologies to meet industrial, societal, and environmental needs, promoting professional excellence.
- **PEO3**: Pursue higher education, research, entrepreneurship, and continuous professional development, ensuring lifelong learning and adaptability to evolving technologies.
- **PEO4**: Exhibit leadership, teamwork, effective communication, and ethical professionalism while contributing to industry and society through responsible engineering practices

Programme Outcomes

Engineering Graduates will be able to:

- **PO1**: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentalsandanengineering specialization as specified in WK1 to WK4 respectively to develop tothesolutionofcomplex engineering problems

- **PO2**: Problem analysis: Identify, formulate, review research literature and analyze complex engineeringproblemsreaching substantiated conclusions with consideration for sustainable development. (WK1toWK4).

- **PO3**: Design/development of solutions: Design creative solutions for complex engineering problems and design/developsystems/components/processes to meet identified needs with considerationfor thepublichealth and safety, whole-life cost, net zero carbon, culture, society and environmentasrequired. (WK5).

- **PO4**: Conduct investigations of complex problems: Conduct investigations of complex engineering problems using research-basedknowledgeincluding design of experiments, modelling, analysis & interpretation of data toprovidevalidconclusions. (WK8).

- **PO5**: Modern tool usage: Create, select and apply appropriate techniques, resources and modern engineering&ITtools,including prediction and modelling recognizing their limitations to solve complexengineeringproblems. (WK2 and WK6).

- **PO6**: The engineer and World: Analyze and evaluate societal and environmental aspects while solving complexengineeringproblems for its impact on sustainability with reference to economy, health, safety, legalframework, culture and environment. (WK1, WK5, and WK7).

- **PO7**: Ethics: Apply ethical principles and commit to professional ethics, human values, diversityandinclusion; adhere to national & international laws. (WK9).

- **PO8**: Individual and Collaborative Teamwork: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

- **PO9**: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

- **PO10**: Project management and finance: Apply knowledge and understanding of engineering management principles andeconomicdecision-making and apply these to one's own work, as a member and leader inateam, andtomanage projects and in multidisciplinary environments.

- **PO11**: Life-long learning: Recognize the need for, and have the preparation and ability for i) independent andlife-longlearning ii) adaptability to new and emerging technologies and iii) critical thinkinginthebroadest context of technological change.

Program Specific Outcomes (PSOs)

Engineering Graduates will be able to:

- **PSO.1**: Understand and apply fundamental concepts of Mathematics, Algorithms and Programming to solve real world problems.

- **PSO.2**: Design and develop multidisciplinary software solutions using broad range of programming languages, open source tools and cutting edge technologies relevant to the IT industry.

- **PSO.3**: Analyze and carry out research in the specialized/emerging areas to meet identified needs within economic, environmental and social constraints.

- **PSO.4**: Exhibit awareness towards Professional Ethics, environmental aspects, social issues and readiness for lifelong learning.

Augmenting Design Thinking with Human–Computer Interaction (HCI)

Design Thinking (DT) fosters human-centered innovation through empathy, ideation, prototyping and testing. Human–Computer Interaction (HCI) contributes rigorous methods for interaction design, usability evaluation, and accessibility. This paper presents an IEEE-style short report on integrating HCI into the Design Thinking lifecycle to improve evidence-based ideation, prototype fidelity, and evaluation. We summarize practical integration patterns, show two illustrative diagrams, and give recent (2022–2025) references useful for publication and further reading.

Index Terms — Design Thinking, Human–Computer Interaction, Usability, Prototyping, User Experience, Evaluation

I. Introduction

Design Thinking (DT) is an iterative, human-centered approach commonly summarized by the stages: Empathize, Define, Ideate, Prototype, Test. While DT emphasizes opportunity framing and creative solution generation, it benefits from HCI's systematic approaches to user research, interaction modeling, and quantitative usability measurement. This paper argues for an augmented workflow in which HCI methods are embedded into DT stages to produce more usable, accessible, and testable digital systems. Key contemporary drivers include generative AI tools for ideation, UX analytics for early KPI detection, and robust usability metrics for validation.

II. Why augment DT with HCI

Depth of user insight. HCI brings structured field methods (contextual inquiry, task analysis, cognitive walkthroughs) that make empathy data measurable and transferable.

Interaction-level problem framing. Mental models, user journeys and use-cases translate needs into interaction requirements, reducing ambiguous problem statements.

Evidence-based prototyping & testing. HCI supplies low→high fidelity prototyping practices and validated metrics (e.g., SUS, task time, error rates) to judge design choices quantitatively.

III. Integration model — practical pattern

Figure 1 visualizes a compact integration model: at each DT stage HCI methods are injected as concrete activities (research methods, artifacts, evaluation metrics). The model emphasizes iterative loops where testing outputs feed back into empathy and ideation.

Practical mapping (examples):

Empathize → contextual inquiry, personas, task analysis.

Define → user journeys, interaction scenarios, mental model mapping.

Ideate → pattern libraries, accessibility heuristics, AI-assisted concept generation.

Prototype → paper prototypes → interactive wireframes → coded mockups; enable A/B test readiness.

Test → moderated usability tests, SUS, eye-tracking or analytics KPIs; feed quantitative results back into iteration.

IV. Prototyping & Evaluation Loop

A focused prototyping loop used in practice by teams wanting fast validation: build → moderate test (task metrics + observations) → analyze (SUS + error/time) → refine. Early UX KPI prediction and automated UX analytics can accelerate iteration and help triage design changes before development.

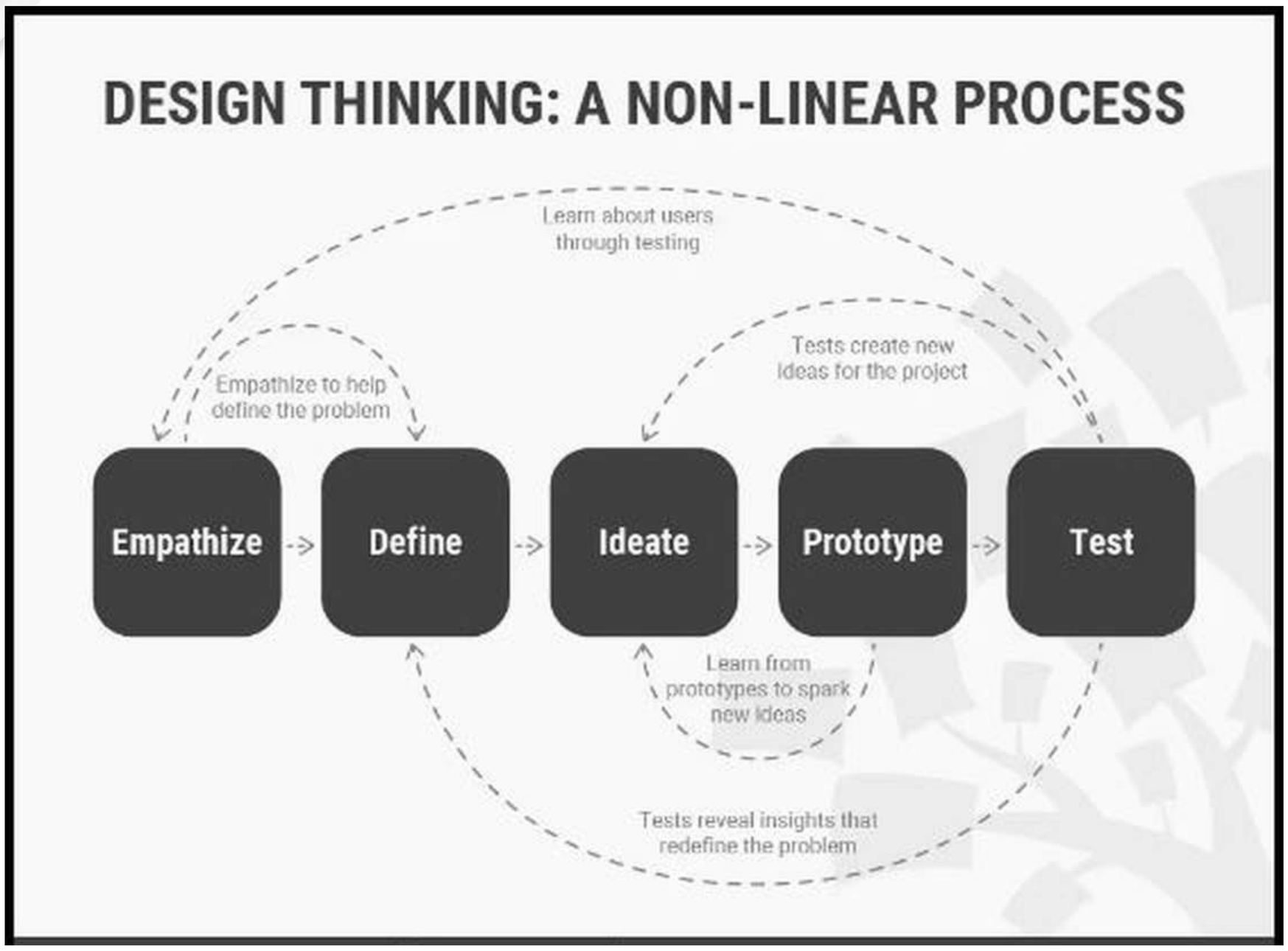


Fig. 1. Augmented Design Thinking — HCI methods injected at each stage (Empathize → Define → Ideate → Prototype → Test). Caption: HCI provides structured research and evaluation activities that make DT outcomes measurable and actionable.

V. Selected Methods & Metrics (practical checklist)

User research: Contextual inquiry, diary studies, remote ethnography.
Interaction artifacts: Personas, journeys, mental models, use cases.
Prototypes: Paper, clickable wireframes, high-fidelity interactive mockups; support A/B testing.
Usability metrics: System Usability Scale (SUS), task completion, mean time on task, error rates, eye-tracking heatmaps when needed. SUS benchmarking for domain-specific apps (e.g., health) shown robust in recent studies.
UX prediction/KPIs: ML-assisted UX KPI detection and early prototype scoring to reduce designer workload and surface risky flows earlier.

VI. Challenges & Mitigations

Resource limits: Usability labs and eye-tracking can be costly. Mitigation: adopt remote moderated tests and lightweight analytics.
Interdisciplinary gaps: Designers, engineers and researchers must align on artifacts and terminologies. Mitigation: create shared artifact templates (journeys, metrics dashboards).
Ethical/AI concerns: When using generative AI for ideation, ensure human oversight, bias checks and explainability.

VII. Conclusion & Recommendations

Augmenting Design Thinking with HCI yields a pragmatic blend: DT supplies creative generative structure; HCI supplies rigorous methods for interaction design and measurable evaluation. Recent work (2022–2025) shows active interest in combining DT, HCI and AI — a promising direction for future studies and empirical evaluations.

Resource : Research Paper - Design Thinking and AI: Systematic Review by A. Sreenivasan (2024)

Seminars and Workshops taken under Student Activity

The I.T. Department, through its Students' Activity Cell, successfully organized several impactful activities, focusing on students' academic excellence, technical skills, and overall personality development. Some of these are:

Seminar on "Robotics and AI " organized on 30th July 2025 by Mr. Rajat Tajne and Mr. Nupendra Waghmare

Seminar on "Careers and Innovations " organized on 5th August 2025 by Mr. Nilesh Deshmukh, President of Industry Academia Consortium

Seminar on "मनाचाकट्टा - Explore the Multiverse of Mind" organized on 13th August 2025 by Dr. Vikram Wankhade, Antarman Mind Care Center, Amravati.

Seminars and Workshops taken under Student Activity

The I.T. Department, through its Students' Activity Cell, successfully organized several impactful activities, focusing on students' academic excellence, technical skills, and overall personality development. Some of these are:

Seminar on"Roadmap of Data Analytics" organized on 28th August 2025 by Ms. Ruchita Rathi, Corporate and Academic Trainer, Pune. (Alumina of Sipna C.O.E.T;Amravati.)

Motivational Talk on the occasion of Engineer's Day organized on 15 Sept. 2025 by Mr. Rahul Chute

Coding Competition organized on 26th Sept. 2025 by Department of Information Technology

Seminars and Workshops taken under Student Activity

The I.T. Department, through its Students' Activity Cell, successfully organized several impactful activities, focusing on students' academic excellence, technical skills, and overall personality development. Some of these are:

Session on "From Engineer to Entrepreneur" organized on 8 Nov. 2025 by Mr. Jigar Raichada, Founder at Rankvana

Session on "WHY GATE?" organized on 22 Dec. 2025 by Dr. Dinesh Rojatkar, Associate Professor, Govt. College of Engineering, Amravati.

Seminars and Workshops taken under Student Activity

The I.T. Department, through its Students' Activity Cell, successfully organized several impactful activities, focusing on students' academic excellence, technical skills, and overall personality development. Some of these are:

Seminar on "Collaborative Student–Faculty Engagement: Ethics, Values and Career Pathways" organized on 23 Dec. 2025 by Mr. Tanuj Rohankar, Nihilent Technology, Pune.

"Codorithm -2K26: A National-Level Coding Competition" organized on 16 March 2026 by Prof. Sakshi S.Deshmukh, Prof. Divya D. Gorde, and Prof. Nikhil E. Karale

Staff Achievement

Congratulations

Dr. L. K. Gautam

Registered as a Ph.D. supervisor at SGBAU, Amravati, in the Computer Science & Engineering and Information Technology disciplines.

Dr. R. L. Pardhi

Awarded Ph.D. by SGBAU, Amravati in Information Technology. And also received copyright on Elective Subject Allocation System.

Staff Achievement

Congratulations

Prof. Dr. A. B. Deshmukh & Prof. Dr. H. N. Datir

Successfully received their patent with other authors on An Efficient Coin Identification System Using Soft Computing Technique from Republic of South Africa.

Mr. N. E. Karale

Asst. Professor
Information Technology

Received “Yuva Acharya Award” by Bharat Education Excellence Awards - 2025

Staff Achievement

Congratulations

Mr. A. J. Ade was the Judge at **DIPEX 2026** held from 05/03/2026 to 08/03/2026 at Chhatrapati Sambhajinagar.

Ms. P. A. Nandagawali, Mrs. V. S. Wadhwani, and Mr. Y. R. Shelokar have successfully registered as Ph.D. scholars in 2025 -26 Academic year.

Student's Achievements

Mr. Vivek Gazalwar and team, students of BE IT, secured the **Winner** position in TECHELONS26 organized by P. R. Pote College of Engineering and Management, Amravati.

Ms. Khushi Jain, and her team, students of BE IT secured the **Winner** position in a Hackathon organized by Microsoft edunet showcasing event.

Mr. Arpan Joshi and team, secured the **Winner** position in Kabaddi at Shri Sant Gajanan Maharaj College of Engineering, Shegaon.

Student's Achievements

Mr. Ritesh Tijare, a student of TY IT, secured the **Winner** position in an Idea Presentation competition held at Priyadarshini Bhagwati College of Engineering, Nagpur.

Bhairavi Fender and team of IT dept., secured the **Winner** position in Kabaddi at Shri Sant Gajanan Maharaj College of Engineering, Shegaon.

Mr. Vivek Gazalwar and team secured **Winner** position at Trade-to-Code, Vidyutan at Sipna College of Engineering and Technology, Amravati

Student's Achievements

Mr. Ameya Pote, a student of TY IT, secured the **Runner-up** position in Lawn Tennis (Inter College 2026) conducted by Sant Gadge Baba Amravati University.

Mr. Vivek Gazalwar and team secured Runner-up position at ecothon26 Sipna College of Engineering and Technology, Amravati

Ms. Siddhi Bhadange, a student of BE IT, secured the **Runner-up** position in a Debate competition held at MGM University.

Shining Moments of Department

Kridayan-2K26, the I.T. Department proudly emerged as the W**inner of the Kridayan Cup,** continuing its glorious victory from Kridayan-2K25

Mr. Arnav Chirde and
Mr. Sujal Thaware, students of TY IT have successfully qualified for the GATE exam with flying colours.

Placements

Sr. No	Name of the Student	Company Name
1	Alisha Narendra Dongare	Comprinno Technologies pvt.ltd
2	Sharwari Rajesh Mondhe	Gyanvix Pvt Ltd in Nagpur
3	Anuradha Rajesh Karule	Gyanvix Pvt Ltd in Nagpur
4	Rakshit Sinha	QSpiders Campus Connect
5	Gaurang Bhasme	QSpiders Campus Connect
6	Arya Rajesh Saksule	QSpiders Campus Connect
7	Isha Ravindra Kakde	Hackveda Solutions Pvt Ltd
8	Charwak Sanjay Bhonde	Hackveda Solutions Pvt Ltd
9	Utkarsha Dnyaneshwar Tamgire	Hackveda Solutions Pvt Ltd

Placements

Sr. No	Name of the Student	Company Name
10	Mrinmayee Arvind Khonde	Hackveda Solutions Pvt Ltd
11	Shruti Sunil Bhakte	Hackveda Solutions Pvt Ltd
12	Om Ajay Pande	Hackveda Solutions Pvt Ltd
13	Radhika Vilas Sable	Hackveda Solutions Pvt Ltd
14	Pratik Satish Dashore	Tata Consultancy Services Limited
15	Anuradha Rajesh Karule	Tata Consultancy Services Limited
16	Tanvi Santosh Zode	Tata Consultancy Services Limited
17	Sumidhi Bokde	Tata Consultancy Services Limited
18	Aditya Rajesh Sahu	Kiran Academy
19	Sairandhree Nitin Shirke	Kiran Academy

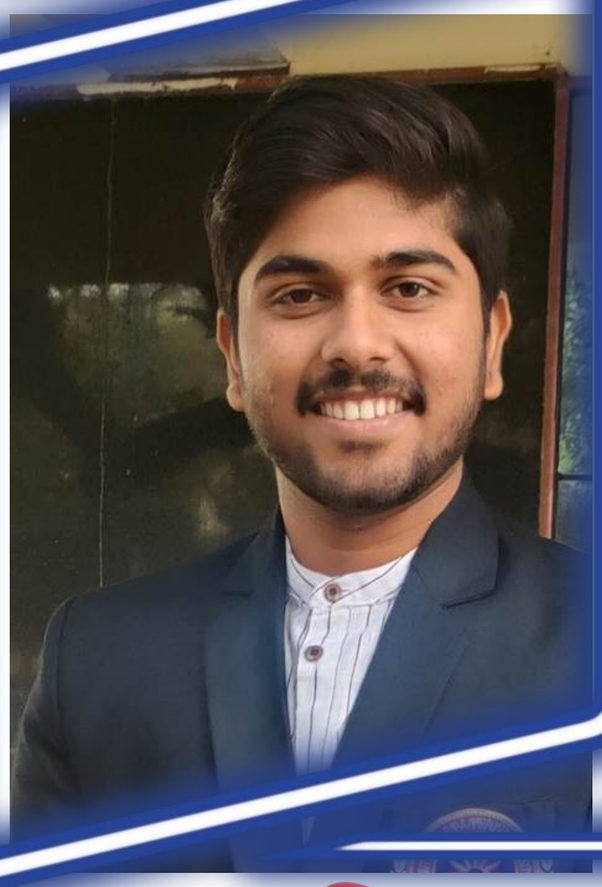
Placement Achievement

Heartiest congratulations to **Ms. Sarthi Thokal**, student of BE IT, for securing a placement at **Tata Consultancy Services (TCS)** with an impressive package of **7 LPA**.

Heartiest congratulations to **Mr. Vivek Gazalwar**, student of BE IT, for securing a placement at **IASYS** with an impressive package of **4 LPA**.

Heartiest congratulations to **Mr. Abhishek Chavan**, student of BE IT, for securing a placement at **Tata Consultancy Services (TCS)** with an impressive package of **3.4 LPA**.

Gem of the Department



Mr. Charwak Bhonde,
a student of BE IT, received
the Colour Coat in Water
Polo.

Ms. Siddhi Bhadange,
a student of BE IT, received
the Colour Coat in Debate.

Mr. Ameya Pote,
a student of TY IT,
received the Colour Coat
in Lawn Tennis and
Handball.

Technical Articles

1.Generative AI and Large Language Models (LLMs)

Introduction

In the last decade, Artificial Intelligence (AI) has transitioned from theoretical research to widespread real-world impact. Among the most transformative advancements is Generative AI, a class of AI systems capable of creating new content — including text, images, audio, and code — that resembles human output. At the heart of this revolution are Large Language Models (LLMs), such as OpenAI's GPT series, Google's LaMDA, and Meta's LLaMA. These models have reshaped human-computer interaction, automation, and creative assistance by understanding and generating natural language with unprecedented accuracy and fluency.

What Are Large Language Models?

Large Language Models are deep neural networks trained on massive text datasets to learn patterns, structure, and meaning in language. Unlike earlier rule-based or statistical methods, LLMs use transformer architectures, which can process entire sequences of text simultaneously rather than word-by-word. This enables them to capture long-range context, subtleties in grammar, and semantic relationships.

Core Components of LLMs

1. Transformers : Introduced in the paper "Attention is All You Need" (Vaswani et al., 2017), transformers revolutionized how language is processed. The key innovation — self-attention — lets each word in a sentence weigh the importance of every other word during computation. This results in better contextual understanding than older recurrent or convolution-based models.

2. Training_Data : LLMs are trained on massive corpora sourced from books, articles, web pages, and code repositories. The volume and diversity of data help the model generalize across different domains and languages.

3. Pre-training and Fine-tuning :

o Pre-training involves teaching the model to predict missing words or next tokens in massive text sequences.

o Fine-tuning adjusts the model for specific tasks (e.g., customer support bots, medical summaries) using curated datasets.

How Generative AI Works

Generative AI refers to any model that creates new content, but in practice today this mostly centers on LLMs generating text. Once trained, the model can take a prompt — a question, sentence fragment, or instruction — and generate coherent, contextually relevant output.

Example

If_the prompt_is: "Explain how neural networks work in simple terms:"

The model generates a paragraph that answers this naturally, often indistinguishable from human writing.

This ability comes from the model's learned statistical patterns in language: it predicts the most likely next word at each step based on context.

Applications of Generative AI and LLMs

LLMs have enabled a broad range of applications spanning industries:

1. Content Creation

• Automated article and blog generation
• Summarization and re-writing tools
• Creative writing assistance

2. Conversational Agents

• AI chatbots for customer support
• Virtual assistants capable of context-aware dialogue

3. Coding Assistance

• Tools like GitHub Copilot generate code based on natural language prompts, improving developer productivity.

4. Education and Tutoring

• Explaining complex concepts, generating examples, and answering student queries.

5. Healthcare

• Drafting medical reports
• Assisting in research literature review

Challenges and Limitations

Despite rapid progress, Generative AI is not perfect. The major technical and ethical challenges include:

1. Hallucinations : LLMs sometimes produce outputs that sound plausible but are factually incorrect. This is because models predict based on patterns rather than verified knowledge.

2. Bias and Fairness : Training data often contains societal biases. Without careful mitigation, models can inadvertently reinforce stereotypes or produce harmful content.

3. Safety and Misuse : Generative AI could be used to produce misleading information (e.g., fake news), phishing messages, or harmful code.

4. Privacy Concerns : Since models learn from vast public data, there's a risk (though low) of exposing sensitive information if not properly filtered.

5. Computational Costs : Training and running large models require significant processing power and energy, raising concerns about sustainability and environmental impact.

Technological Innovations and Future Directions

Research in Generative AI and LLMs continues to advance rapidly. Future trends include:

1. Multimodal Models

These are models that can understand and generate across multiple data types — text, image, speech, and even video — in a unified framework.

2. Smaller Efficient Models

Techniques like knowledge distillation and quantization allow powerful AI on resource-limited devices such as smartphones.

3. Personalized AI

Future models may adapt to individual preferences, writing styles, idioms, and knowledge levels.

4. Responsible AI Development

To address ethical issues, researchers are focusing on robust safety layers, bias correction, and transparent data governance.

Conclusion :

Generative AI and Large Language Models represent one of the most paradigm-shifting developments in modern computing. Their impact spans content creation, automation, education, and human-computer interaction. While their potential is enormous, safe and ethical deployment requires continued research, governance, and thoughtful design. As we enter a future where AI assistants become ubiquitous collaborators, understanding the principles and limitations of LLMs is essential for technologists, ethicists, and society at large.

Chaitanya Gughane
Student, TY IT,

2.Understanding RAG:
The Technical Core Concepts Behind Modern AI

One of the most important breakthroughs in the evolution of Large Language Models (LLMs) is Retrieval-Augmented Generation (RAG)— a hybrid architecture that combines information retrieval with text generation.

1. The Core Problem: Static Knowledge in Dynamic Worlds

LLMs like GPT, Claude, or Gemini are trained on massive datasets — but their knowledge freezes at training time. They can't access new documents, internal data, or real-time facts.

RAG addresses this limitation by retrieving external data at runtime, enriching the model's context before it generates a response.

2. RAG Architecture: Retrieval + Generation

A. Retrieval Phase

1. Query Embedding
2. Similarity Search
3. Context Assembly

Example: If you ask, "What's our refund policy for premium customers?" → The retriever fetches the relevant section from your internal policy PDFs.

B. Generation Phase

The retrieved context + user query are concatenated into a structured prompt. The LLM (e.g., GPT-4, Llama 3, Mistral) processes this expanded context and generates a grounded, accurate response. The model's attention mechanism allows it to focus on retrieved facts rather than hallucinating.

3. Technical Building Blocks

Component Role Example Tokenizer Converts text into discrete tokens GPT Tokenizer, Sentence Piece Embedding Model Maps text → vector space OpenAI, Cohere, Hugging Face Vector Database Stores and retrieves embeddings efficiently Pinecone, FAISS, ChromaDB Retriever Finds top-k semantically relevant vectors BM25 + Dense Retrieval (Hybrid) Generator (LLM) Produces the final answer GPT-4, Claude, Mistral Prompt Builder

Structures retrieved data for LLM LangChain, LlamaIndex Evaluator Validates factual accuracy Faithfulness metrics, Groundedness scores.

4. Advanced RAG Concepts

A. Hybrid Retrieval

Combines dense vector search (semantic similarity) with sparse retrieval (keyword-based like BM25).

Improves precision and recall in heterogeneous datasets.

B. Context Compression

Instead of dumping all retrieved chunks into the LLM, RAG systems now use summarization or embedding clustering to keep only the most relevant and non-redundant context. This improves token efficiency and reduces hallucinations.

C. Iterative / Multi-Step RAG

The model retrieves, reasons, and retrieves again based on intermediate reasoning steps.Used in complex question-answering and research assistants (e.g., Chain-of-Retrieval (CoR) pipelines).

D. Knowledge Graph–Augmented RAG

Combines RAG with graph databases (Neo4j, ArangoDB) to provide structured, relational knowledge.Especially useful in biomedical, financial, or legal domains.

5. Real-World Use Cases of RAG

Enterprise Knowledge Assistants

Microsoft Copilot, Google Duet AI, and Notion AI use RAG to answer questions from internal documentation, Slack threads, and project files — without retraining.E.g., “Summarize all product updates in Q2 across departments.”

Healthcare & Research

PubMed GPT, BioMedLM, and tools like Galactica use RAG to retrieve peer-reviewed papers, enabling clinicians to get source-grounded answers from trusted literature.

Resource Paper: Atlas: Few-Shot Learning with Retrieval Augmentation by G Izacard · 2022