Indore Institute of Science & Technology
Affiliated to - RGPV (Bhopal) & Approved by - AICTE (New Delhi)

तकनीकी BUZZ

Department of Computer Science & Engineering

Technical Contributor : Mr. Rakesh Jain
Takniki Buzz-Editor : Ms. Poorva Shukla

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Vision of the Institute

To be a nationally recognized institution of excellence in technical education and produce competent professionals capable of making a valuable contribution to society.

Mission of the Institute

- To promote academic growth by offering state-of-the-art undergraduate and postgraduate programs.
- To undertake collaborative projects which offer opportunities for interaction with academia and industry.
- To develop intellectually capable human potential who are creative, ethical and gifted leaders

Vision of the Department

To be a center of academic excellence in the field of computer science and engineering education.

Mission of the Department

- Strive for academic excellence in computer science and engineering through well designed course curriculum, effective classroom pedagogy and in-depth knowledge of Laboratory work
- Transform under graduate engineering students into technically competent, socially responsible and ethical computer science and engineering professionals.
- Create computing centres of excellence in leading areas of computer science and engineering to provide exposure to the students on latest software tools and computing technologies.
- Incubate, apply and spread innovative ideas by collaborating with relevant industries and R&D labs through focused research group.
- Attain these through continuous team work by group of committed faculty, transforming the computer science and engineering department as a leader in imparting computer science and engineering education and research .

(Generative AI &ChatGPT)

Generative Artificial Intelligence (Generative AI) is a subset of AI that can **create new content** such as:

- Text
- Images
- Audio
- Code
- Videos
- 3D models

It does this by learning patterns from existing data and generating outputs that resemble or extend that data.

Generative Artificial Intelligence (Generative AI) refers to a subset of AI technologies designed to **create new content**, including text, images, audio, video, and even code, by learning patterns from existing data.

Core Technologies Behind Generative AI

1. Neural Networks
These are algorithms inspired by how the human brain works. They can learn patterns in large amounts of data.

2. Transformers
A powerful neural network architecture used for understanding language. Examples:

- **GPT (Generative Pre-trained Transformer)**
- **BERT (Bidirectional Encoder Representations from Transformers)**

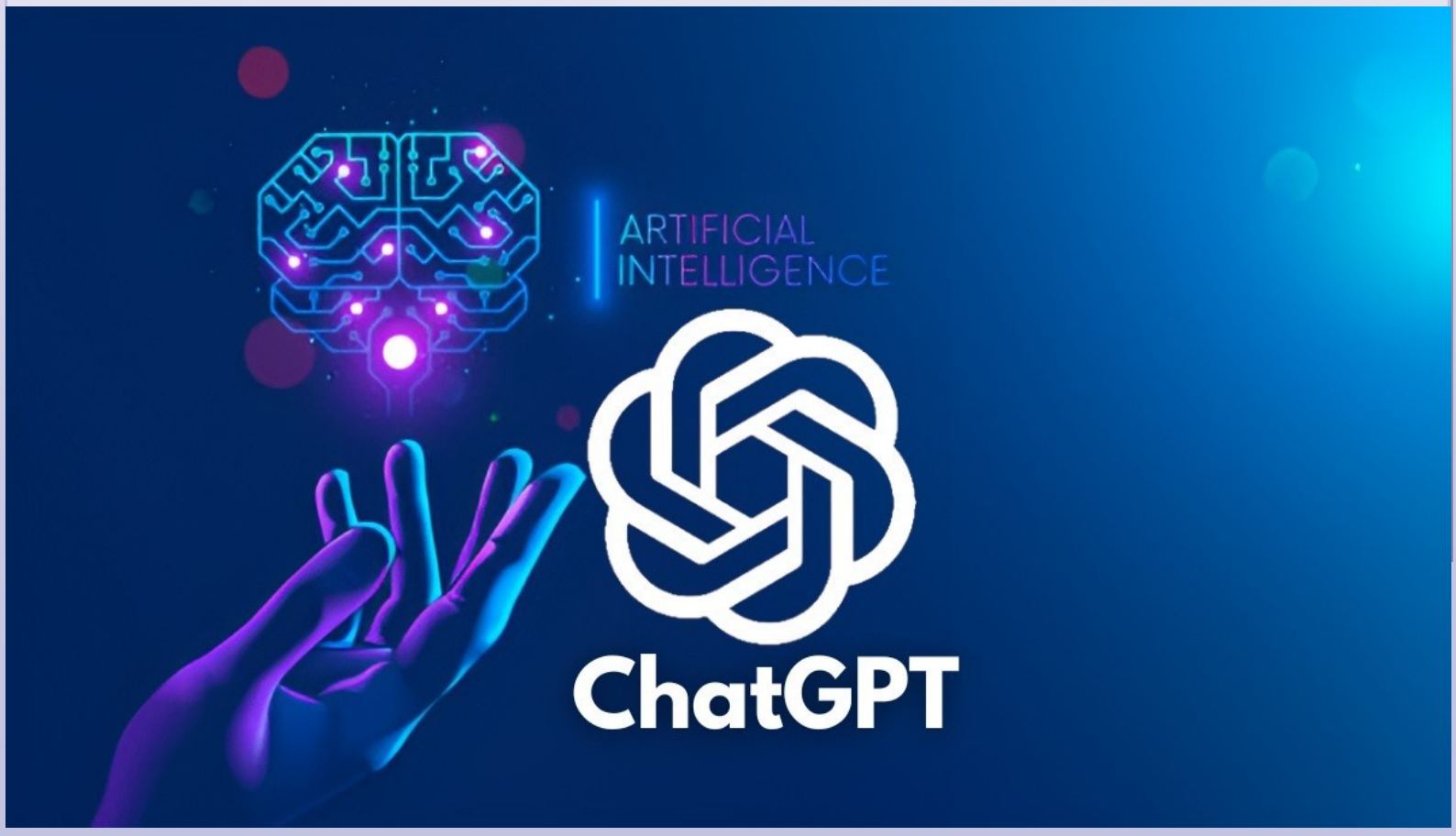
3. Large Language Models (LLMs)
LLMs are trained on **billions of words** from books, articles, websites, etc. They generate human-like responses. Example models:

- **GPT-3, GPT-4**
- **Bard (Google)**
- **Claude (Anthropic)**

4. Diffusion Models
Used in image generation (like DALL·E, Midjourney). These models start with noise and gradually refine it into a meaningful image.

How ChatGPT Works (Simplified Process)

Pre-training
- The model learns grammar, facts, language structure, and patterns by reading massive datasets.
- It learns to **predict the next word** in a sentence.



Fine-tuning

•The model is refined with **human feedback** to make responses more accurate, safe, and useful.

Prompt-based generation

•When a user types something, ChatGPT analyzes the prompt and generates an answer word-by-word.

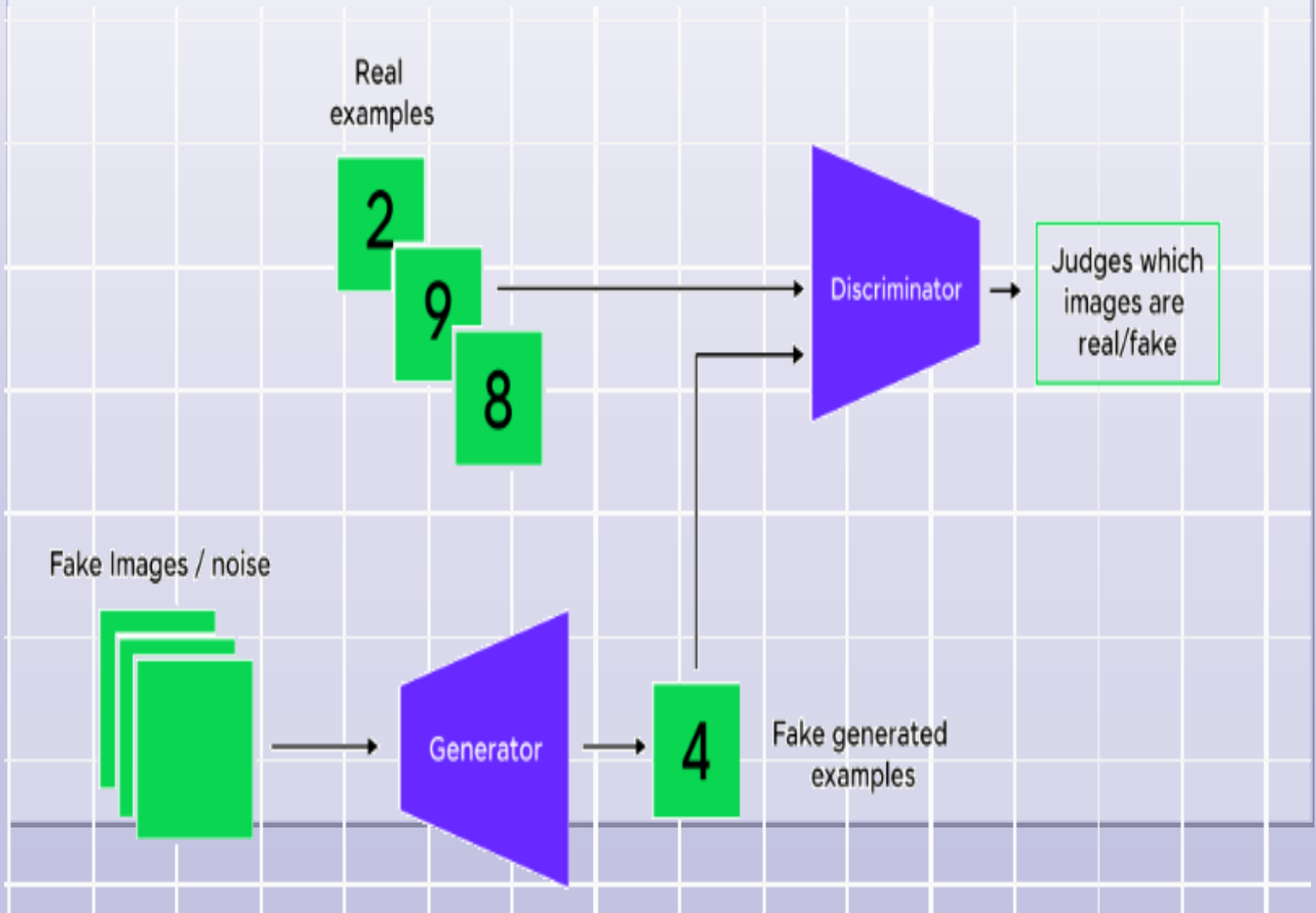
Strengths of Generative AI

•**Efficiency**: Saves time in content creation.
•**Creativity**: Offers new ideas and perspectives.
•**Personalization**: Can tailor responses to specific user needs.
•**24/7 Availability**: Chatbots and assistants never sleep.
•**Multimodal**: Can handle text, images, and more in some models.

Advanced System Architecture of ChatGPT (GPT Models)

1. Transformer Architecture

•Introduced in the paper "Attention Is All You Need" (2017).
•Core concept: **Self-attention mechanism**—it allows the model to weigh the importance of different words in a sentence, regardless of their position.
•Composed of:
•**Encoder-Decoder blocks** (GPT uses decoder-only for generation)
•**Multi-head attention layers**
•**Feed-forward neural network**
•**Positional encoding**



2. Training Process

a. Pre-training

- Model is trained on massive unlabeled text datasets (books, web pages, Wikipedia).
- Objective: **Next Word Prediction** (language modeling).
- Learns **syntax, grammar, factual info**, and **patterns in language**.

The Future of Generative AI

- **Multimodal AI**: Combine text, images, voice, and video in one model.
- **Better Reasoning**: Models that think through problems more logically.
- **Explainable AI**: Transparent models that justify their answers.
- **Secure & Ethical AI**: Built-in safeguards to prevent misuse.
- **Human-AI Collaboration**: AI as a co-pilot, not a replacement.

Custom GPTs (ChatGPT Plugins & GPTs)

- **Custom GPTs** allow users to build a chatbot with custom instructions, files, and behaviors.
- **ChatGPT Plugins** connect AI to external tools (like code execution, web browsing, or APIs).

6. Limitations (In Simple Terms)

- May give **wrong answers** confidently.
- Doesn't **understand meaning** like humans (it predicts text, not "think").
- Can be **biased** if trained on biased data.
- Not always **up-to-date** (e.g., GPT-4's training data cuts off in 2023 unless web browsing is enabled).

Conclusion

Generative Artificial Intelligence (Generative AI) and models such as ChatGPT transcend conventional computational tools; they constitute a **novel, intelligent interface bridging humans and the digital cosmos**. These systems leverage advanced **deep learning architectures, transformer models, and natural language understanding** to perform a spectrum of complex cognitive tasks, ranging from **automated code synthesis and algorithmic composition** to **scientific problem-solving, data analysis, and creative content generation**.

Their integration into contemporary workflows is catalyzing a **paradigm shift across industries, education, research, and professional ecosystems**, redefining traditional notions of productivity, creativity, and human-computer collaboration. .