DESCRIPTIVE QUESTIONS-

Q1. What is Generative AI? What are its applications?   
Ans: Generative Artificial Intelligence (AI) refers to a branch of AI focused on algorithms capable of producing fresh and innovative content, spanning various mediums such as audio, text, code, video, and images. These algorithms utilize neural networks to analyse and comprehend patterns within existing data, enabling them to generate content that is often indistinguishable from human-created content.

Some of the most prominent practical applications of generative AI include chatbot creation, chatbot improvement, text generation and summarization, gameplay content creation, video/audio creation, image generation, music and audio generation, synthetic data creation, code building, career coaching, drug discovery and predictive studies, and customer service.

Q2. What are Generative Adversarial Networks (GANs) and how do they work?  
Ans: Generative Adversarial Networks (GANs) are a class of machine learning frameworks that consist of two neural networks: a generator and a discriminator. GANs are designed to generate realistic data samples, such as images, audio, or text, by learning the underlying distribution of a given dataset.

Generative Adversarial Network has two parts:  
1. The **generator** learns to generate plausible data. The generated instances become negative training examples for the discriminator.

2. The **discriminator** learns to distinguish the generator's fake data from real data. The discriminator penalizes the generator for producing implausible results.

It then fosters into an adversarial training process, in which the generator and discriminator are trained simultaneously in a competitive manner. During training, the generator tries to improve its ability to fool the discriminator by generating increasingly realistic data samples. At the same time, the discriminator aims to become better at distinguishing between real and fake data.

Q3. How do Generative Adversarial Networks (GANs) and transformer-based models differ in their approach to data analysis and generation?

Ans: Generative Adversarial Networks (GANs) are neural networks designed to distinguish between original and generated data. These networks engage in a competitive process where they refine their algorithms to produce data that closely resembles the original material.

Transformer-based models are primarily utilized for analysing sequential data, such as the arrangement of words in a sentence. In contemporary contexts, transformer-based methodologies are widely adopted as a standard approach for modelling natural language.

Q4. Explain the roles of the generator and discriminator in a GAN framework and how they contribute to the training process.

Ans: In a Generative Adversarial Network (GAN) framework, the generator and discriminator play distinct roles crucial to the training process. The generator is responsible for creating synthetic data samples, such as images, audio, or text, with the objective of producing outputs that closely resemble real data. On the other hand, the discriminator acts as a critic, evaluating the generated samples to discern between real data from the dataset and fake data produced by the generator. Through adversarial training, the generator seeks to improve its ability to deceive the discriminator by generating increasingly realistic data samples, while the discriminator aims to become more adept at distinguishing between genuine and artificially produced data. This competitive process improves both networks over time, resulting in the generation of data that closely resembles the original material.

Q5. What is a Large Language Model (LLM)?

Ans: A large language model (LLM) is a type of artificial intelligence (AI) program that can recognize and generate text, among other tasks. LLMs are trained on huge sets of data — hence the name "large." LLMs are built on machine learning: specifically, a type of neural network called a transformer model.

In simpler terms, an LLM is a computer program that has been fed enough examples to be able to recognize and interpret human language or other types of complex data.

LLMs use a type of machine learning called deep learning in order to understand how characters, words, and sentences function together.

GPT-3 (Generative Pre-trained Transformer 3) is an example of a large-scale LLM developed by OpenAI. LLMs are capable of a wide range of natural language processing tasks, such as language translation, text summarization, and question-answering.

Q6. Differentiate between GANs and LLM.

Ans: Generative Adversarial Networks (GANs) and Language Models (LLMs) are both powerful tools in the field of artificial intelligence, but they serve different purposes and operate on distinct principles. Here's a differentiation between the two:  
  
1. Purpose:   
GANs: They are primarily used for generating synthetic data that closely resembles real data. They are commonly employed in tasks such as image synthesis, style transfer, and data augmentation

LLMs: LLMs are created to comprehend and produce text that resembles human language. They demonstrate proficiency in various natural language processing assignments like translating languages, summarizing text, and answering questions.  
  
2. Architecture:   
GANs: GANs consist of two neural networks, a generator and a discriminator, which are trained simultaneously through adversarial training. The generator produces synthetic data samples, while the discriminator distinguishes between real and generated samples.

LLMs: LLMs are based on deep learning architectures. These models are trained on large text data using techniques like pre-training and fine-tuning.

3. Training objectives:  
GANs: The aim is to enhance the generator's capability to generate data that is progressively more realistic and believable, thereby empowering GANs for tasks such as creating images, transferring styles, and augmenting data.

LLMs: LLMs are trained to understand the structure and semantics of natural language. They learn to generate coherent and contextually relevant text by predicting the next word in a sequence given the preceding words.

4. Applications:

GANs: Use cases of GANs are as follows- code writing, content generation, story writing, autonomous driving, 3D models, image and video generation, voice cloning, text to speech etc.

LLMs: LLMs find applications in language translation, text summarization, sentiment analysis, chatbots, and other natural language processing tasks.

Q7. What are some challenges in Generative AI?

Ans: 1. Safety: Making sure generative AI doesn't create harmful content and follows ethical rules. 2. Limited abilities: Generative AI might not do all tasks well, depending on how hard they are. 3. Unpredictable outcomes: Sometimes, what generative AI makes is surprising or hard to guess, which can be a problem in important areas. 4. Data Security: Generative AI needs lots of data, but that can raise worries about privacy and keeping data safe. 5. Big Data Requirement: Generative AI needs huge and diverse datasets to learn well, which can be hard or expensive to get. 6. Privacy: Generative AI could create content that invades people's privacy or accidentally shares private info from its training data. 7. Legal Issues: Laws might not deal with the problems of generative AI well, causing confusion about who's responsible and who owns what. 8. AI Ethics & Responsibility: There are important questions about how generative AI should be used and what it should be allowed to do, including being fair and not biased.

Q9. What is Artificial Intelligence? Describe the importance of data preprocessing in AI.  
Ans: Artificial Intelligence (AI) involves replicating human-like intelligence in machines, enabling them to undertake tasks that would normally necessitate human cognitive abilities, including problem-solving, learning, and decision-making.

Data preprocessing plays a pivotal role in AI, encompassing the cleaning, conversion, and structuring of raw data to ensure its appropriateness and quality for AI algorithms. This process aims to eliminate inconsistencies, manage absent data, standardize data formats, and minimize data complexity, thereby enhancing the precision and effectiveness of AI models.

Q10. Name a few top GEN AI Models and give a short description.

Ans: Few GEN AI Models are-

1. GPT-4 (Generative Pre-Trained Transformer-4)-

GPT-4 was developed by OpenAI and is one of the most remarkable amongst generative AI models. With billions of parameters, it has demonstrated remarkable text generation abilities. It can answer questions, write essays, generate code and can even create conversational agents that engage users in natural language.

1. Bert (Bidirectional Encoder Representations from Transformers)-

Although primarily known for its expertise in natural language understanding, BERT also shows generative capabilities. It excels in tasks such as text completion and summarization, it has various applications such as chat engines and chatboard, and it comes from Google.

1. DALL-E-

If you love generative art, DALL-E is a model to watch. Developed by OpenAI, this model can generate images from textual descriptions, it takes creativity to new heights by creating visuals based on written prompts, showing the potential of generative AI in the visual arts.

1. Stable Diffusion-

Released in 2022, it is a text to image model, created by a collaboration between engineers and researchers from Stability AI and LAION. This is a deep learning model that utilizes diffusion processes to generate high quality artwork from input images.

Q11. What is Machine Learning? How does Machine Learning work?  
Ans: Machine learning (ML) is a branch of artificial intelligence (AI) and computer science that focuses on the using data and algorithms to enable AI to imitate the way that humans learn, gradually improving its accuracy.

There are three main parts in Machine Learning:   
1. Decision Process: Typically, machine learning algorithms are utilized to predict or classify data. They analyse input data, whether labelled or unlabelled, to estimate patterns within the dataset.

2. Error Function: An error function assesses the accuracy of the model's predictions, particularly when compared against known examples.

3. Model Optimization Process: To better fit the data points in the training set, the model adjusts weights to minimize the difference between known examples and model predictions. This iterative process of evaluation and adjustment continues autonomously until a desired level of accuracy is achieved.

Q12. What is Deep Learning?

Ans: Deep learning is a subset of machine learning that uses multi-layered neural networks, called deep neural networks, to simulate the complex decision-making power of the human brain. Some form of deep learning powers most of the artificial intelligence (AI) in our lives today.

Deep learning drives many applications and services that improve automation, performing analytical and physical tasks without human intervention. It lies behind everyday products and services—e.g., digital assistants, voice-enabled TV remotes, credit card fraud detection—as well as still emerging technologies such as self-driving cars and generative AI.

Q13. How does Deep Learning differ from Machine Learning?  
Ans: Machine learning and deep learning are both types of AI. In short, machine learning is AI that can automatically adapt with minimal human interference. Deep learning is a subset of machine learning that uses artificial neural networks to mimic the learning process of the human brain.   
  
Machine Learning refers to the study of computer systems that learn and adapt automatically from experience, without being explicitly programmed. Deep Learning is a machine learning technique that layer algorithms and computing units or neurons into artificial neural networks that mimic the human brain.

Machine Learning excels at data driven tasks such as classification, regression etc, whereas Deep Learning excels at complex tasks such as image recognition and natural language processing.

Machine Learning automates learning from data and requires less manual intervention. Deep Learning automates feature extraction, reducing the need for manual engineering.

Q14. Differentiate between Artificial Intelligence and Deep Learning.

Ans: Artificial Intelligence-  
1. AI simulates human intelligence to perform tasks and make decisions.

2. AI may or may not require large datasets; it can use predefined rules.

3. AI can be rule-based, requiring human programming and intervention.

4. AI can handle various tasks, from simple to complex, across domains.

5. AI algorithms can be simple or complex, depending on the application.

6. AI may require less training time and resources for rule-based system.

7. AI systems may offer interpretable results based on human rules.

8. AI is used in virtual assistants, recommendation systems, and more.

Deep Learning-

1.DL is a subset of ML that employs artificial neural networks for complex tasks. 2. DL requires extensive labeled data and performs exceptionally with big datasets. 3. DL automates feature extraction, reducing the need for manual engineering. 4. DL excels at complex tasks like image recognition, natural language processing, and more. 5. DL relies on deep neural networks, which can have numerous hidden layers for complex learning. 6. DL training demands substantial computational resources and time for deep networks. 7. DL models are often considered less interpretable due to complex network architectures. 8. DL is utilized in autonomous vehicles, speech recognition, and advanced AI applications.

Q15. What are the ethical considerations in AI development and deployment?

Ans: Ethical considerations in AI development and deployment include issues of bias and fairness, privacy and data protection, transparency and explainability, accountability, and the impact of AI on employment. Ensuring ethical AI involves responsible data handling, algorithmic transparency, addressing biases, and actively considering the societal impact of AI systems.

MULTIPLE CHOICE QUESTIONS

Q1. Who developed chatgpt?

1. OpenAI
2. Microsoft
3. Google
4. Facebook

ANS: OpenAI

Q2. What does GAN stand for?

1. Global Area Network
2. Generative Adversarial Network
3. Government Access Network
4. Generalized Area Network

ANS: Generative Adversarial Network

Q3. What does LLM stand for?

1. Large Learning Model
2. Longitudinal Learning Model
3. Linearized Langevin Method
4. Low-level Laser Therapy

ANS: Large Learning Model

Q4. Which one of these is a use case of Generative AI?

1. Identifying spam emails
2. Predicting stock prices
3. Generating photorealistic images
4. Classifying images of animals

ANS: Generating photorealistic images

Q5. Which one of these is a challenge in Generative AI?

1. Enhancing customer service efficiency
2. Optimizing supply chain logistics
3. Addressing data privacy concerns
4. Ensuring the safety and reliability of AI-generated content

Ans: Ensuring the safety and reliability of AI-generated content

Q6. Deep Learning is a subset of?

1. Machine Learning
2. Civil Engineering
3. Cryptocurrency
4. Quantum computing

ANS: Machine Learning

Q7. Which one of these tasks does Deep Learning excel at?

1. Classification
2. Regression
3. Imagine Recognition
4. Conducting sentiment analysis on text data

ANS: Image recognition

Q8. Which one of these tasks does Machine Learning excel at?

1. Classification
2. Generating photorealistic image
3. Conducting sentiment analysis on text data
4. Calculating the trajectory of a rocket

ANS: Classification

Q9. An example of Traditional AI is-

1. Generating code
2. Voice Cloning
3. Autonomous driving
4. Image Classification

ANS: Image Classification

Q10. What is the full form of GPT-4?

1. General purpose transformer-4
2. Generative pre-trained transformer-4
3. Graphical processing toolkit-4
4. Global positioning tracker-4

ANS: Generative pre-trained transformer-4