Gen AI Assignment Questions

1. Introduction to Generative AI:

- **Q1:** What is Generative AI? How does it differ from traditional AI models that focus on classification or regression tasks?
- **Q2:** Explain the key differences between **Generative AI** and **Discriminative AI** models. Provide examples of each.
- **Q3:** Describe the purpose and basic functioning of **Generative Adversarial Networks (GANs)**. What are the roles of the generator and discriminator in a GAN?
- **Q4:** What is a **latent space** in Generative AI? Explain how it is used to generate new data (e.g., images, text).
- **Q5:** Explain how **Variational Autoencoders (VAEs)** work. How are VAEs different from GANs, and what types of tasks are VAEs typically used for?

2. Applications of Generative AI:

- **Q6:** What are some real-world applications of Generative AI? List at least four areas where generative models are applied and provide a brief description of each.
- **Q7:** How can Generative AI be applied in the field of healthcare? Provide two examples where it can be useful, such as in drug discovery or medical image generation.
- **Q8:** Explain how **text generation models** (e.g., GPT-3) can be used in content creation. Give an example of how these models can generate blog posts or social media content.

3. Popular Generative AI Models:

- **Q9:** Describe the **GPT** (Generative Pre-trained Transformer) model. How does it generate human-like text, and what are its key applications?
- **Q10:** Explain how **Recurrent Neural Networks (RNNs)** can be used for generating sequences, such as text or music. How do RNNs handle sequential data differently from other models?
- **Q11:** What is **BERT** (Bidirectional Encoder Representations from Transformers), and how is it different from models like GPT-3 in the context of text generation?

4. Prompt Engineering and Control of Output:

- **Q12:** Write a prompt for a language model to generate a 150-word description of a futuristic city. Explain the role of clarity and specificity in the prompt.
- **Q13:** How can **temperature** and **max tokens** be adjusted in a language generation model to control the creativity and length of the generated output? Provide examples of both adjustments.
- **Q14:** Write a prompt to generate a dialogue between two characters in a mystery novel. Provide guidelines in your prompt for tone and character development.

5. Evaluating the Output of Generative AI Models:

- **Q15:** How would you evaluate the quality of text generated by a model like GPT-3? List at least three criteria you would consider when assessing its output.
- **Q16:** What are some common problems with generated content, such as **hallucinations** or **irrelevant responses**? How can these issues be minimized in prompt design?
- **Q17:** How can **feedback loops** be used to improve generative models? Explain how iterative testing and refinement of prompts can enhance the output.

6. 7. Hands-on Practice with Generative AI:

- **Q18:** Write a prompt that will instruct a language model to summarize a research paper about machine learning. Include specific instructions to highlight the main points and avoid irrelevant details.
- **Q19:** Generate a list of ideas for a new mobile app using a language generation model. Provide at least five app ideas and explain how the model can generate creative suggestions.
- **Q20:** Generate a set of **product descriptions** for an e-commerce website using a language model. Evaluate the clarity, persuasiveness, and accuracy of the descriptions.

Answers

Q1: Generative AI generates new data, similar to a given dataset, such as images or text, based on models using probability. In contrast to traditional AI, which is mainly prediction-based (classification/regression), generative AI generates its own data.

Q2: Generative models learn to generate data whereas discriminative models classify or predict (like logistic regression). Example: GANs generate images, while SVMs classify them.

Q3: GANs are basically two components- generator (makes data) and discriminator (measures the validity of data). Generator learns through this process as the discriminator becomes deceived, resulting in realistic outputs.

Q4: Latent space is essentially the compressed representation of data. The model can take points within that space and output diverse outcomes like different versions of an image or text.

Q5: VAEs compress input data into the latent space and then reproduce it to produce outputs. VAEs are probabilistic and suited for anomaly detection or for synthesizing structured data as opposed to GANs.

Q6:
1. Images Generation- DALL-E-like tools creating images that are photorealistic or artistically appealing.
2. Text generation: GPT-like models can be used to create essays, code, and even stories
3. Healthcare: Synthesizing medical images for the training AI.
4. Gaming: Create characters, levels, stories.

Q7:
1. Drug Discovery: Generate molecule structures for new drugs.

2. Generation of Medical Images: Diversity in training data for disease detection.

Q8: Text generation models like GPT-3, which can generate a blog based on a prompt specifying tone and content, can write social media posts tailored to marketing campaigns.

Q9: GPT uses transformers to predict the next word in a sequence and can generate human-like text that can be applied for use in chatbots, summarization, and creative writing.

Q10: RNNs process sequential data by maintaining hidden states, enabling tasks like text or music generation. They differ by using temporal dependencies unlike standard neural networks.

Q11: BERT processes text bidirectionally, understanding context better than GPT. While GPT focuses on generation, BERT excels in understanding and classification tasks.

Q12: Prompt: “Describe a futuristic city with eco-friendly technology, floating buildings, and efficient transport systems in 150 words.” Specificity ensures precise responses, avoiding ambiguity.

Q13: Lowering temperature (like 0.3) reduces creativity for factual outputs, while increasing it (example 0.9) enhances creativity. Max tokens limit output length, controlling verbosity.

Q14: Question: "Write a dialogue between a detective and a suspect in a mystery novel. Keep the suspenseful mood and build up the suspect as evasive yet interesting."

Q15: Assess by ensuring the text generated is relevant, coherent, and factually correct.

Q16: Hallucinations (made-up facts) or nonsensical responses are created due to vague prompts. Avoid such instances as much as possible. Provide concrete, realistic instructions.

Q17: Refine prompts using results, where the model will iteratively get better by testing and adjusting towards accuracy and creativity.

Q18: Prompt: Summarize the key ideas of the research paper titled 'Advances in Machine Learning,' focusing on methods and conclusions but not with extra details.

Q19: Ideas:
1. Virtual diet planner with AR food analysis.
2. AI-based mental health chatbot.
3. Personalized book recommendation app.
4. Augmented reality pet training app.
5. Smart habit tracker with AI insights.

Q20: Product descriptions: "This eco-friendly water bottle keeps beverages cold for 24 hours. Lightweight and durable, it's perfect for travel." Evaluate clarity (easy to understand), persuasiveness (appealing), and accuracy (truthful).