TASK 11

SUBJECT:

Programming For AI

PROGRAM:

BS DATA SCIENCE

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Lab 11 task

1. Lang Chain

Definition:

LangChain is an **open-source framework** designed to make it easier to build applications using **Large Language Models (LLMs)** by connecting them to **external data sources, tools, and memory**.

Key Points:

- Acts as a **pipeline** to connect LLMs with other tools (e.g., APIs, databases).
- Supports **retrieval-based systems**, agents, and chains of LLM calls.
- Useful for building **systems chatbots, document analysis tools, question-answering**, etc.
- Helps manage **context** and connect models with real-time or external data.

2. RAG (Retrieval-Augmented Generation)

Definition:

RAG is a technique where a model first **retrieves information** from external sources (like documents or a vector database) and then uses a **generative model (LLM)** to create responses based on that retrieved data.

Key Points:

- Combines **search (retrieval)** and **generation.**
- Helps reduce **hallucination** (wrong info from AI).
- Uses **retrievers** like FAISS and **generators** like GPT.
- Ideal for question-answering on **custom documents** or **knowledge bases.**

3. LLMs (Large Language Models)

Definition:

LLMs are **AI models** trained on large amounts of text data to understand, generate, and interact using **natural human language**.

Key Points:

- Examples: **GPT-3, GPT-4, BERT, PaLM**.
- Can generate **text, translate languages, summarize, answer questions**, etc.
- Based on deep learning and **transformer architecture**.
- Backbone of modern **chatbots, virtual assistants, and content generation tools**.

4. FAISS (Facebook AI Similarity Search)

Definition:

FAISS is a **library developed by Meta AI** for **efficient similarity search and clustering** of dense vectors. It helps to find similar documents, text, or items using **vector embeddings**.

Key Points:

- Used in **Vector Databases** to find similar results fast.
- Supports **high-dimensional vector** comparison.
- Helps in **semantic search**, RAG pipelines, and recommendation systems.
- Optimized for **speed and scalability**.

5. Vector

Definition:

In AI, a vector is a list of numbers that **represents data** (like text, images, or audio) in a machine-understandable format. These vectors are used to compare **similarity or meaning** between pieces of data.

Key Points:

- Created using **embedding models** (e.g., Word2Vec, Sentence Transformers).
- Example: "Apple" → [0.25, -0.10, 0.87, ...]
- Used in **semantic search, recommendations, clustering**, etc.
- Allows comparison based on **meaning, not keywords**.

6. VectorDB (Vector Database)

Definition:

A Vector Database stores, indexes, and retrieves **vector embeddings** of data. It enables **fast similarity search** across large datasets using vector distances (like cosine similarity).

Key Points:

- Supports **semantic search** using vectors.
- Examples: **Pinecone, Weaviate, Milvus, Chroma**.
- Works well with LLMs and **RAG-based systems**.
- Stores data in **high-dimensional numeric formats**.

7. Generative AI

Definition:

Generative AI refers to any type of **artificial intelligence** that can create **new content** such as text, images, videos, music, or code by learning from existing data.

Key Points:

- Examples: **ChatGPT (text), DALL·E (images), Jukebox (music)**.
- Uses models like **LLMs, GANs, VAEs**.
- Can be used for **content creation, simulation, art, education**, etc.
- Learns patterns and creates **original output** based on that.

8. GANs (Generative Adversarial Networks)

Definition:

GANs are a type of **neural network architecture** where two models (Generator and Discriminator) work against each other to produce **high-quality synthetic data**.

Key Points:

- **Generator** creates fake data (e.g., fake image).
- **Discriminator** tries to detect whether data is real or fake.
- Both models improve by competing — hence "adversarial".
- Commonly used in **image generation, deepfake creation, art, gaming**, etc.

Summary Table :

Term	Type	Purpose
LangChain	Framework	Build LLM apps with tools/data access
RAG	AI Technique	Retrieve + Generate accurate results
LLMs	AI Models	Understand & generate human language
FAISS	Library	Fast similarity search of vectors
Vector	Data Format	Numerical representation of content
VectorDB	Database	Store & search vector embeddings
Generative AI	AI Field	Create new content using AI
GANs	Model Architecture	Generate realistic images/videos etc.