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**SUBJECT:** PROGRAMMING FOR AI LAB

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1. **LANG CHIAN**

LangChain is a framework that helps you build applications powered by Large Language Models (LLMs) like GPT-4.  
It connects LLMs with your data, APIs, tools, and memory to create more powerful, dynamic apps — like chatbots, search engines, or automation agents.

It provides ready-made components for:

* Managing prompts
* Fetching and retrieving external information
* Chaining multiple tasks together
* Allowing LLMs to take actions (use tools/APIs)

1. **RAG**

RAG (Retrieval-Augmented Generation) is a technique where a language model (like GPT) retrieves relevant information from an external knowledge base (like a database or documents) before generating a response.

Instead of relying only on what it was trained on, the model:

* Retrieves fresh, factual, or specific info.
* Generates an answer based on both its internal knowledge + the retrieved info

1. **LLMs**

LLMs (Large Language Models) are AI models trained on huge amounts of text data to understand, generate, and manipulate human language.

* They predict the next word in a sentence (word by word) very intelligently.
* Examples: GPT-4, LLaMA, PaLM, Claude.
* They can answer questions, write articles, translate languages, summarize, code, and more.

1. **FAISS**

FAISS (Facebook AI Similarity Search) is a library developed by Facebook to search for similar items very fast — especially when you have millions of items stored as vectors.

* It is mainly used for vector search (like finding which document, image, or sentence is most similar to a query).
* Super fast even with billions of items.
* Popular in AI, Recommendation Systems, and RAG pipelines.

1. **Vector**

Vector in AI means a list of numbers that represents information like text, images, audio, or anything else.

* Example of a vector: [0.2, 0.8, -0.5, 1.0]
* Each number (dimension) carries features or meaning.
* Vectors are used because computers understand numbers, not raw text or images.
* Similar things have similar vectors (this is super important for search and AI).

1. **VectorDB**

Vector Database is a **special type of database** made to **store** and **search** vectors.

* It stores vectors instead of just text, numbers, or files.
* It can quickly find similar vectors — super useful for semantic search, AI search, recommendations, etc.
* Regular databases (like SQL) can't efficiently handle millions of vectors — that's why VectorDB exists.

1. **Generative AI**

Generative AI refers to artificial intelligence models designed to create new content such as text, images, music, or even code, based on input data. Unlike traditional AI, which often focuses on analyzing and classifying data, generative AI generates novel outputs that can mimic the patterns and structures of the data it has been trained on.

Key points about Generative AI:

* Creativity: It can create new and original content that resembles training data (e.g., generating realistic images, writing essays, etc.).
* Learning from data: It learns patterns from existing data and uses that to produce something new.
* Versatile outputs: It can create anything from text (like GPT-3), images (like DALL·E), music (like Jukedeck), videos, and more.

1. **GANs**

GANs (Generative Adversarial Networks) are a type of machine learning framework used for generating new data that mimics real data, such as images, videos, audio, and more. GANs consist of two neural networks that are trained simultaneously in a process of competition, which helps generate realistic and high-quality outputs.

Key Components of GANs:

* Generator: This network tries to create data that is similar to the real data (e.g., creating an image of a person).
* Discriminator: This network evaluates whether the generated data looks similar to real data or if it is a fake.

Training Process:

* Adversarial Process: The generator creates data, and the discriminator tries to distinguish whether the data is real or fake. Over time, the generator gets better at producing data that the discriminator finds harder to differentiate from real data.
* Competition: The generator and discriminator are like two players in a game. The generator tries to "fool" the discriminator into thinking the generated data is real, while the discriminator tries to correctly identify whether the data is real or fake.