VERSION IT

AI FULL STACK

WITH GEN AI, AGENTIC AI, PROMPT ENGINEERING, MLOPS, AIOPS, & PYTHON

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#No -46, SAP street, Behind Mytrivanam,
Ameerpet, Hyderabad-500038

+91 9848015399, +91 9391237284

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Module 1: Programming Foundations for AI

Topics:

- Variables, data types, operators
- Input/output handling
- Conditional statements & loops
- Python setup, IDEs, environment (VS Code, Jupyter)
- **Data structures:**

o Lists, Tuples, Sets, Dictionaries

- **Functions:**

o Arguments, return types, recurssion

- File handling (CSV, JSON, TXT)
- Exception handling & debugging
- **Object-Oriented Programming:**

o Classes, objects, inheritance, polymorphism
o Decorators, generators, iterators
o Shallow vs Deep Copy

- **Introduction to NumPy & Pandas**

Module 2: AI & Generative AI Fundamentals

Topics:

- What is AI, ML, Deep Learning
- Real-world AI applications
- Introduction to Generative AI
- Types of GenAI:

o Text, Image, Audio, Code generation

- AI lifecycle & architecture
- APIs & model usage concepts

Module 3: NLP Foundations

Topics:

- **Text preprocessing:**
  - o Tokenization, stemming, lemmatization
  - o Stopwords removal
- **Feature engineering:**
  - o Bag of Words
  - o TF-IDF
- **Word embeddings:**
  - o Word2Vec (CBOW & Skip-gram)
  - o Sentence embeddings
- Hands-on NLP pipelines

Module 4: Deep Learning for NLP

Topics:

- Neural Networks basics
- RNN (Recurrent Neural Networks)
- LSTM & GRU (limitations solved)
- Bidirectional RNN
- Encoder–Decoder architecture
- Sequence-to-Sequence models

Module 5: Attention & Transformers

Topics:

- Why Attention is needed
- Attention mechanism (intuition + math)
- **Transformer architecture:**
  - o Embeddings & positional encoding
  - o Multi-head attention
  - o Residual connections & normalization
  - o Feedforward layers
- Training pipeline of transformers

Module 6: Large Language Models (LLMs)

Topics:

- Evolution of LLMs
- **Model types:**

o Encoder-only (BERT)
o Decoder-only (GPT)
o Encoder-Decoder (T5)

- Tokens & tokenization
- **Parameters:**

o Temperature, Top-p, max tokens

- Context window concept

Module 7: Working with OpenAI & APIs

Topics:

- OpenAI API usage
- Prompt-based interaction
- Structured outputs
- Function calling
- API integration in Python apps

Module 8: Prompt Engineering

Topics:

- Prompt design fundamentals
- Zero-shot vs Few-shot prompting
- Chain-of-Thought (CoT)
- Role-based prompting
- Output formatting techniques
- Prompt optimization strategies

Module 9: LangChain Framework (Core Development)

Topics:

- LangChain architecture
- Components:

o LLMs, Prompts, Chains

- Memory:

o Buffer, summary, window memory

- Output parsers
- Runnables & pipelines
- Tool integration

Module 10: Data Handling & Vector Databases

Topics:

- Document loaders:

o PDF, TXT, Web APIs

- Text splitting strategies
- Embedding generation
- **Vector databases:**
- FAISS
- Pinecone

o Chroma

- Similarity search concepts

Module 11: Retrieval-Augmented Generation (RAG)

Topics:

- RAG architecture & workflow
- Retriever design
- Naïve RAG implementation
- **Advanced RAG:**

o Multi-query retrieval

o Reranking
- RAG evaluation techniques
- Real-world use cases (chatbots, Q&A systems)

Module 12: Agentic AI Systems

Topics:

- What are AI agents
- Tool calling & APIs
- ReAct framework (Reason + Act)
- Multi-agent systems
- Agent communication
- Workflow orchestration

Module 13: LangGraph & AI Workflows

Topics:

- LangChain vs LangGraph
- **Workflow types:**

o Reranking
o Sequential
o Parallel

- Iterative
- Stateful agents
- Streaming responses
- Chatbot with memory & tools

Module 14: Advanced AI Applications

Topics:

- RAG + Agents integration
- Multi-agent orchestration
- Guardrails & safe AI
- AI for automation (resume screening, analytics)
- No-code AI tools (LangFlow)

Module 15: Model Optimization & Fine-Tuning

Topics:

- Fine-tuning basics
- Instruction tuning
- **Quantization:**

o GGML vs GGUF

- Performance vs cost trade-offs

Module 16: LLM Evaluation & Observability

Topics:

- Metrics:

o BLEU, ROUGE, METEOR

- Evaluation pipelines
- Experiment tracking
- Debugging LLM outputs

Module 17: AI DevOps & LLMOps

Topics:

- CI/CD for AI apps
- GitHub Actions
- Model versioning
- Dataset management
- Experiment tracking

Module 18: Deployment & Cloud

Topics:

- Streamlit app deployment
- API deployment
- Cloud basics
- Scaling LLM apps

Module 19: DevOps Essentials

Topics:

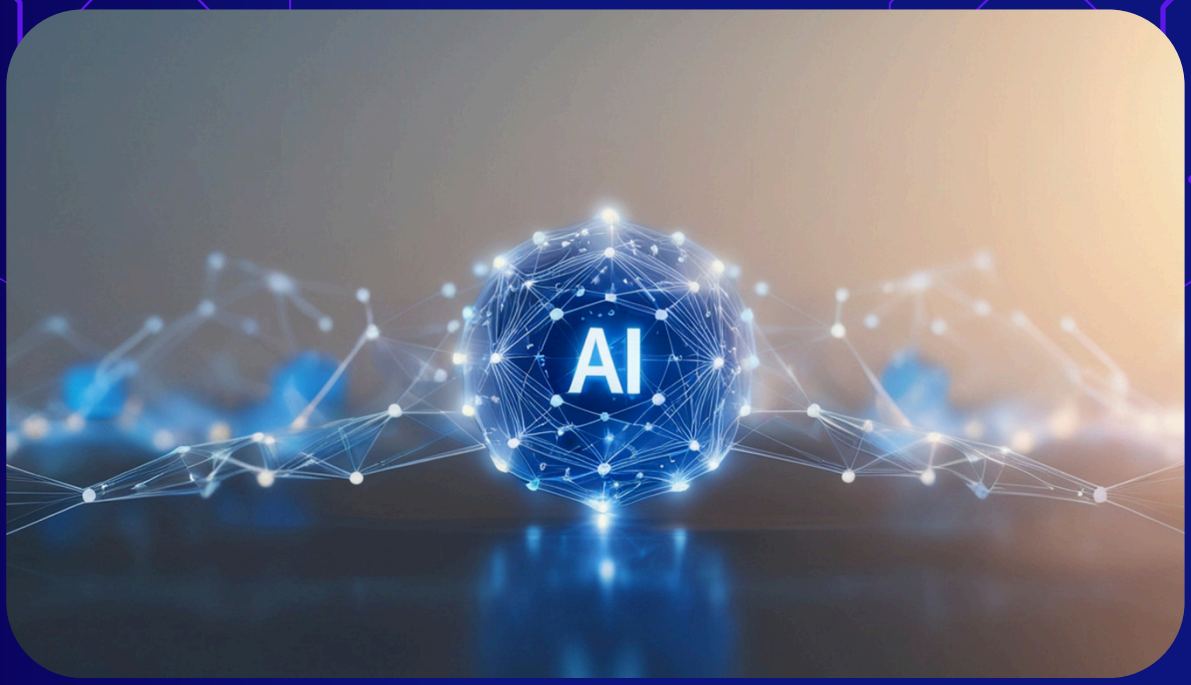
- Git basics:

o Repositories, commits, branching

- Docker:

o Containers & images

o Deployment workflows



ADDRESS:

Version IT: No: 46, SAP street, Behind Mytrivanam, Ameerpet, Hyderabad-500038

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