

Generative AI

1. Introduction to Generative AI & LLMs

- What is Generative AI and how it differs from traditional AI
- Overview of large language models (LLMs) like GPT, Claude, Gemini
- Real-world applications: chatbots, assistants, content creation, automation

2. Foundations of Large Language Models (LLMs)

- Architecture basics: Transformers and self-attention
- How LLMs are trained and why they generate human-like text
- Tokenizers, embeddings, and model output generation

3. Neural Network Basics for Generative AI

- Deep learning basics: neurons, layers, activation
- Role of deep networks in GenAI
- Connection to NLP and content generation

4. Text Representation & Tokenization

- Word embeddings and vector representations
- Tokenization processes: BPE, WordPiece, SentencePiece
- Understanding context and positional encoding

5. Prompt Engineering Fundamentals

- What prompts are and why they matter
- Prompt formats: zero-shot, one-shot, few-shot
- Crafting effective initial prompts to guide LLM output

6. Advanced Prompt Engineering Techniques

- Chain-of-thought prompting
- Role-based and structured prompts
- Prompt debugging and optimization strategies

7. Retrieval-Augmented Generation (RAG)

- What RAG is and when to use it
- Combining retrieval systems with LLMs
- Building RAG pipelines for better accuracy and grounding

8. Tools & Frameworks for GenAI

- Generative AI APIs (OpenAI API, Gemini API)
- Hugging Face models and transformers
- Using LangChain, vector databases like FAISS or Chroma

9. AI Content Creation — Text, Images & Multimedia

- Generating text content (stories, articles, summaries)
- Introduction to multimodal GenAI (images, audio)
- Combining models for rich content generation

10. Evaluation, Metrics & Model Performance

- Evaluating AI output quality
 - Understanding repetition, coherence, factual accuracy
 - Metrics for text generation and content quality
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11. Ethics, Bias & Responsible GenAI

- **Ethical considerations in content generation**
 - **Mitigating biases and harmful outputs**
 - **Responsible deployment practices**
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12. Generative AI Deployment & APIs

- **Integrating GenAI into applications**
 - **Hosting models and API consumption**
 - **Basic security and cost control**
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13. Industry Use Cases & Applications

- **Business automation with GenAI**
 - **AI in marketing, education, customer support**
 - **Case studies and success stories**
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14. Hands-on Projects & Capstone Development

- **Build an LLM-powered chatbot or assistant**
 - **Prompt engineering portfolio**
 - **Content creation workflows and evaluation**
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