Analytics Vidhya

How to Become a Generative AI Expert?

6 Months

6-8 Hours / Week

MONTH 1:

Python + Intro to ML

Learn Python basics, libraries, and dive into ML essentials like data preprocessing, evaluation metrics, and linear models.

MONTH 2:

ML + NLP

Advance in ML with model selection, unsupervised learning, and start DL with PyTorch, feedforward networks, and NLP basics.

MONTH 3:

CV + Intro to GenAI

Explore CNNs, object detection, GANs, and learn foundational generative AI techniques for creating images and text.

MONTH 4:

LLMs + Prompt Eng.

Master LLMs like Llama, OpenAI tools, and learn prompt engineering techniques to optimize LLM-based AI applications.

MONTH 5:

RAG + Finetuning LLMs

Build RAG systems, fine-tune LLMs, and apply advanced techniques like LoRA to create customized AI solutions.

MONTH 6:

Multimodal AI

Train and fine-tune LLMs, explore diffusion models for image generation, and build multimodal systems and agentic AI applications.

Note: You do **NOT** need any prerequisites!

Month 1: Python Fundamentals + Introduction to ML

Week 1: Python Foundations & Data Structures

- **Learn Python**
  - **Introduction to Python**
    - Complete Tutorial: Learn Data Science Python from Scratch
    - How to Learn Python Step-by-Step
    - Introduction to Data Science (Free Course)
- **Control Flow**
  - Python control flow
  - MCQs on Python Control Flow (If Statements and Loops)
  - Loops and Control Statements (In-Depth Tutorial)
- **Functions**
  - Functions in python
  - MCQs on Python Functions
- **Data Structures**
  - Data Structures in Python
  - Guide to Data Structures in Python
  - Sets in Python
  - How to Sort Python Dictionaries
  - MCQs on Python Sets and Operations
  - Tuples in Python
  - MCQs on Python Tuple Manipulation
- **Classes & Objects**
  - Advanced Python
  - Everything About Classes and Objects in Python

Week 2: Libraries in Python (Pandas, Numpy, Visualization)

- **Pandas**
  - Pandas Tips and Tricks
  - Ultimate Guide to Pandas for Data Science

        - Pandas Functions for Data Analysis and Manipulation
    - **Scikit-Learn: Overview and Concepts**
        - A Comprehensive Guide to Sklearn - Part 1: Overview of the Package
        - Scikit-Learn: Objects - Fit vs Transform vs Fit_Transform vs Predict
        - Scikit-Learn: Python Machine Learning Tool
    - **Numpy**
        - Ultimate Numpy Tutorial for Data Science Beginners
        - Numpy Tips and Tricks for Beginners
        - Hands-On with Numpy
    - **Matplotlib & Seaborn (Data Visualization)**
        - Must-Know Data Visualization Techniques
        - Exploratory Data Analysis (EDA) Guide
        - **Matplotlib**
            - Beginner Guide to Matplotlib
            - Introduction to Matplotlib Using Python
            - Quick Matplotlib Tips for Beginners
        - **Seaborn and SciPy**
            - Comprehensive Data Visualization Guide
            - Beginner's Guide to Seaborn
            - Scipy in Python

Week 3-4: Core Machine Learning Part 1

- **Outliers & Data Preprocessing**
    - Detecting and Treating Outliers
    - Outlier Detection in Python (PyOD)
    - Z-Score Method for Dealing with Outliers
- **Machine Learning Pipeline**
    - Build Your First ML Pipeline
- **Evaluation Metrics**
    - Confusion Matrix in Machine Learning
    - Precision and Recall in Machine Learning
    - AUC-ROC Curve Explained
- **Linear Models**

    - Your First Machine Learning Model - Linear Regression
    - Understanding Cost Function and Gradient Descent
    - Lasso and Ridge Regularization
    - Support Vector Machines (SVM)
        - Support Vector Machines (SVM): A Complete Guide for Beginners
        - One-Class SVM for Anomaly Detection
        - SVM Kernels: In-Depth Intuition and Practical Implementation

Month 2: Machine Learning Intermediate and Introduction to Deep Learning

Week 5: Core Machine Learning Part 2

- **Model Selection and Evaluation**
    - Selecting the Right Model: Bias Variance Tradeoff
    - Introduction to Overfitting and Underfitting
    - Understanding K Fold Cross Validation
    - Hyperparameter Tuning
- **Algorithms and Techniques**
    - Knn
    - Decision Tree
    - Naive Bayes
    - Basics of Ensemble Techniques
- **Dimensionality Reduction and Feature Selection**
    - Introduction to Feature Selection
    - Advance Dimensionality Reduction
- **Unsupervised Learning**
    - Unsupervised Machine Learning Methods
    - Understanding K-Means
- **Machine Learning Interpretability**
    - Introduction to Machine Learning Interpretability

Week 6: Deep Learning Basics

- **Introduction to Deep Learning Concepts**
  - Introduction to Deep Learning
  - Feed Forward Networks
- **Core Components of Deep Learning**
  - Gradient Descent
  - Loss Function
  - Activation Functions
  - Optimizers
  - Learning Rate Schedulers
- **Frameworks and Tools**
  - Introduction to PyTorch

Week 7-8: NLP and Transformers

- **Introduction to NLP Concepts**
  - Introduction to NLP
  - Text Pre-processing
- **NLP Courses**
  - Building a Text Classification Model with Natural Language Processing - Free Course
  - Exploring Natural Language Processing (NLP) using Deep Learning
- **NLP Libraries**
  - SpaCy Tutorial: Learn Natural Language Processing
  - Topic Identification with Gensim Library Using Python
- **Topic Modeling**
  - Beginner's Guide to Topic Modeling in Python
- **Text Representation**
  - One-Hot Encoding vs Label Encoding Using Scikit-Learn
  - Step-by-Step Guide to Master NLP Text Vectorization Approaches
- **Word Vectors**
  - Word Embeddings: Count vs Word2Vec
  - Pretrained Word Embeddings in NLP

- **Language Modeling**
  - Comprehensive Guide to Language Models in NLP
- **Sequence Models and RNNs**
  - Why Sequence Models?
  - Introduction to RNN
  - What is Long Short Term Memory (LSTM)
  - What is Gated Recurrent Unit (GRU)?
- **Self-Attention and Transformers**
  - Understanding Transformers: State-of-the-Art Models in NLP
  - An Explanatory Guide to BERT Tokenizer
  - Implementation of Attention Mechanism for Caption Generation on Transformers Using TensorFlow
- **BERT and Large Language Models**
  - Demystifying BERT: Groundbreaking NLP Framework
  - 6 Pretrained Models for Text Classification

Month 3: Computer Vision and Introduction to Generative AI

Week 9-10: Everything in Computer Vision

- **Computer Vision Courses**
  - Building Your First Computer Vision Model
- **Introduction to Computer Vision**
  - Introduction to Computer Vision
  - Image Processing
  - Interesting Applications of OpenCV
- **Understanding CNN Architectures**
  - Understanding CNN Architecture
  - AlexNet
  - VGG16
  - Understanding Inception Modules
  - ResNets

    - How to Code Your ResNet From Scratch in TensorFlow
    - Building ResNet-34 Model Using PyTorch
- **Object Detection**
    - Introduction to Object Detection
    - Region Based Convolutional Neural Network
    - Fast R-CNN and Faster R-CNN
    - YOLO
    - How to Use YOLOv5 Object Detection Algorithm for Custom Object Detection
    - How to Train a Custom Object Detection Model With YOLOv7
- **Image Segmentation**
    - Image Segmentation
    - Introduction to Image Segmentation part 2
- **Image Generation**
    - Generative Adversarial Networks(GANs): End-to-End Introduction
    - Realistic Face Restoration With GFP-GAN and DFDNet
    - Creating Stylized Sketches of Faces Using JoJoGAN

Week 11-12: Introduction to Generative AI

- **Introduction to Generative AI**
    - Introduction to Generative AI
    - No-code Generative AI App Development
    - Code-focused Generative AI App Development
    - Introduction to Responsible AI
- **Large Language Models (LLMs)**
    - What are Large Language Models?
    - Foundation Models
- **Popular LLMs**
    - GPT Models
    - Mistral
    - Llama
    - Gemini
- **Open Source LLMs**

    - Top Open Source LLMs
    - Large Language Models on Hugging Face
- **Hallucination in LLMs**
    - Hallucinations in LLMs
- **Indic LLMs**
    - LLMs Built in India
- **Gemini**
    - Google Gemini API
    - Building a Conversational QA Chatbot with Gemini Pro Free API
- **Resources**
    - LLM Books
- **Small Language Models (SLMs)**
    - Phi 3.5 SLMs
    - Smallest LLMs You Can Run on Local Devices
    - What are Small Language Models (SLMs)?

Introduction to Generative AI and LLMs (COURSES)

- Generative AI - A Way of Life - Free Course
- Getting Started with Large Language Models
- Reimagining GenAI: Common Mistakes and Best Practices for Success

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Month 4: Popular LLMs and Prompt Engineering

Week 13: Llama

- **Llama**
    - Getting Started with Llama 2
    - Document Parsing with LlamaParse
    - How to Run Llama 3 Locally
    - Llama 3.2 Models

- GPT-4 vs Llama 3.1
- Llama 3.1 Storm 8B
- Llama 3 vs Llama 3.1
- Tool Calling in Llama 3.1
- Meta Llama 3.1
- Ways to Use Llama 3

Week 14: Everything about OpenAI and Anthropic

- **OpenAI**
  - O1 Preview vs O1 Mini
  - GPT-4O vs OpenAI O1
  - How to Access OpenAI O1
  - OpenAI O1
  - GPT-4O Mini
  - Claude 3 Sonnet vs ChatGPT 3.5
- **Anthropic and Claude Models**
  - Anthropic's Contextual RAG
  - Anthropic Prompt Engineering Course
  - Claude 3.5 Sonnet
  - Anthropic Unveils Their Fastest AI Model: Claude Haiku

Week 15: Hands On LLMs

- **Applications**
  - Build a Text Summarizer Using LLMs with Hugging Face
  - How to Use Llama 3 as Copilot in VS Code for Free
  - How to Build Different LLM Applications?

Generative AI Applications (COURSES)

- Creating Problem-Solving Agents Using GenAI for Action Composition
- GenAI Applied to Quantitative Finance: For Control Implementation
- Learning Autonomous Driving Behaviors with LLMs & RL

- Mastering Multilingual GenAI - Open Weights for Indic Languages
- **Interview Questions**
    - LLM Interview Questions

Week 16: Prompt Engineering and Introduction to RAG

- **Introduction to Prompt Engineering**
    - What is Prompt Engineering?
    - What is Prompt Engineering Guide?
    - How to Harness the Full Potential of ChatGPT: Tips & Prompts
    - OpenAI's Guide to Prompt Engineering
- **Advanced Prompting Techniques**
    - 17 Prompting Techniques to Supercharge Your LLMs
    - Out-of-the-Box ChatGPT Prompts
    - Power of LLMs: Zero-Shot and Few-Shot Prompting
    - One-Shot Prompting
    - What is Chain of Thought Prompting and Its Benefits?
    - OpenAI's Guide to PromOpenAI's Guide to Prompt Engineeringpt Engineering
- **Thought-Based Prompting Strategies**
    - Tree of Thoughts
    - Skeleton of Thoughts
    - Chain of Emotion in Prompt Engineering
- **Prompt Engineering for Specific Applications**
    - How to Generate Images Using Stable Diffusion
- **Resources on Prompt Engineering**
    - Top Best Prompt Engineering Books
- **LLM Parameters and Optimization**
    - LLM Parameters

Building LLM Applications (COURSES)

- Building LLM Applications using Prompt Engineering - Free Course
- Framework to Choose the Right LLM for Your Business

- Coding a ChatGPT-Style Language Model from Scratch in PyTorch

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Month 5: RAG and Finetuning

Week 17: Introduction to RAG (Retrieval-Augmented Generation)

- **Introduction to RAG**
  - Introduction to RAG Systems
  - Evaluation of RAG Systems
  - Retrieval-Augmented Generation (RAG) in AI
  - A Beginner's Guide to Evaluating RAG Pipelines Using RAGAS
- **RAG Systems and Techniques**
  - Guide to Building Multimodal RAG Systems
  - Enhancing RAG with Hypothetical Document Embedding
  - Advanced RAG Technique: LangChain ReAct and Cohere
  - Improving Real-World RAG Systems

Week 18: RAG Frameworks and Tools

- **LangChain**
  - **Introduction to LangChain**
    - Intro to the LangChain Ecosystem
    - LangChain Guide
  - **Core Concepts and Components**
    - Core Components of LangChain
    - Applications of LCEL Chains
  - **Advanced Applications**
    - Implement Huggingface Models Using LangChain
    - RAG Using LangChain
    - LangGraph: Revolutionizing AI Agent

        - LangSmith: Ultimate Guide
        - Building LLM-Powered Applications with LangChain
        - Multi-Modal RAG Pipeline with LangChain
        - RAG and Streamlit Chatbot: Chat with Documents Using LLM
- **LlamaIndex**
    - **Introduction to LlamaIndex**
        - Getting Started with LlamaIndex
    - **Core Concepts and Applications**
        - RAG Pipeline with the Llama Index
    - **Advanced Approaches**
        - Multi-Document Agentic RAG Using LlamaIndex
        - Advanced Approaches for Powerful RAG Systems
    - **Agentic RAG Systems**
        - Building Agentic RAG Systems with LangGraph
        - Multi-Document Agentic RAG Using LlamaIndex
        - Building LLM Agent Using Advanced RAG Techniques

Retrieval-Augmented Generation (RAG) (COURSES)

- Building Production-Ready RAG Systems Using LlamaIndex
- Building Your First RAG System Using LlamaIndex - Free Course
- Improving Real-World RAG Systems: Key Challenges & Practical Solutions

- **Projects**
    - Build a Travel Assistant Chatbot
    - Build Your Own Translator with LLMs and Hugging Face
    - LangChain Chatbot with Memory
    - Multilingual Chatbot Using LLMs
    - Projects on LLM

Week 19-20: Training LLM from Scratch and Fine Tuning LLMs

Training LLMs from Scratch

- Beginner's Guide to Build Large Language Models from Scratch

Finetuning LLMs

- **Introduction to Finetuning**
  - Introduction to Finetuning LLMs
  - Fine-Tuning Large Language Models
- **Fine-Tuning Techniques**
  - LORA: A Comprehensive Guide to Fine-Tuning LLMs
  - LLM Fine-Tuning with PEFT Techniques
  - LoRA and QLoRA
- **Tools for Finetuning**
  - Using Unsloth for Fine-Tuning Google Gemma
  - Using Huggingface for Fine-Tuning
- **Fine-Tuning LLaMA 3**
  - Fine-Tune LLaMA 3 Using Direct Preference Optimization
  - Fine-Tuning LLaMA 3 for Sequence Classification
- **Custom Model Fine-Tuning and Deployment**
  - Fine-Tune and Deploy Custom PaliGemma Model
- **LLM Evaluation**
  - How to Evaluate a Large Language Model (LLM)

Month 6: Diffusion Models - Multimodal LLMs

Week 21: Getting started with Diffusion Model

- **Introduction to Diffusion Models**
  - What are Diffusion Models?
  - Introduction to Stable Diffusion
- **Image Generation with Stable Diffusion**
  - Generating Image Using Stable Diffusion

    - Prompt Engineering Concepts for Stable Diffusion
- **Other Diffusion-Based Tools**
    - MidJourney
    - Understanding DALL·E 3
- **Diffusion Models**
    - Stable Diffusion 3
    - How to Generate and Edit DALL·E Images in Copilot
- **Diffusion Models: Core Components and Processes**
    - Different Components of Diffusion Models
    - Positional Encoding in Stable Diffusion
    - Noise Schedules in Stable Diffusion
    - Reverse Diffusion Process
    - Forward Process in Stable Diffusion

Stable Diffusion and Image Generation (COURSES)

- Exploring Stability.AI
- MidJourney: From Inspiration to Implementation
- Nano Course: Dreambooth-Stable Diffusion for Custom Images

Week 22-23: Multimodal LLMs and Agentic AI

- **Multimodal LLMs**
    - LLaMA 3.2 90B vs GPT-4O
    - Multimodal Chatbot with GPT-4O
    - Building an Image Data Extractor Using Gemini Vision LLM
    - Pixtral 12B
- **Agentic AI**
    - LangChain's Agent Framework
    - Build AI Agents from Scratch
    - LLaMA Agents: Agents as a Service
    - Agentic Workflow with CreWAI and Groq
    - Build an AI Coding Agent with LangGraph by LangChain
    - Building Smart AI Agents with LangChain

    - AI Agent Frameworks
    - Agentic Design Patterns
    - Agentic Frameworks for Generative AI Applications
    - Build Multi-Agent System

Week 24: Projects

- Build a Travel Assistant Chatbot
- Multilingual Chatbot Using LLMs
- LangChain Chatbot with Memory
- Build Your Own Translator with LLMs and Hugging Face