



GEN AI CAREER TRACK – 2025 EDITION

"Building Intelligent Systems for the Future"

Market Demand Note

Generative AI is transforming industries by enabling **content creation, automation, and human-like interaction.**

The market for Generative AI is projected to grow from **\$44B in 2023 to \$1.3T by 2032**, driven by demand for **LLM-powered apps, synthetic media, and autonomous agents.**

Duration: 4–5 Months | **Mode:** Online/Offline

Gen AI Engineer Career Track — 2025 Edition

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Module 1: Introduction to Generative AI (8 Hours)

What You'll Learn

- What is Generative AI? How it's different from traditional (discriminative) machine learning.
- Evolution of GenAI: Key breakthroughs—GANs, VAEs, Diffusion, LLMs.
- Current Applications: In content creation, customer service, healthcare, e-commerce, entertainment.
- Bengaluru Scene: Local startups, companies, and use cases (Flipkart, Swiggy, edtech, healthcare).
- Ethics & Responsibility: Copyright, deepfakes, misinformation, bias, Indian law/policy.
- Career Landscape: Roles, salaries, and skills in demand.

Why This Matters

- Industry transition: Most companies now have GenAI teams; Bangalore is the epicenter for AI product development in India.
- Ethics is non-negotiable: Responsible AI is mandatory for hiring in 2025.
- Business value: You'll learn to spot real ROI-driven GenAI projects.

Practical Exercises

- Research assignment: Map 3 GenAI use cases for Indian healthcare, e-commerce, and finance—pros/cons, business impact, risks.
 - Workshop: Debate AI ethics with peers—copyright, regulation, and practical mitigation strategies.
 - Guest lecture: Invite a local GenAI startup founder for a Q&A (recorded/virtual if not in person).
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Module 2: Python & AI Foundations (10 Hours)

What You'll Learn

- Python Core: Functions, lists, dicts, classes, decorators, error handling, logging.
- Data Engineering: NumPy for tensors, Pandas for tabular data, Polars for big data.
- Visualization: Matplotlib/Seaborn for EDA, Plotly for dashboards.
- APIs & JSON: Async requests, pagination, caching, rate limits.
- Cloud-Native Dev: Virtualenv, Docker basics, GitHub, CLI tools.

Why This Matters

- Python is table stakes for GenAI roles in Bangalore.
- Production-grade code is a hard requirement—no Jupyter-only data scientists.
- APIs are everywhere: All modern GenAI platforms are API-first.
- You'll stand out: Most applicants don't know async, logging, or Docker.

Practical Exercises

- Lab 1: Build a Python pipeline that scrapes product data from an Indian e-commerce API (e.g., Flipkart, Amazon India), cleans it, and visualizes sales trends—with robust error handling and logging.
 - Lab 2: Write a Dockerfile to containerize your data pipeline.
 - Lab 3: Use async requests to fetch data from multiple APIs in parallel (e.g., weather + news + product data).
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Module 3: Mathematics for Generative Models (12 Hours)

What You'll Learn

- Linear Algebra: Vectors, matrices, tensor operations, SVD, eigendecomposition.
- Probability: Distributions, Bayes' rule, Markov chains.
- Calculus: Derivatives, gradients, backpropagation, optimization.
- Information Theory: Entropy, KL divergence, GAN/VAE loss functions.
- Code from Scratch: No frameworks—just Python + NumPy.

Why This Matters

- You can't debug GenAI without knowing the math.
- Interviewers grill you on backprop, gradients, and loss landscapes.
- Real R&D roles require you to modify model architectures—not just call `model.fit()`.

Practical Exercises

- Lab 1: Implement a 2-layer neural network from scratch (forward pass, backward pass, training loop) on CPU using only NumPy.
- Lab 2: Visualize loss landscapes for different activation functions and optimizers.
- Lab 3: Derive and implement KL divergence and cross-entropy loss for a toy VAE/GAN.

Module 4: Machine Learning Essentials for GenAI (10 Hours)

What You'll Learn

- ML Types: Supervised vs. unsupervised, clustering, regression, classification.
- Feature Engineering: Text, image, and audio feature extraction, normalization, embeddings.
- Evaluation Metrics: BLEU, FID, Inception Score, CLIP score, human evaluation.
- Pre-training Tasks: Sentiment, topic, intent classification as foundation for LLMs.

Why This Matters

- GenAI is built on ML: You need to know what's under the hood.
- Evaluation is hard: Most GenAI projects fail because teams don't measure the right things.

- Pre-training matters: Fine-tuning LLMs works best when you start with a strong base model.

Practical Exercises

- Lab 1: Preprocess and featurize a multilingual Indian social media dataset (e.g., Twitter, Reddit India) for sentiment classification.
 - Lab 2: Train and evaluate a classifier—compare traditional ML (scikit-learn) vs. simple neural net (PyTorch).
 - Lab 3: Implement BLEU/ROUGE scoring for a text generation task.
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Module 5: Deep Learning Foundations (12 Hours)

What You'll Learn

- Neural Nets: Perceptrons, activation functions, loss, optimization.
- CNNs: Convolution, pooling, ResNet, EfficientNet.
- RNNs/LSTMs: Sequence modeling, time series, text generation.
- Transformers: Self-attention, multi-head, positional encoding, encoder/decoder.
- Training Tricks: Mixed precision, gradient clipping, LR scheduling, early stopping.

Why This Matters

- Transformers power GenAI: You must understand attention and self-attention.
- Architecture choice makes/breaks your model's performance and cost.
- Debugging skills are essential for real-world model development.

Practical Exercises

- Lab 1: Train a CNN from scratch on an Indian image dataset (e.g., products, landmarks).
 - Lab 2: Implement an LSTM for Indian language text generation.
 - Lab 3: Build and train a tiny transformer (encoder-only) for Indian language text completion—visualize attention heads.
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Module 6: Text Generation & LLMs (14 Hours)

What You'll Learn

- Open-Source LLMs: Llama 2, Mistral, BERT, T5, multilingual models.
- Prompt Engineering: Zero-shot, few-shot, chain-of-thought, constitutional AI.
- LangChain/LlamaIndex: Agents, tools, memory, document retrieval.
- Fine-tuning: LoRA, QLoRA, adapter methods, dataset prep.
- RAG: ChromaDB, FAISS, semantic search, hybrid retrieval.

Why This Matters

- Bangalore is LLM central: Every product team wants RAG, fine-tuning, and agents.
- Prompt engineering is a core skill—not just for ChatGPT but for production systems.
- You'll be deploy-ready: Most courses don't teach RAG or fine-tuning on real data.

Practical Exercises

- Lab 1: Fine-tune Mistral/Llama 2 on an Indian domain dataset (e.g., legal FAQs, medical transcripts).
- Lab 2: Build a custom Q&A bot with LangChain + RAG (ChromaDB/FAISS) for Indian legal/medical docs.
- Lab 3: Implement prompt chaining to solve multi-step reasoning problems.

Module 7: Image Generation & Diffusion Models (12 Hours)

What You'll Learn

- GANs: DCGAN, StyleGAN, training dynamics, mode collapse.
- VAEs: Latent space, reconstruction loss, disentanglement.
- Diffusion Models: Denoising, scheduler, classifier-free guidance.
- Stable Diffusion: Text-to-image, image-to-image, ControlNet, LoRA fine-tuning.
- Optimization: Quantization, distillation, ONNX/TensorRT.

Why This Matters

- Visual GenAI is exploding: E-commerce, gaming, marketing, art all need these skills.
- You'll learn to optimize—critical for cost-sensitive Indian startups.

- Custom fine-tuning is a key differentiator for job applications.

Practical Exercises

- Lab 1: Train a DCGAN on an Indian product image dataset.
 - Lab 2: Fine-tune Stable Diffusion with LoRA on Indian art/motifs—build a Streamlit app for users to generate custom images.
 - Lab 3: Quantize a diffusion model for faster, cheaper inference.
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Module 8: Audio & Video Generation (10 Hours)

What You'll Learn

- Audio Synthesis: WaveNet, Tacotron, HiFi-GAN, Bark, MusicGen.
- Voice Cloning: OpenVoice, VoiceCraft, coqui-tts.
- Video Generation: Deforum, Runway ML, AnimateDiff.
- Multimodal Pipelines: Lip-sync, talking avatars, sound effects.

Why This Matters

- Audio/video GenAI is the next frontier—very few engineers have these skills.
- Indian market: Voice cloning in local languages, film/animation, edtech video generation are all hot.
- You'll be a full-stack GenAI engineer—not just text or image.

Practical Exercises

- Lab 1: Build a podcast intro generator—voice clone in Hindi/Kannada/Tamil + AI music.
 - Lab 2: Generate a short AI video from a script using Deforum/RunwayML.
 - Lab 3: Create a talking avatar with lip-sync for an edtech demo.
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Module 9: Multimodal AI Systems (12 Hours)

What You'll Learn

- CLIP Models: Embedding spaces, similarity search, zero-shot classification.
- Multimodal LLMs: LLaVA, GPT-4V, InstructBLIP.

- Applications: E-commerce search, edtech tutors, gaming NPCs, virtual assistants.
- Deployment: Edge/cloud, real-time, cost optimization.

Why This Matters

- Multimodal = future-proof: Unicorns want engineers who can fuse text, image, audio.
- You'll build real products: Not just demos—scalable systems.
- Bengaluru startups are racing to launch multimodal AI for Indian languages/contexts.

Practical Exercises

- Lab 1: Build a cross-modal search engine for Indian e-commerce (text + image query → product results).
- Lab 2: Create a virtual tutor that explains STEM concepts with generated diagrams + voice.
- Lab 3: Deploy a multimodal chatbot for a local business (text + image in, text + audio out).

Module 10: AI Deployment & MLOps for Generative AI (10 Hours)

What You'll Learn

- MLflow/DVC: Experiment tracking, model registry.
- Docker: Multi-stage builds, GPU support, security.
- Kubernetes: Pods, services, autoscaling, GPU scheduling.
- FastAPI: REST/WebSocket, streaming, rate limiting.
- Monitoring: Prometheus/Grafana, drift detection, alerting.

Why This Matters

- Deployment is the bottleneck: Most GenAI projects die in POC hell.
- You'll be production-ready: Critical for Bangalore tech interviews.
- Cost matters: Learn to optimize inference for Indian budgets.

Practical Exercises

- Lab 1: Containerize a Stable Diffusion model with Docker.

- Lab 2: Deploy as a scalable API on Kubernetes with FastAPI.
 - Lab 3: Set up monitoring/alerts for model performance and drift.
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Module 11: Capstone Projects (15 Hours)

What You'll Learn

- End-to-end product development: From idea to deployed demo.
- Teamwork and agile practices: Real-world collaboration.
- Business thinking: ROI, UX, scalability, ethics.

Project Ideas

- Personalized Children's Story Generator: Illustrated stories with Indian characters/contexts.
- AI Product Designer: 3D models + visuals from descriptions (e-commerce focus).
- Multilingual Video Tutor: Educational videos with captions/voices in Indian languages.
- AI News Anchor: Realistic news videos from text, with Indian accents/languages.
- Fashion AI: Generate/recommend clothing patterns from Indian trend data.

Assessment

- GitHub portfolio
 - Live demo
 - Technical documentation
 - Business impact analysis
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Module 12: Career Preparation (5 Hours)

What You'll Learn

- Portfolio Building: Showcase GenAI projects with clear READMEs, demos, videos.
- Resume/LinkedIn: Tailor for AI roles in India—keywords, quantifiable impact.
- Hackathons: Local/global GenAI competitions.

- Technical Interviews: Coding, system design, ethics—mock interviews with feedback.

Practical Exercises

- Mock interviews with alumni/industry mentors.
- Portfolio review—get actionable feedback.
- LinkedIn profile audit—optimize for recruiters.