



CERTIFIED AIML ENGINEER TRAINING PROGRAM

Duration -: 3-Months

AI Engineer Training Curriculum

Goal

This comprehensive 3-month curriculum is designed to transform individuals with foundational programming knowledge into highly proficient, job-ready AI Engineers. It aims to equip them with the skills to design, develop, and deploy advanced AI solutions, including specialized areas like LLM fine-tuning and complex Agentic AI systems.

Target Audience

This curriculum is ideal for aspiring AI Engineers, Machine Learning Engineers, and Data Scientists who possess basic programming skills and a foundational understanding of AI/ML concepts. It also caters to professionals seeking to specialize in advanced AI development and deployment.

Learning Methodology

Each day will incorporate a blend of theoretical deep dives, hands-on labs, coding challenges, tool mastery sessions, and project-based learning. The curriculum emphasizes practical application, problem-solving, and the adoption of industry best practices through real-world case studies.

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Monthly Breakdown and Daily Schedule

Month 1: AI/ML Foundations & Core Engineering (Days 1-30)

Goal: Reinforce Python for data science, establish strong AI/ML fundamentals, and introduce basic machine learning and deep learning concepts.

Day	Topic	Key Concepts
Day 1	Introduction to AI, ML, and Deep Learning	What is AI, ML, DL? History, applications, ethical considerations.
Day 2	Python Refresher for Data Science	Data types, control flow, functions, object-oriented programming basics.
Day 3	NumPy for Numerical Computing	Arrays, array operations, broadcasting, linear algebra with NumPy.
Day 4	Pandas for Data Manipulation	DataFrames, Series, data loading, cleaning, manipulation, aggregation.
Day 5	Data Visualization with Matplotlib & Seaborn	Basic plots, statistical plots, customizing visualizations.
Day 6	Introduction to Statistics for ML	Descriptive statistics, probability, hypothesis testing basics.
Day 7	Week 1 Review & Mini-Project	Consolidate Week 1 concepts.
Day 8	Supervised Learning: Regression	Linear Regression, Polynomial Regression, evaluation metrics (MAE, MSE, R2).
Day 9	Supervised Learning: Classification	Logistic Regression, Decision Trees, evaluation metrics (accuracy, precision, recall, F1-score).
Day 10	Model Evaluation & Hyperparameter Tuning	Cross-validation, Grid Search CV, Randomized Search CV.
Day 11	Unsupervised Learning: Clustering	K-Means, Hierarchical Clustering, DBSCAN.
Day 12	Introduction to Deep Learning	Neural network basics, perceptrons, activation functions, backpropagation (conceptual).
Day 13	Building Simple Neural Networks	Feedforward networks, layers, training process.

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Day 14	Week 2 Review & Mini-Project	Consolidate Week 2 concepts.
Day 15	Natural Language Processing (NLP) Fundamentals	Text preprocessing, tokenization, word embeddings (Word2Vec, GloVe).
Day 16	Introduction to Large Language Models (LLMs)	Transformer architecture (conceptual), LLM types, applications.
Day 17	Prompt Engineering	Crafting effective prompts, few-shot learning, chain-of-thought prompting.
Day 18	Computer Vision (CV) Basics	Image processing, CNNs (conceptual), image classification.
Day 19	Introduction to MLOps	CI/CD for ML, version control for models and data, experiment tracking.
Day 20	Model Deployment & Monitoring (Conceptual)	REST APIs for models, Docker for containerization, basic monitoring
Day 21	Week 3 Review & Mini-Project	Consolidate Week 3 concepts.
Day 22	Retrieval Augmented Generation (RAG) Systems	RAG architecture, vector databases, integrating LLMs with external knowledge.
Day 23	Advanced RAG Implementation	Fine-tuning RAG components, evaluation of RAG systems.
Day 24	Introduction to Agentic AI	AI agents, planning, tool use, multi-agent systems (conceptual).
Day 25	Building a Simple AI Agent	Defining agent capabilities, integrating tools.
Day 26	End-to-End Project Development	Project planning, data acquisition, model building, deployment considerations.
Day 27	Capstone Project Work & Refinement	Continue working on the capstone project, focus on code quality and documentation.
Day 28	Portfolio Building & Resume Preparation	Showcasing projects, writing effective resumes, LinkedIn optimization.
Day 29	Interview Preparation & Mock Interviews	Common AI/ML interview questions, behavioral questions, technical challenges.
Day 30	Final Review & Next Steps	Recap of the entire curriculum, continuous learning strategies, career paths.

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Month 2: Advanced AI, MLOps & LLM Engineering (Days 31-60)

Goal: Dive deeper into advanced AI concepts, master MLOps principles for production-grade AI, and begin specialized training in Large Language Models (LLMs).

Day	Topic	Key Concepts
Day 31	Advanced NLP: Transformers in Depth	Attention mechanism, encoder-decoder architecture, BERT, GPT.
Day 32	Advanced NLP: Fine-tuning Pre-trained Models	Transfer learning, domain adaptation, PEFT (Parameter-Efficient Fine-Tuning).
Day 33	Advanced Computer Vision: CNN Architectures	ResNet, VGG, Inception, transfer learning in CV.
Day 34	Object Detection & Segmentation Basics	YOLO, R-CNN (conceptual), semantic vs. instance segmentation.
Day 35	ML Ops: CI/CD for Machine Learning	Automated testing, model registry, continuous training.
Day 36	ML Ops: Data Versioning & Experiment Tracking	DVC for data versioning, MLflow for experiment tracking.
Day 37	ML Ops: Model Monitoring & Explain ability	Drift detection, performance monitoring, SHAP, LIME.
Day 38	Containerization with Docker for ML	Dockerfiles, Docker Compose, building and running ML applications in containers.
Day 39	Orchestration with Kubernetes (Conceptual)	Pods, deployments, services, scaling ML workloads.
Day 40	Cloud ML Platforms: AWS SageMaker	Overview of SageMaker services, training jobs, endpoints.
Day 41	Cloud ML Platforms: GCP AI Platform/Vertex AI	Overview of Vertex AI, managed datasets, model deployment.
Day 42	Week 6 Review & Advanced Project	Consolidate Month 2 concepts.
Day 43	LLM Architecture Deep Dive	Encoder-decoder, decoder-only models, attention mechanisms, tokenization.

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Day 44	Advanced Prompt Engineering Techniques	Chain-of-Thought, Tree-of-Thought, self-consistency, prompt chaining.
Day 45	LLM Fine-tuning: Parameter-Efficient Methods (PEFT)	LoRA, QLoRA, understanding their application and benefits.
Day 46	LLM Fine-tuning: Data Preparation & Evaluation	Dataset curation, instruction tuning, evaluation metrics for LLMs.
Day 47	Vector Databases for RAG	Pinecone, ChromaDB, FAISS – indexing, querying, and managing embedding's.
Day 48	Advanced RAG Architectures	Hybrid search, re-ranking, multi-hop RAG.
Day 49	LLM Deployment Strategies	API-based deployment, on-premise deployment, cost optimization.
Day 50	Ethical AI & Responsible LLM Development	Bias detection, fairness, privacy, safety in LLMs.
Day 51	Week 7 Review & Advanced LLM Project	Consolidate LLM concepts.
Day 52	Reinforcement Learning from Human Feedback (RLHF) Conceptual	Understanding the process and its role in LLM alignment.
Day 53	Generative AI beyond Text: Image & Audio	Diffusion models, GANs (conceptual), text-to-image/audio.
Day 54	Edge AI & TinyML (Conceptual)	Deploying ML models on edge devices, optimization for resource-constrained environments.
Day 55	Graph Neural Networks (GNNs) Conceptual	Introduction to graph data, GNN architectures, applications.
Day 56	Time Series Analysis with ML	ARIMA, Prophet, recurrent neural networks (RNNs) for time series.
Day 57	Federated Learning (Conceptual)	Privacy-preserving ML, distributed training.
Day 58	Advanced Data Engineering for AI	Data pipelines, ETL, data lakes, data warehousing.
Day 59	Cloud Cost Optimization for AI Workloads	Strategies for managing cloud spending on ML training and inference.
Day 60	Month 2 Review & Mid-Program Assessment	Comprehensive review of Month 2 topics.

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Month 3: Specialization, Advanced Deployment & Agentic AI (Days 61-90)

Goal: Specialize in advanced LLM techniques, explore complex Agentic AI systems, implement robust deployment strategies, and prepare for senior AI engineering roles.

Day	Topic	Key Concepts
Day 61	Advanced LLM Fine-tuning: Full Fine-tuning & Distillation	When to use full fine-tuning, model distillation for smaller models.
Day 62	LLM Evaluation Beyond Perplexity	Human evaluation, ROUGE, BLEU, BERTScore, MMLU.
Day 63	Multi-Modal LLMs (Conceptual)	Integrating text with images/audio, CLIP, DALL-E.
Day 64	Advanced Agentic AI: Multi-Agent Systems	Agent communication, coordination, emergent behavior.
Day 65	Agentic AI: Tool Integration & Function Calling	Giving agents access to external tools and APIs.
Day 66	Agentic AI: Planning & Reasoning	ReAct, CoT, self-correction mechanisms in agents.
Day 67	Advanced MLOps: Production Monitoring & Alerting	Setting up robust monitoring, anomaly detection, alerting systems.
Day 68	Advanced MLOps: A/B Testing & Canary Deployments	Strategies for rolling out new models, experimentation.
Day 69	Model Security & Adversarial Attacks	Robustness against adversarial examples, data poisoning.
Day 70	Responsible AI & Governance	AI ethics frameworks, regulatory compliance, explainable AI.
Day 71	Week 10 Review & Advanced Agentic Project	Consolidate Agentic AI concepts.
Day 72	Building Scalable AI Infrastructure	Distributed training, GPU optimization, cloud infrastructure management.
Day 73	Real-time Inference & Low-Latency Systems	Optimizing models for speed, streaming data processing.
Day 74	Data Governance & Privacy in AI	GDPR, CCPA, data anonymization, secure data handling.

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Day 75	Advanced Cloud ML Services Deep Dive	Specific features of AWS SageMaker, GCP Vertex AI, Azure ML for advanced use cases.
Day 76	Capstone Project: Planning & Architecture	Define project scope, choose technologies, design architecture.
Day 77	Capstone Project: Development - Phase 1	Implement core components, data integration.
Day 78	Capstone Project: Development - Phase 2	Model training, MLOps integration.
Day 79	Capstone Project: Development - Phase 3	Deployment, testing, documentation.
Day 80	Capstone Project: Refinement & Presentation Prep	Polish the project, prepare presentation, create demo.
Day 81	Portfolio Building: Advanced Strategies	Crafting compelling project narratives, showcasing impact.
Day 82	Resume & LinkedIn Optimization for Senior Roles	Tailoring for senior AI engineer positions, highlighting leadership.
Day 83	Advanced Interview Preparation: System Design	Preparing for system design interviews in AI.
Day 84	Advanced Interview Preparation: Behavioral & Leadership	Behavioral questions, leadership scenarios, team collaboration.
Day 85	Networking & Career Growth Strategies	Building professional connections, mentorship, continuous learning.
Day 86	Industry Trends & Future of AI	Emerging technologies, research frontiers, ethical implications.
Day 87	Open Source Contributions & Community Engagement	Contributing to open-source AI projects, participating in forums.
Day 88	Personal Branding for AI Professionals	Building an online presence, technical blogging, speaking engagements.
Day 89	Final Capstone Project Presentation	Presenting the end-to-end AI solution.
Day 90	Curriculum Review & Future Learning Path	Recap of the entire 3-month journey, identifying areas for further specialization.

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Major Tools Covered (Cumulative)

- **Programming Languages:** Python
- **Data Manipulation & Analysis:** NumPy, Pandas
- **Data Visualization:** Matplotlib, Seaborn
- **Machine Learning:** Scikit-learn
- **Deep Learning:** TensorFlow, PyTorch
- **Natural Language Processing:** NLTK, SpaCy, Hugging Face Transformers
- **Computer Vision:** OpenCV
- **LLM Frameworks:** LangChain, LlamaIndex
- **Vector Databases:** Pinecone, ChromaDB, FAISS
- **MLOps & Deployment:** Docker, Kubernetes, MLflow, DVC, AWS/GCP/Azure ML Platforms (SageMaker, Vertex AI, Azure ML), Flask/FastAPI, Prometheus, Grafana, GitHub Actions/GitLab CI
- **Development Environment:** Jupyter Notebooks, Google Colab, VS Code, Git
- **Advanced LLM Techniques:** LoRA, PEFT
- **Agentic AI Frameworks:** LangChain Agents, CrewAI (conceptual)
- **Big Data & Data Orchestration (Conceptual):** Apache Spark, Airflow

Assessment

Throughout the 3-month program, progress will be rigorously assessed through:

- **Daily Coding Exercises & Quizzes:** To reinforce learning and test comprehension.
- **Weekly Project Submissions:** Practical application of learned concepts.
- **Monthly Comprehensive Assessments:** Evaluating mastery of each month's curriculum.
- **Mid-Program Project (End of Month 1):** A significant project demonstrating foundational AI engineering skills.
- **Advanced Project (End of Month 2):** A complex project showcasing advanced MLOps and LLM engineering capabilities.
- **Final Capstone Project (End of Month 3):** A production-ready, end-to-end AI solution that integrates multiple advanced concepts and tools, demonstrating job-readiness for senior roles.
- **Continuous Portfolio Development:** Building a robust portfolio of completed projects, including detailed documentation and code.
- **Mock Interviews & Technical Challenges:** Preparing for real-world interview scenarios, including system design and behavioral questions.

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