Contents

1 Foundations of Artificial Intelligence

Day 1: Introduction to Artificial Intelligence

Explore what AI is, its history, types, and real-world applications. Set up your development environment (Python, Jupyter, Google Colab) and run your first AI demo using pre-trained models.

Day 2: Mathematics for AI - Linear Algebra

Understand vectors, matrices, linear transformations, and eigenvalues. Implement operations with NumPy and explore applications in image processing and dimensionality reduction.

Day 3: Mathematics for AI - Calculus & Probability

Learn derivatives, gradients, chain rule for backpropagation, probability distributions, and Bayes' theorem. Visualize gradient descent and implement optimization algorithms.

2 Machine Learning Fundamentals

Day 4: Introduction to Machine Learning

Discover ML paradigms (supervised, unsupervised, reinforcement), the ML workflow, train/validation/test splits, and overfitting. Build your first model using scikit-learn with linear regression.

Day 5: Regression Algorithms

Deep dive into linear, polynomial, Ridge, and Lasso regression. Learn evaluation metrics (MSE, RMSE, R^2) and build a housing price prediction project with feature engineering.

Day 6: Classification Algorithms I

Master logistic regression, K-Nearest Neighbors, and decision trees. Learn classification metrics (accuracy, precision, recall, F1) and build an email spam detection system.

Day 7: Classification Algorithms II

Explore Support Vector Machines, Naive Bayes, Random Forests, and ensemble methods. Apply these to image and text classification projects with cross-validation.

Day 8: Unsupervised Learning I

Learn clustering algorithms (K-Means, Hierarchical, DBSCAN) and evaluation metrics. Work on customer segmentation, image compression, and anomaly detection projects.

Day 9: Unsupervised Learning II

Master dimensionality reduction with PCA and t-SNE, association rule learning, and feature selection. Build recommendation systems and visualize high-dimensional data.

Day 10: Model Optimization & Selection

Learn hyperparameter tuning (Grid Search, Random Search, Bayesian optimization), feature engineering strategies, and build a complete end-to-end ML pipeline with AutoML introduction.

3 Deep Learning & Neural Networks

Day 11: Introduction to Neural Networks

Understand artificial neurons, perceptrons, activation functions, and forward propagation. Build neural networks from scratch and with TensorFlow/Keras for MNIST digit recognition.

Day 12: Training Neural Networks

Master backpropagation, gradient descent variants (SGD, Adam, RMSprop), loss functions, and learning rate scheduling. Monitor training with TensorBoard and debug neural networks.

Day 13: Improving Neural Networks

Learn regularization techniques (L1, L2, Dropout), batch normalization, weight initialization, and data augmentation. Prevent overfitting and build robust production-ready models.

Day 14: Convolutional Neural Networks (CNNs)

Explore convolution operations, pooling, CNN architectures (LeNet, VGG), and feature maps. Build custom image classifiers with transfer learning and introduction to object detection.

Day 15: Advanced Computer Vision

Master modern architectures (ResNet, Inception, EfficientNet), object detection (YOLO, R-CNN), semantic segmentation, and build real-time detection systems and face recognition.

Day 16: Recurrent Neural Networks (RNNs)

Learn sequence modeling, RNN architecture, LSTM and GRU cells, bidirectional RNNs. Apply to time series forecasting, text generation, and sentiment analysis projects.

Day 17: Natural Language Processing (NLP)

Study text preprocessing, tokenization, word embeddings (Word2Vec, GloVe), attention mechanism, and transformers. Build chatbots, NER systems, and text summarization tools.

4 Advanced Topics & Professional Practice

Day 18: Advanced NLP & Transformers

Deep dive into BERT and GPT architectures, fine-tuning transformer models, Hugging Face ecosystem, and prompt engineering. Build question-answering systems and machine translation.

Day 19: Generative AI

Explore Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs), and diffusion models. Generate synthetic images, augment datasets, and work with Stable Diffusion.

Day 20: Reinforcement Learning

Master RL fundamentals (Agent, Environment, Reward), Q-Learning, Deep Q-Networks, and policy gradients. Train game-playing AI with OpenAI Gym and build autonomous agents.

Day 21: MLOps & Model Deployment I

Learn ML lifecycle management, experiment tracking with MLflow, model versioning, CI/CD for ML, Docker containerization, and model monitoring best practices.

Day 22: MLOps & Model Deployment II

Build REST APIs with FastAPI/Flask, deploy to cloud platforms (AWS, GCP, Azure), use TensorFlow Serving, and implement scaling strategies with security best practices.

Day 23: AI Ethics & Responsible AI

Study bias and fairness, model interpretability (XAI), privacy-preserving AI, regulatory compliance (GDPR). Use LIME and SHAP for model explanation and conduct bias audits.

Day 24: Industry Applications & Case Studies

Explore AI in Healthcare, Finance, Manufacturing, and Retail. Work on industry-specific projects, develop business cases, and calculate ROI for AI implementations.

Day 25: Capstone Project Development & Presentations

Develop your end-to-end AI solution from problem definition to deployment. Present capstone projects, receive peer and industry feedback, build your AI portfolio, explore career guidance, certification opportunities, and join the AI community network.

"Artificial Intelligence is the new electricity." - Andrew Ng

From Zero to Hero in 25 Days!