

Comprehensive AI Knowledge Guide

Part 1: Introduction to AI (Beginner Level)

1. What is AI?

- Definition of AI.
- Types: Narrow AI, General AI, Super AI.
- Subfields: ML, DL, NLP, Computer Vision, Robotics.

2. Key Concepts and Terminology

- Algorithms, Data, Features.
- Training and Testing.
- Learning Types: Supervised, Unsupervised, Reinforcement.

3. Essential Tools and Platforms

- Python Programming, Libraries: NumPy, Pandas, Matplotlib.
- Platforms: Google Colab, Jupyter Notebooks.

Recommended Resources:

- Online Courses: Coursera, edX.
- Books: "Artificial Intelligence" by Michael Negnevitsky.

Part 2: Building the Foundation (Intermediate Level)

1. Machine Learning Basics

- Regression: Linear, Logistic.
- Classification: KNN, Decision Trees, SVM.
- Clustering: K-Means, Hierarchical.
- Evaluation Metrics: Accuracy, Precision, Recall.

2. Neural Networks Basics

- Neurons, Layers, Activation Functions.
- Feedforward Networks, Backpropagation.

3. Tools and Frameworks

- TensorFlow, PyTorch, scikit-learn.
- Visualization: Seaborn, Plotly.

Example Projects:

- Predict house prices with regression.
- Build a spam classifier.

Part 3: Diving Deeper (Advanced Level)

1. Deep Learning

- CNNs: Image Processing.
- RNNs, LSTMs: Time Series, NLP.
- Transformers: GPT Architecture.

2. Advanced Techniques

- Transfer Learning, Hyperparameter Tuning.
- GANs, Reinforcement Learning.

3. Deployment and Scalability

- Flask, FastAPI for Model Deployment.
- Optimization: ONNX, Quantization.

Example Projects:

- Image Classifier with CNNs.
- Chatbot using Transformers.
- Game Agent with Reinforcement Learning.

Part 4: Specialized AI Topics

1. Natural Language Processing (NLP)

- Tokenization, Embeddings: Word2Vec, BERT, GPT.
- Sentiment Analysis, Text Summarization.

2. Computer Vision

- Image Segmentation, Object Detection: YOLO.
- Facial Recognition.

3. Ethical AI

- Bias, Explainability, Governance.

Advanced Applications:

- AI for Healthcare, Climate Models.
- Cutting-edge Research on arXiv.org.

Part 5: Mastery (Expert Level)

1. Research and Development

- Replicate Research Papers.
- Contribute to Open-Source Projects.

2. Advanced Mathematics

- Calculus, Linear Algebra.

- Bayesian Learning, Optimization.

3. Real-World Applications

- End-to-End Systems, Distributed Computing.

Final Projects:

- Disease Detection from Images.
- Autonomous Driving Simulator.
- Multi-lingual Virtual Assistant.