**Study Plan for AI (Science + Engineering)**

*Total Time: 6 hours/day*  
*Full-Time Dedication: 20–40 hours/week*

**Months 1-3: Foundation (AI Science + Engineering Basics)**

**Focus Areas:** Python Programming, Mathematics, Data Structures, and Algorithms

* **Weeks 1-4: Python Programming (Focus on AI)**
  + Week 1: Python basics (variables, control flow, functions)
  + Week 2: Data structures: lists, sets, dictionaries
  + Week 3: Introduction to libraries: NumPy, Pandas, Matplotlib
  + Week 4: OOP (Object-Oriented Programming) for AI
* **Weeks 5-8: Mathematics for AI**
  + Week 5: Linear Algebra (vectors, matrices, matrix operations)
  + Week 6: Calculus (derivatives, gradients, optimization)
  + Week 7: Probability (distributions, random variables, Bayes' Theorem)
  + Week 8: Statistics (mean, variance, standard deviation, confidence intervals)
* **Weeks 9-12: Data Structures and Algorithms**
  + Week 9: Algorithms: sorting, searching (bubble sort, binary search)
  + Week 10: Data structures: trees, graphs, heaps
  + Week 11: Big O Notation: Complexity analysis (space and time complexity)
  + Week 12: Hands-on coding: LeetCode and HackerRank practice

**Months 4-6: Machine Learning and Applied AI**

**Focus Areas:** ML Principles, Applied AI Techniques, and Initial Projects

* **Weeks 13-16: Introduction to Machine Learning**
  + Week 13: Supervised Learning (Linear and Logistic Regression)
  + Week 14: Classification Models (KNN, SVM, Decision Trees)
  + Week 15: Unsupervised Learning (K-means clustering, PCA)
  + Week 16: Model evaluation (cross-validation, precision, recall, F1-score)
* **Weeks 17-20: Building AI Systems**
  + Week 17: Feature engineering, data preprocessing
  + Week 18: Implementing basic models using scikit-learn
  + Week 19: Hyperparameter tuning and model optimization
  + Week 20: Prepare for a mini project presentation
* **Weeks 21-24: First Real-World Project (Combining Science + Engineering)**
  + Week 21: Choose a dataset (Kaggle or UCI repository)
  + Week 22: Apply learned algorithms to build and evaluate a model
  + Week 23: Document and share progress on GitHub
  + Week 24: Write a project report and prepare a presentation

**Months 7-9: Deep Learning (AI Science + Advanced AI Engineering)**

**Focus Areas:** Advanced Neural Networks, CNNs, RNNs, and Specialized Applications

* **Weeks 25-28: Neural Networks Fundamentals**
  + Week 25: Basic principles of Neural Networks (Perceptrons, backpropagation)
  + Week 26: Forward and Backward Propagation
  + Week 27: Activation and Loss Functions
  + Week 28: Introduction to TensorFlow and PyTorch
* **Weeks 29-32: CNNs (Computer Vision)**
  + Week 29: Convolutional layers, pooling
  + Week 30: CNN architectures (LeNet, AlexNet, ResNet)
  + Week 31: Implementing CNNs in TensorFlow or PyTorch
  + Week 32: Project: Image Classification task (Kaggle competition or custom dataset)
* **Weeks 33-36: RNNs (Time Series/NLP)**
  + Week 33: Recurrent Neural Networks (RNNs) fundamentals
  + Week 34: LSTM and GRU architectures
  + Week 35: Sequence Modeling for NLP or Time Series data
  + Week 36: Implementing RNNs in TensorFlow or PyTorch

**Months 10-12: Advanced Topics and Capstone Project**

**Focus Areas:** Specialized AI Techniques, Capstone Development, and Portfolio Building

* **Weeks 37-40: Reinforcement Learning**
  + Week 37: Introduction to RL (Markov Decision Processes)
  + Week 38: Q-Learning, Policy Gradients
  + Week 39: Implementing RL models using OpenAI Gym
  + Week 40: Project: RL-based game or optimization problem
* **Weeks 41-44: Natural Language Processing (NLP)**
  + Week 41: Text preprocessing (tokenization, stemming, lemmatization)
  + Week 42: Word embeddings (Word2Vec, GloVe)
  + Week 43: Transformers and BERT models (state-of-the-art NLP)
  + Week 44: NLP project (e.g., sentiment analysis, text generation)
* **Weeks 45-48: Final Capstone Project (Portfolio Building)**
  + Apply your knowledge to solve a real-world AI problem
  + Combine elements of AI Science (understanding data, concepts) and AI Engineering (building systems)
  + Create a detailed project report, showcase it on GitHub, and write a blog post summarizing your project

**Months 13-15: Advanced Engineering and Deployment**

**Focus Areas:** Deployment Strategies, MLOps, and AI System Design

* **Weeks 49-52: AI Model Deployment**
  + Week 49: Containerization with Docker
  + Week 50: Deploying models with Flask or FastAPI
  + Week 51: Introduction to cloud services (AWS, Google Cloud)
  + Week 52: Model monitoring and maintenance
* **Weeks 53-56: MLOps and AI System Design**
  + Week 53: MLOps principles (CI/CD pipelines, model management)
  + Week 54: Designing scalable AI systems (handling large datasets, distributed training)
  + Week 55: Best practices for model versioning and retraining
  + Week 56: Project: End-to-End AI system deployment (deploy a model in the cloud)

**Months 16-18: Specialization and Real-World Applications**

**Focus Areas:** Specialized Applications and Industry Trends

* **Weeks 57-60: AI in Industry**
  + Week 57: Applications in healthcare (medical imaging, diagnostics)
  + Week 58: Applications in finance (fraud detection, trading algorithms)
  + Week 59: AI in autonomous systems (self-driving cars, robotics)
  + Week 60: Ethics and Responsible AI (fairness, bias detection, AI ethics frameworks)
* **Weeks 61-64: Advanced Projects and Networking**
  + Week 61: Work on a specialized project (based on industry/domain of your choice)
  + Week 62: Document and share your project on GitHub
  + Week 63: Attend AI industry conferences or webinars
  + Week 64: Networking: connect with professionals in the AI field

**Ongoing: Continuous Learning and Networking**

* Weekly: Review AI research papers (arXiv, NeurIPS)
* Weekly: Participate in AI communities (LinkedIn, Reddit, Discord)
* Monthly: Participate in coding competitions (Kaggle, Data Science Bowl)
* Continuously update your GitHub repository and work on open-source projects

**Daily Time Breakdown (6 hours/day):**

* Learning Theory (courses, reading) – 2-3 hours/day
* Hands-on Coding (projects, practice) – 2-3 hours/day
* Review and Practice Problems (LeetCode, HackerRank) – 1-2 hours/day
* Networking and Community Engagement – 1 hour/day

This plan now gives an even distribution across all months while ensuring a balanced learning approach in AI Science and Engineering.

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