**Week 1: Python Basics (10 hours)**

* **Day 1-2:** Review Python basics (variables, loops, conditionals, functions).
* **Day 3:** Practice with Python data structures (lists, dictionaries, tuples).
* **Day 4-5:** Learn file handling and basic debugging.
* **Day 6-7:** Solve beginner problems on platforms like HackerRank/LeetCode.

**Week 2-3: NumPy and Pandas (20 hours)**

* **Day 8-10:** Introduction to NumPy: arrays, indexing, slicing, and basic operations.
* **Day 11-14:** Learn Pandas: data frames, indexing, filtering, and grouping.
* **Day 15-16:** Practice basic Pandas workflows on small datasets.

**Week 4: Data Visualization (10 hours)**

* **Day 17-18:** Learn Matplotlib: line plots, bar plots, histograms.
* **Day 19-20:** Introduction to Seaborn: advanced visualizations (pair plots
* heatmaps).
* **Day 21:** Analyze and visualize a sample dataset.
* **Day 22-23:** Practice creating plots and telling stories with data.

**Week 5: Real-World Data Manipulation (10 hours)**

* **Day 24-25:** Work on cleaning messy datasets.
* **Day 26-27:** Combine multiple datasets with merging and concatenation.
* **Day 28:** Perform exploratory data analysis (EDA) on a public dataset.

**Phase 2: Statistics, Probability, and Data Preprocessing (Month 2 - 60 hours)**

**Goal:** Build a solid foundation in statistics and probability while learning preprocessing techniques.

**Week 1: Statistics Basics (10 hours)**

* **Day 29-30:** Learn mean, median, mode, variance, and standard deviation.
* **Day 31-32:** Understand distributions (normal, uniform) and skewness.
* **Day 33:** Practice summarizing datasets with statistical measures.

**Week 2: Probability (10 hours)**

* **Day 34-36:** Learn basic probability, conditional probability, and Bayes' theorem.
* **Day 37-38:** Introduction to probability distributions (binomial, Poisson).
* **Day 39:** Practice with real-world examples.

**Week 3: Data Cleaning and Preprocessing (20 hours)**

* **Day 40-41:** Handle missing values and outliers.
* **Day 42-44:** Learn feature scaling (normalization, standardization).
* **Day 45-47:** Encode categorical data (one-hot, label encoding).
* **Day 48:** Work on a sample dataset to preprocess.

**Week 4: Project (20 hours)**

* **Day 49-50:** Choose a dataset and perform full EDA.
* **Day 51-53:** Preprocess the dataset.
* **Day 54-55:** Summarize findings and present insights.
* **Day 56:** Reflect and review this phase.

**Phase 3: Core Machine Learning (Months 3 & 4 - 120 hours)**

**Goal:** Understand machine learning fundamentals, build and evaluate models, and practice.

**Month 3, Week 1: Machine Learning Basics (10 hours)**

* **Day 57-59:** Learn supervised vs. unsupervised learning.
* **Day 60-61:** Introduction to scikit-learn.
* **Day 62:** Build your first linear regression model.

**Month 3, Week 2: Supervised Learning (20 hours)**

* **Day 63-64:** Linear regression in-depth.
* **Day 65-67:** Introduction to classification: Logistic Regression.
* **Day 68-69:** Evaluate models (accuracy, precision, recall).
* **Day 70:** Practice supervised learning models.

**Month 3, Week 3-4: Unsupervised Learning (20 hours)**

* **Day 71-73:** Introduction to clustering (k-means).
* **Day 74-75:** Learn about dimensionality reduction (PCA).
* **Day 76-78:** Practice unsupervised learning techniques.
* **Day 79-80:** Work on a small project combining supervised and unsupervised learning.

**Month 4: Advanced Supervised Learning (40 hours)**

* **Week 1:** Decision trees and random forests (10 hours).
* **Week 2:** Gradient boosting (XGBoost, LightGBM) (10 hours).
* **Week 3:** Model hyperparameter tuning (GridSearch, RandomSearch) (10 hours).
* **Week 4:** Build a supervised learning project (10 hours).

**Phase 4: Deep Learning and Deployment (Month 5 - 60 hours)**

**Goal:** Understand neural networks and how to deploy ML models.

**Week 1-2: Deep Learning Basics (20 hours)**

* **Day 121-122:** Learn neural networks fundamentals (perceptron, activation functions).
* **Day 123-125:** Build your first neural network using TensorFlow/Keras.
* **Day 126-130:** Work on image or text classification using neural networks.

**Week 3: Advanced Deep Learning (20 hours)**

* **Day 131-134:** Learn about CNNs (Convolutional Neural Networks).
* **Day 135-137:** Introduction to RNNs (Recurrent Neural Networks).
* **Day 138-140:** Practice with pre-trained models.

**Week 4: Deployment (20 hours)**

* **Day 141-143:** Learn Flask for building APIs.
* **Day 144-146:** Deploy a machine learning model.
* **Day 147-150:** Build a full project with deployment.

**Phase 5: Specialization and Portfolio Building (Month 6 - 60 hours)**

**Goal:** Focus on areas of interest and build a portfolio of projects.

**Week 1: Choose a Specialization (10 hours)**

* Options: NLP, Computer Vision, Time Series, or Reinforcement Learning.
* Spend the week learning the basics of your chosen field.

**Week 2-3: Build a Project (30 hours)**

* Focus on creating a portfolio-worthy project in your specialization.

**Week 4: Polish and Showcase (20 hours)**

* **Day 171-173:** Refine your project with clear documentation.
* **Day 174-176:** Add the project to GitHub.
* **Day 177-180:** Prepare for interviews (questions + explanations).