

Data Analytics & Machine Learning with Python for Economic Forecasting

Duration: 5 Days

Hardware/Software: Jupyter notebook and google colab

Chapter 01: Introduction to Data Analytics, Machine Learning and Economic Forecasting

- Introduction to Data Analytics
- Understanding Economic Data
- Introduction to Machine Learning
- Types of Machine Learning
- Machine Learning Workflow
- Applications in Economics and Finance
- Introduction to Forecasting Problems

Chapter 02: Python for Data Analytics

- Python Fundamentals
- NumPy for Numerical Computing
- Pandas for Data Manipulation
- Data Import and Export
- Data Visualization using Matplotlib and Seaborn
- Working with Economic Datasets

Chapter 03: Data Preprocessing and Feature Engineering

- Data Cleaning Techniques
- Handling Missing Values
- Outlier Detection and Treatment
- Data Transformation and Scaling

- Encoding Categorical Variables
- Feature Engineering Techniques
- Data Aggregation and Summarization
- Preparing Time-Series Features for Forecasting

Chapter 04: Exploratory Data Analysis (EDA)

- Descriptive Statistics
- Data Visualization Techniques
- Correlation Analysis
- Trend and Pattern Discovery
- Economic Indicator Analysis
- Time-Series Visualization Basics

Chapter 05: Supervised Machine Learning Fundamentals

- Regression vs Classification
- Train-Test Split
- Cross Validation
- Bias-Variance Tradeoff
- Performance Metrics
- Introduction to Forecasting Models

Chapter 06: Decision Trees and Random Forest

- Decision Tree Fundamentals
- Tree-Based Regression Models
- Random Forest Algorithm
- Feature Importance Analysis
- Economic Forecasting using Random Forest
- Advantages and Limitations

Chapter 07: Support Vector Machines

- Introduction to SVM
- Support Vector Regression (SVR)

- Kernel Functions
- Feature Scaling Requirements
- Economic Forecasting using SVM
- Advantages and Limitations

Chapter 08: Ensemble Learning and XGBoost

- Ensemble Learning Concepts
- Bagging and Boosting
- Gradient Boosting Machines
- Introduction to XGBoost
- Feature Importance and Explainability
- Economic Forecasting using XGBoost

Chapter 09: Introduction to Deep Learning

- Artificial Intelligence vs Machine Learning vs Deep Learning
- Biological and Artificial Neurons
- Neural Network Architecture
- Activation Functions
- Forward Propagation and Backpropagation
- Loss Functions and Optimizers

Chapter 10: Artificial Neural Networks (ANN)

- Building ANN Models using Keras
- Model Training and Validation
- Regularization Techniques
- Dropout and Early Stopping
- ANN for Economic Prediction and Forecasting

Chapter 11: Time Series Analysis and Forecasting Fundamentals

- Components of Time Series Data
- Trend, Seasonality and Cyclicity
- Feature Engineering for Time Series

- Forecasting Strategies
- Preparing Sequential Data for Machine Learning Models
- Business and Economic Forecasting Examples

Chapter 12: Recurrent Neural Networks and LSTM

- Introduction to Sequential Data
- Recurrent Neural Networks (RNN)
- Limitations of RNNs
- Long Short-Term Memory (LSTM)
- Building LSTM Models with Keras
- Economic Forecasting using LSTM
- Forecast Evaluation (MAE, RMSE, MAPE)
- Model Comparison and Result Interpretation