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Python for Data Analytics Course

Course Overview

This course provides a comprehensive introduction to data analytics using Python, equipping students with the skills to analyze data, create visualizations, and apply statistical methods. The course covers essential Python programming concepts, data manipulation with libraries like Pandas, and data visualization with Matplotlib and Seaborn. Additionally, it includes advanced topics such as machine learning with Scikit-learn and real-world applications.

Course Modules

Part 1: Introduction to Python

Module 1: Python Basics

- Overview of Python
- Setting Up Python Environment
- Basic Syntax and Data Types
- Control Structures: Loops and Conditionals
- Functions and Modules

Module 2: Advanced Python Concepts

- Data Structures: Lists, Tuples, Dictionaries, and Sets
- File Handling
- Error and Exception Handling
- Object-Oriented Programming (OOP) in Python

Part 2: Data Manipulation with Pandas

Module 3: Introduction to Pandas

- Overview of Pandas
- Series and DataFrames
- Importing and Exporting Data

Module 4: Data Cleaning and Preparation

- Handling Missing Data
- Data Transformation and Normalization
- Merging and Joining DataFrames
- Data Aggregation and Grouping

Module 5: Data Exploration

- Descriptive Statistics
- Filtering and Sorting Data
- Pivot Tables

Part 3: Data Visualization

Module 6: Data Visualization with Matplotlib

- Introduction to Matplotlib
- Creating Basic Plots: Line, Bar, and Scatter Plots
- Customizing Plots: Labels, Legends, and Colors
- Advanced Plots: Histograms, Box Plots, and Heatmaps

Module 7: Data Visualization with Seaborn

- Overview of Seaborn
- Creating Statistical Plots: Bar, Box, and Violin Plots
- Visualizing Relationships: Pairplot and Jointplot
- Customizing and Enhancing Seaborn Plots

Part 4: Statistical Analysis

Module 8: Descriptive Statistics

- Measures of Central Tendency: Mean, Median, Mode
- Measures of Dispersion: Variance, Standard Deviation
- Data Distributions

Module 9: Inferential Statistics

- Hypothesis Testing
- Confidence Intervals
- t-Tests and ANOVA
- Correlation and Regression Analysis

Part 5: Machine Learning with Scikit-learn

Module 10: Introduction to Machine Learning

- Overview of Machine Learning
- Supervised vs. Unsupervised Learning
- Setting Up Scikit-learn

Module 11: Supervised Learning

- Linear Regression
- Logistic Regression
- Decision Trees and Random Forests
- Model Evaluation and Validation

Module 12: Unsupervised Learning

- Clustering with K-Means
- Principal Component Analysis (PCA)
- Anomaly Detection

Part 6: Real-World Applications and Case Studies

Module 13: Business Applications of Data Analytics

- Marketing Analytics
- Financial Analytics
- Operations and Supply Chain Analytics
- Healthcare Analytics

Module 14: Case Studies and Projects

- Real-World Data Analytics Projects
- End-to-End Data Analysis Workflow
- Presentation and Interpretation of Results

Part 7: Tools and Technologies

Module 15: Data Analysis with Excel

- Advanced Excel Functions for Data Analysis
- Pivot Tables and Pivot Charts
- Data Analysis Toolpak

Module 16: SQL for Data Analytics

- Introduction to SQL
- Querying Databases
- Aggregating and Joining Data
- Advanced SQL Functions

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Course Overview

The Data Analytics course provides a comprehensive understanding of data analysis techniques and tools, equipping students with the skills to extract insights from data and make data-driven decisions. The course covers essential mathematical and statistical concepts and practical applications using tools like Power BI, Tableau, Python's Matplotlib, and Seaborn.

Course Modules

Part 1: Foundations of Data Analytics

Module 1: Introduction to Data Analytics

- Overview of Data Analytics
- Importance of Data-Driven Decision Making
- Data Analytics Process: Collecting, Cleaning, Analyzing, and Visualizing Data

Module 2: Essential Mathematics for Data Analytics

- Basic Algebra and Calculus
- Linear Algebra for Data Analysis
- Probability Theory and Applications

Module 3: Essential Statistics for Data Analytics

- Descriptive Statistics: Mean, Median, Mode, Variance, and Standard Deviation
- Inferential Statistics: Hypothesis Testing, Confidence Intervals, and p-values
- Regression Analysis and Correlation
- Statistical Significance and Power Analysis

Part 2: Data Collection and Preparation

Module 4: Data Collection Techniques

- Types of Data: Structured and Unstructured
- Data Sources: Databases, APIs, Web Scraping
- Data Warehousing and ETL Processes

Module 5: Data Cleaning and Preparation

- Handling Missing Data
- Data Transformation and Normalization
- Data Integration and Merging Datasets
- Data Quality and Validation

Part 3: Data Analysis Techniques

Module 6: Exploratory Data Analysis (EDA)

- Overview of EDA
- Data Visualization Techniques
- Identifying Patterns and Trends
- Summary Statistics and Distributions

Module 7: Advanced Data Analysis

- Time Series Analysis
- Cluster Analysis
- Principal Component Analysis (PCA)
- Machine Learning for Data Analytics: Supervised and Unsupervised Learning

Part 4: Data Visualization Tools

Module 8: Data Visualization with Power BI

- Introduction to Power BI
- Connecting to Data Sources
- Creating and Customizing Visuals
- Building Interactive Dashboards
- Sharing and Collaborating with Power BI

Module 9: Data Visualization with Tableau

- Introduction to Tableau
- Connecting to Data Sources
- Creating and Customizing Visuals
- Building Interactive Dashboards
- Tableau Public and Online Sharing

Module 10: Data Visualization with Python (Matplotlib and Seaborn)

- Introduction to Data Visualization in Python
- Creating Plots with Matplotlib
- Enhancing Visuals with Seaborn
- Customizing and Exporting Visuals

Part 5: Advanced Analytics and Applications

Module 11: Predictive Analytics

- Introduction to Predictive Modeling
- Linear and Logistic Regression
- Decision Trees and Random Forests
- Evaluating Model Performance

Module 12: Prescriptive Analytics

- Overview of Prescriptive Analytics
- Optimization Techniques
- Simulation Modeling
- Applications in Business Decision Making

Part 6: Real-World Applications and Case Studies

Module 13: Business Applications of Data Analytics

- Marketing Analytics
- Financial Analytics
- Operations and Supply Chain Analytics
- Healthcare Analytics

Module 14: Case Studies and Projects

- Real-World Data Analytics Projects
- End-to-End Data Analysis Workflow
- Presentation and Interpretation of Results

Part 7: Tools and Technologies

Module 15: Data Analysis with Excel

- Advanced Excel Functions for Data Analysis
- Pivot Tables and Pivot Charts
- Data Analysis Toolpak

Module 16: SQL for Data Analytics

- Introduction to SQL
- Querying Databases
- Aggregating and Joining Data
- Advanced SQL Functions

Capstone Project

- Real-World Data Analytics Project
- Data Collection and Cleaning
- Data Analysis and Visualization
- Interpretation and Presentation of Results

Assessment and Certification

- Quizzes and Exams
- Practical Lab Assessments
- Final Project Evaluation
- Certification of Completion