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Beginning Python for Machine Learning

Programming foundations, data preparation and introductory model examples

FA-0586 · 3 days

Software Development · Data & Analytics

Learn Python foundations and practise a small data-preparation and machine-learning workflow using guided examples.

Introduction

This three-day course is designed for learners new to Python, including those with no programming background and programmers moving from another language. It builds from syntax, collections and control flow to functions and basic data analysis.

The final stage introduces supervised and unsupervised learning using prepared datasets. Selected regression, classification and clustering examples provide a starting point for further study; other algorithm variants are compared through demonstrations. The course is an introduction, not comprehensive machine-learning or data-science training.

Learning outcomes

The course teaches participants to:

- Write simple Python programs using variables, collections, operators and control flow.
- Organise reusable functions and import modules.
- Work with introductory NumPy arrays, pandas DataFrames and CSV files.
- Explain the stages of a basic machine-learning workflow and distinguish supervised from unsupervised learning.
- Prepare a sample dataset and separate training from evaluation.
- Explore selected regression, classification and clustering examples and recognise their limitations.

Prerequisites

- Basic computer and file-management skills; no prior programming knowledge is required.
- High-school-level mathematics, including basic algebra.
- A Windows, macOS or Linux computer and internet access.
- A suitable local Python environment or access to a hosted notebook such as Google Colab.
- Administrative/root access and server-architecture knowledge are not course prerequisites; local installation permissions depend on the chosen environment.

Training outline

1. Day 1 — Python Programming Foundations

Module 1 — Syntax and Collections

- Identifiers
- Reserved Words
- Lines and Indentation
- Comments
- Numbers
- Python Lists
- Python Tuples
- Python Dictionaries
- Python Sets
- Copying collections and recognising shared references.
- Python Strings
- String formatting

Module 2 — Operators and Control Flow

- Arithmetic operators.
- Comparison (Relational) Operators
- Assignment Operators
- Logical Operators
- Membership Operators
- Operator precedence.

- Decision Making
- if statements.
- if/else branches.
- for loops.
- while loops.
- break and continue.

2. Day 2 — Functions and Data Workflows

Module 3 — Functions and Reusable Code

- Defining Your Own Functions
- Parameters
- Function Documentation
- Passing Collections to a Function
- Variable Number of Arguments
- Scope
- Introductory map examples.
- Introductory filter examples.
- Simple lambda expressions.
- Import a module and organise a small reusable script.

Module 4 — NumPy and pandas

- NumPy arrays.
- Basic matrix operations.
- Review variable scope in a data-processing function.
- pandas Series and DataFrames.
- Import and Export data from CSV

Module 5 — Machine-Learning Concepts

- What is Machine Learning?
- A basic machine-learning process.
- Life Cycle of Machine Learning
- Illustrative machine-learning applications and their limitations.
- Types Of Machine Learning

3. Day 3 — Introductory Machine-Learning Examples

Module 6 — Data Preparation and Evaluation

- Importing Libraries
- Importing Dataset
- Taking care of Missing Data
- Encoding Data: Categorical Data
- Separate training and test data before fitting preprocessing or models.
- Fit feature scaling and other learned preprocessing on training data only; apply the learned transformation to held-out data.

Module 7 — Regression and Classification

- Guided simple linear regression example.
- Compare multiple regression using a prepared demonstration.
- Compare polynomial regression and the risk of overfitting.
- Selected logistic-regression classification example.
- Naive Bayes overview and prepared demonstration.

Module 8 — Clustering and Review

- K-means Clustering
- Explore how candidate cluster counts affect an example; clustering is not automatic discovery of definitive real-world groups.
- Guided or prepared k-means example, according to class progress.
- Use a selected prepared example to connect data preparation, fitting and evaluation.
- Explain algorithm assumptions, model limitations and next learning steps.

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