AI-Driven Python Data Stack

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(Python + SQL + NumPy + Pandas + AI Programming)

Introduction to Programming

- Overview of Programming Languages
- High-Level vs Low-Level Languages
- Role of Programming in Modern Technology
- Applications of Python in AI, Web, and Data Science

Python Ecosystem

- Python installation and setup
- Python IDEs (VS Code, Cursor, Google Colab)
- Running Python programs
- Python environment and package manager

Python Syntax Basics

- PPython structure & indentation
- PComments and documentation
- PInput and output functions

Variables and Data Types

Tools: Python, VS Code, ChatGPT

- Variables and naming rules
- Numeric data types
- Strings and boolean values
- Type conversion

Operators

- Arithmetic operators
- Comparison operators
- Logical operators
- Assignment operators

Input and Output

- Taking user input
- Formatting output
- Basic debugging using AI tools

Conditional Statements

- if statements
- if-else statements
- nested conditions

Looping Concepts

- for loops
- while loops
- break and continue statements

Problem Solving Logic

- Algorithm basics
- Flowchart thinking
- Debugging logical errors using AI

Functions in Python

- Defining functions
- Function parameters and return values
- Default parameters

Modules and Packages

- Importing modules
- Creating custom modules
- Code reusability concepts

Python Data Structures

Lists

- Creating lists
- Indexing and slicing
- List methods

Tuples and Sets

- Tuple basics
- Set operations
- Difference between lists and tuples

Dictionaries

- Key-value storage
- Dictionary methods
- Nested dictionaries

File Operations

- Reading files
- Writing files
- Appending data

File Formats

- Working with CSV files
- Working with JSON files

Data Persistence

- Saving program data
- Simple data management systems

Database Management with SQL

Platform: MySQL / SQLite

Learning Resource: W3Schools SQL

Database Fundamentals

- What is a database
- Relational database concepts
- Tables, rows and columns

SQL Basics

- SELECT statements
- WHERE clause
- ORDER BY and LIMIT

Data Manipulation

- INSERT records
- UPDATE records
- DELETE records

Table Management

- CREATE TABLE
- ALTER TABLE
- PRIMARY KEY and FOREIGN KEY

SQL Filtering

- AND, OR conditions
- LIKE operator
- IN and BETWEEN

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Data Aggregation

- COUNT function
- SUM and AVG
- GROUP BY

Table Relationships

- INNER JOIN
- LEFT JOIN
- RIGHT JOIN

NumPy Introduction

- What is NumPy
- NumPy arrays
- Array creation

Array Operations

- Indexing and slicing
- Reshaping arrays
- Copy vs view

Mathematical Operations

- Matrix operations
- Statistical functions
- Random numbers

Data Analysis with Pandas

Pandas Basics

- Pandas installation
- Series and DataFrames
- Loading datasets

Data Exploration

- Viewing datasets
- Filtering data
- Sorting data

Data Cleaning

- Handling missing values
- Removing duplicates
- Data transformation

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AI Tools for Programming

Tools: ChatGPT, GitHub Copilot, Cursor, Kaggle

11.1 AI Assisted Coding

- Generating code with AI
- Understanding code with AI
- Debugging using AI

11.2 Prompt Engineering for Developers

- Writing effective prompts
- Optimizing AI responses
- AI pair programming

11.3 AI Productivity Tools

- GitHub Copilot coding suggestions
- Cursor AI IDE features
- Using AI for documentation

Data Projects and Practice Platforms

Platforms: Kaggle, HackerRank, LeetCode

Coding Practice

- Python coding challenges
- SQL query challenges

Dataset Practice

- Downloading datasets from Kaggle
- Running analysis notebooks

Portfolio Building

- Creating GitHub repositories
- Documenting projects

FINAL MILESTONE

Career Preparation

- Resume building for Python / Data roles
- GitHub portfolio creation
- Interview preparation

Final Evaluation

- Final project presentation
- Code review and evaluation

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