

Expert Python Programming

Prerequisites: Working Knowledge of Python Programming

1. Python refresher

- Data types
- Sequences
- Mapping
- Types
- Program Structure
- Files and Console
- Conditionals
- Loops
- Built-Ins

2. OS Services

- The OS Module
- Environment Variables
- Launching external commands
- Walking directory trees
- Paths, directories, and filenames
- Working with file systems
- Dates and times

3. Pythonic Programming

- The Zen of Python
- Common idioms Lambda functions List
- comprehensions
- Generator expressions
- String formatting

4. Modules and packages

- Initialization code
- Namespaces
- Executing modules as scripts
- Documentation
- Packages and name resolution
- Naming conventions
- Using imports

5. Classes Defining classes

- Instance methods and data Properties
- Initializers
- Class and static methods/data Inheritance

6. Metaprogramming
 - Implicit properties `globals()` and `locals()`
 - Working with attributes
 - The `inspect` module
 - Decorators
 - Monkey patching
7. Programmer tools Analyzing programs
 - Using `pylint`
 - Testing code
 - Using `unittest`
 - Debugging
 - Profiling and benchmarking
8. Database access The DB API
 - Available Interfaces
 - Connecting to a server
 - Creating and executing a cursor
 - Fetching data
 - Parameterized statements
 - Metadata
 - Transaction control
9. Network Programming
 - Sockets Clients Servers
 - Application protocols
 - Forking servers
 - Binary data
10. Multiprogramming When to use threads?
 - The Global Interpreter Lock The threading
 - module Simple threading
 - Sharing variables The `queue` module
 - Debugging threaded programs Multiprocessing
 - Other alternatives
11. XML and JSON Working with XML
 - DOM and Sax
 - Introducing `ElementTree` and `xml`
 - Parsing XML
 - Navigating the document
 - Creating a new XML document
 - JSON
 - Parsing JSON into Python

- Converting Python into JSON

12. Extending Python

- About non-Python modules
- Overview of a C extension
- Writing C by hand
- Using SWIG
- Loading modules with ctypes

13. File Handling and Conversion

- Opening and Reading Files
- Writing and Appending Data to Files
- Handling Different File Formats (CSV, JSON, XML)
- Using os and os.path for File Operations
- Converting Files Between Formats (e.g., CSV to JSON)

14. File Conversion to Shapefile (SHP)

- Introduction to Shapefiles
- Using geopandas to Convert Files to SHP
- Exporting Data to Shapefile

15. Adding Data into the Geo Database

- Introduction to Geo Databases
- Creating and Managing Geo Databases
- Inserting Data into Geo Databases using geopandas
- Updating and Deleting Data in Geo Databases

16. PostgreSQL Database Operations

- Connecting to PostgreSQL in Python
- Basic SQL Operations (SELECT, INSERT, UPDATE, DELETE)
- Creating and Managing Tables

17. Error Handling with PostgreSQL

- Introduction to Error Handling in Python
- Common PostgreSQL Errors and Exceptions
- Using try, except, and finally Blocks
- Implementing Transaction Management and Rollbacks
- Logging Errors for PostgreSQL Operations

18. Data Combination and Transformation

- Merging and Joining DataFrames in pandas
- Using geoPandas for Geospatial Data Manipulation
- Fetching and Processing Data from APIs using requests
- Data Cleaning and Transformation Techniques

- Working with Large Datasets Efficiently

19. File Conversion into GeoDataFrame

- Introduction to GeoDataFrame
- Reading Different File Formats into a GeoDataFrame
- Data Cleaning and Preparation for Conversion
- Exporting GeoDataFrame to Various Formats (e.g., SHP, GeoJSON)
- Handling Coordinate Reference Systems (CRS)

20. Email Alerts in Python

- Setting Up Email Servers (smtplib)
- Composing and Sending Emails
- Sending Emails with Attachments
- Automating Email Alerts for Various Events
- Handling Email Errors and Exceptions

21. Spatial Analysis in Python

- Introduction to Spatial Analysis Concepts
- Analyzing Spatial Relationships using geopandas
- Visualizing Spatial Data with matplotlib

22. Geometric Operations with shapely

- Introduction to shapely Geometry Objects
- Creating and Manipulating Geometric Shapes
- Combining shapely with geopandas for Analysis

23. Vector Data Manipulation with geopandas

- Introduction to Vector Data in GIS
- Creating and Manipulating Geo DataFrames
- Performing Geospatial Operations (e.g., clipping, dissolving)
- Exporting and Sharing Vector Data