PYTHON FOR COMPUTATIONAL PROBLEM SOLVING

Python Modules and PIP

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Introduction to Modules

- A module in Python is simply a file containing Python code, functions, classes, or variables that you can reuse in other programs.
- Modules help organize large programs into smaller, manageable, and reusable pieces.
- Python provides many built-in modules like math, os, random, and datetime that simplify common programming tasks.
- You can also create your own modules by saving functions in a .py file and importing them into another program using the import statement.
- You can also include the third-party modules in the python code.

Advantages of Modules

- **Reusability:** Write code once and reuse it across multiple programs, reducing duplication and saving development time.
- **Modularity:** Break large programs into smaller, logical parts, making code easier to develop, debug, and maintain.
- **Separate Namespace:** Each module has its own namespace, preventing naming conflicts between functions or variables in different modules.
- **Better Organization:** Groups related functions/classes into structured files and folders, improving project clarity and scalability.

Types of Modules

1. Built-in Modules.
2. User-Defined Modules (Creating your own modules).
3. PIP - Third Party Modules.

What is PIP?

- **PIP = Pip Installs Packages**
  Tool to install/manage third-party python packages.

Common commands:

- pip install package_name
  pip uninstall package_name
  pip list

Types of Modules

Built-in Modules

- Provided by Python by default (e.g., math, os, random, datetime)
  No installation needed
  Useful for common programming tasks

Types of Modules

Ways to import Built-in Modules

Importing Entire Module

```
import math
print(math.sqrt(16))
```

Importing Specific Attributes

```
from math import sqrt
print(sqrt(16))
```

Importing All

```
from math import *
```

Types of Modules

User-Defined Modules

- Modules created by the programmer
  Stored as .py files containing functions, classes, or variables
  Used to organize and reuse your own code

Types of Modules

User-Defined Modules

Examples (files you create):

- my_utils.py → your helper functions
  calculator.py → custom math operations
  string_ops.py → string-related utilities

Usage:

```
import my_utils
```

Types of Modules

Third-Party Modules

- Developed by the Python community
- Must be installed using **PIP** (e.g., numpy, scikit-learn, pillow)
- Extend Python with advanced or specialized features

Types of Modules

Third-Party Modules (via PIP)

- numpy → numerical computing
  pandas → data analysis
  matplotlib → plotting & visualization
  requests → working with APIs
  Pillow → image processing

THANK YOU

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