DS035- Python Libraries

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https://youtu.be/ktRwfBMV4S8

Why Python Packages Are a Must

The Shortcut of Python Packages

When we make programs, we often need to do the same thing more than once. Writing all that code again and again would take forever. That’s where Python packages come in. They are like a shortcut, so we don't have to write the same code repeatedly. When we need some code, we just bring in the package.

What’s in a Python Package?

Think of a package as a folder on your computer. Inside this folder, there are files which are called modules. These files have Python code that we can use in our own programs.
A Python package looks like this:

- **Folder (Package)**
  - **File (`__init__.py`)**: This special file tells Python, "Hey, this folder is a package with code you can use!"
  - **Another File (`module1.py`)**: A file with Python code for doing a specific job.
  - **Maybe More Files (`module2.py`, etc.)**: More files with more code for more jobs.

Using Python Libraries

Libraries are big collections of packages that help us do tasks without having to write the code ourselves. They can be simple things like working with dates and times or complex stuff like making websites or analyzing data.
In short, Python packages save us time and effort, so we can make cool things without starting from zero every time.

Common Libraries:

There are several Python libraries that are particularly useful for beginners due to their ease of use and the immediate impact they can have on various projects. Here are some of the most popular ones:

1. **`numpy`**: For numerical computing, `numpy` is the go-to library. It's excellent for working with arrays and matrices, and it's widely used in scientific computing.
2. **`pandas`**: When it comes to data analysis and manipulation, `pandas` provides easy-to-use data structures and data analysis tools. It's particularly good for working with tabular data (like spreadsheets) and time series.
3. **`random`**: This is part of the Python Standard Library and is great for generating random numbers and making choices at random. It's very useful for games, simulations, and testing.
4. **`datetime`**: Also included in the Python Standard Library, `datetime` helps you deal with dates and times, allowing you to perform operations like getting the current date, adding days to a date, or finding the difference between two dates.

5. `math`: This standard library module provides access to mathematical functions like square roots, trigonometry, and logarithms, which are essential for any kind of scientific or engineering calculations.
6. `os` and `sys`: These standard libraries are useful for interacting with the operating system, like navigating through directories, getting environment variables, reading command-line arguments, and more.

How could access other people coding/ libraries?

A package repository in Python is a centralized online location where Python packages are stored and made available for download and installation by end-users. These repositories allow users to search for and install software packages and libraries developed by others, which can significantly speed up the development process by reusing code.

Why We Need Package Repositories

- **Centralization**: Repositories provide a central place to access a wide range of packages, making it easier for users to find and install the tools they need.
- **Version Control**: They keep track of different versions of packages, allowing developers to work with specific versions that their projects depend upon.
- **Dependency Management**: Repositories record the dependencies of each package, facilitating the installation process by automatically resolving and installing required dependencies.
- **Distribution**: For package authors, repositories simplify the process of distributing their software, making it accessible to a wider audience with minimal effort.
- **Quality Control**: Many repositories enforce certain quality standards and security measures, which can help to ensure the reliability and safety of the packages.

Examples of Package Repositories and Their Package Managers

1. **PyPI (Python Package Index)**
   - **Package Manager**: `pip`

- PyPI is the default package repository for Python. You can install packages from PyPI using the `pip` command as follows:
- `pip install package-name`

2. **Anaconda Repository**
   - **Package Manager**: `conda`
   - The Anaconda repository is focused on data science and machine learning libraries. You can install packages from the Anaconda repository using the `conda` command like this:
   - `conda install package-name`

It's also good to note that before installing Python packages system-wide (which usually requires administrator privileges), it is often recommended to work within a virtual environment to avoid potential conflicts with system-wide Python packages.

Note:

- A module is a single file (or files) that are imported under one import and used.
- A package is a collection of modules in directories that give a package hierarchy.
- A library is a collection of packages and modules. It is not limited to a single directory structure it's more about the functionality that is provided together as a set. It may also refer to a distribution that can be installed via a package manager.

Sure! Let's clarify the distinction with some concrete examples:
Example of a Python Package: `requests`. It is technically a package because it contains an `__init__.py` file and has a directory structure that includes other modules and sub-packages.

When you install `requests` using `pip`:

```
pip install requests
```

You can then use this package in your code like so:

```
import requests
```

```
response = requests.get('https://api.github.com')
```

Example of a Python Library: `SciPy`

To use `SciPy`, you first install the library:

```
pip install scipy
```

Then you can use its packages and the functions they provide:

```
from scipy import optimize


result = optimize.minimize(func, x0, args=(a, b, c))
```