CSC 223 - Advanced Scientific Programming

Python Modules and Packages

Modules and Packages

- The Python standard library includes may useful tools for a wide range of tasks.
- This feature is sometimes called "batteries included".
- Python organizes libraries into modules that can be used in Python scripts.
- There are also many third-party tools and packages that offer more specialized functionality.

The import Statement

- The import statement loads built-in and third party modules and can be used in various ways:
  - Explicit import (preserves the modules content in a namespace)

    ```
    import math
    math.cos(math.pi)
    ```

  - Explicit import by alias

    ```
    import math as m
    m.cos(m.pi)
    ```

  - Explicit import of module contents

    ```
    from math import cos, pi
    cos(pi)
    ```

  - Implicit import of module contents

    ```
    from math import *
    cos(pi)
    ```

Python Module Conventions

- A Python script can be treated as a module (imported into another Python program) or as a stand alone program.
- A runnable script typically has a this statement

```
if __name__ == '__main__':
    # statements that should not
    # be executed when imported
    # into another file
```

- The code in the main block will not be executed when the file is imported.

Useful Standard Library Modules

- `os` and `sys`: tools for interfacing with the operating system.
- `math`: mathematical functions and operations
- `itertools`: tools for constructing and interacting with iterators and generators.
- `random`: tools for generating pseudorandom numbers
- `json` and `csv`: tools for reading file formats.

Third-Party Modules

- Python has modules that are not included in the standard library.
- These modules can be imported like the standard library modules provided that they are installed.
- Useful third-party modules:
  - `numpy`: provides an efficient way to store and manipulate multi-dimensional dense arrays.
  - `pandas`: provides a labeled interface to multi-dimensional data.
  - `matplotlib`: provides a way to create scientific visualizations.