Scientific Computing using Python

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mini-course webpage: https://swaprava.wordpress.com/a-short-course-on-python/

Disclaimer: the contents of this lecture series are based on several texts and online resources

Outline of the Talk

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- Academic usage: companion of many courses – for 101 CS courses or for supportive computing

Relative popularity of Python

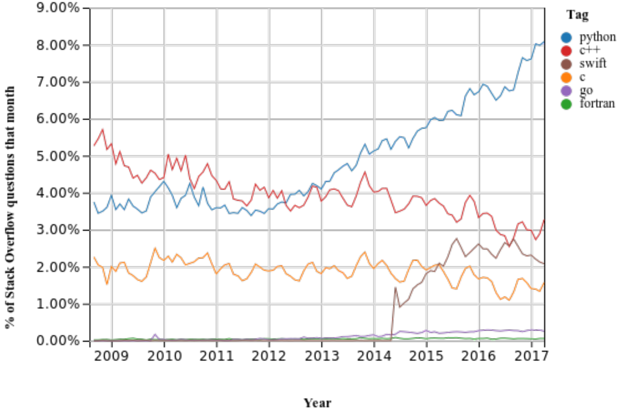

Image courtesy: www.quantecon.org

The plot, produced using Stack Overflow Trends, shows one measure of the relative popularity of Python

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- Usually implemented as interpreted as opposed to compiled (e.g. in C)
- Syntax and design of a python code makes it easier to read, debug, and develop

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    - Step-by-step execution also helps in identifying errors

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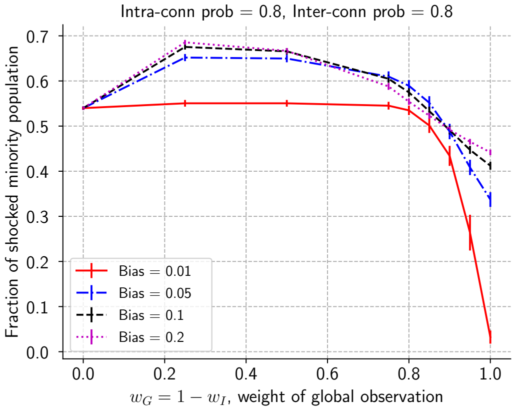
  - `pandas` – for data handling
- used in data science, machine learning, artificial intelligence, computational biology, computational physics, quantitative economics etc.

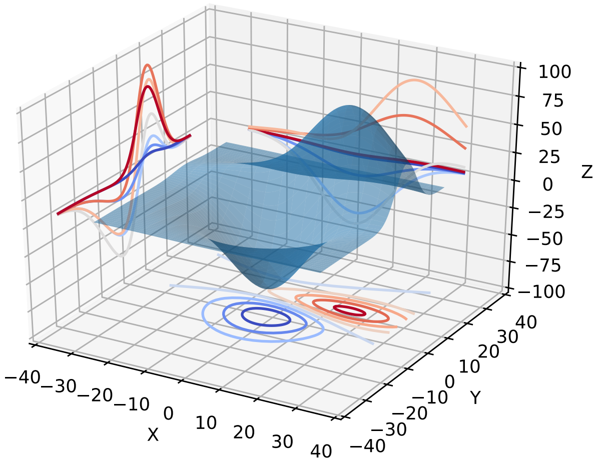
Example in action – 2D plot

- A plot of surprise in the Brexit election



- Used `pandas`, `numpy`, `matplotlib`

Example in action – 3D plot



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- `spyder` is useful for a long codebase development
- Examples

Some Introductory Python Programs

- Task 1: finding if a number is even/odd – `if-else` clause
- Task 2: finding the smallest of three numbers
- Task 3: finding if a natural number is prime or not – `while` loop and `for` loop

- Notice the indentation and absence of any braces or brackets
- Makes the code clutter-free and more readable

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$$x_{t+1} = x_t - \frac{f(x_t)}{f'(x_t)}$$

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- Python data types: mutable and immutable
- Primitive data types: `int, float, bool`
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Functions

- Example of a function – the root finding algorithm as a function
- Example of recursion of a function – checking a palindrome
- **Exercise**: solve the ‘Tower of Hanoi’ problem using recursion