

Introduction to Terminal and Python

CS 279 Fall 2024



Some slides taken from previous iterations

What will be covered

- **Terminal**

- Basic commands (i.e. cd, ls, mv, cp)
- How to edit / run python scripts
- Demo

- **Python**

- Variable types and operations
- Lists, tuples, and numpy arrays
- If-else, loops, and functions

Terminal



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- **cat** <file_name>: prints contents of file

Tips

- Use tab to auto-fill file names
- Use up/down arrows to go through previous and new commands
- Use right/left arrows + option key to skip across a line faster (ctrl a/e to jump to the start/end)
- **clear:** clear the terminal
- **head/tail <filename>:** print first few or last few lines
- **man <command>:** more information about a command (q to exit)

Editing python files

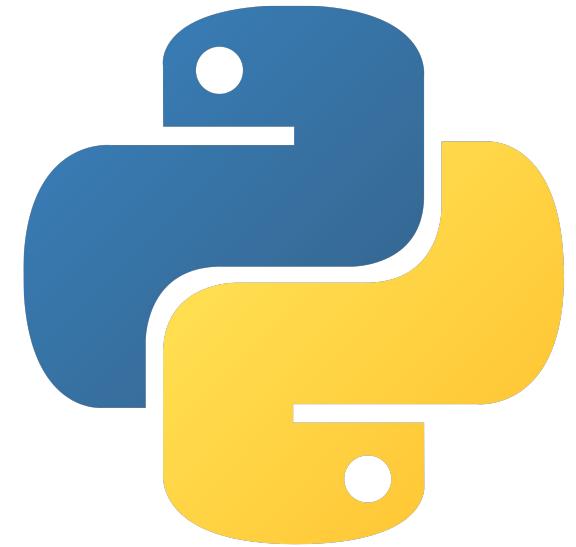
- **Editing files**
 - **Recommended:** using an IDE (PyCharm, VSCode)
 - VSCode download: <https://code.visualstudio.com/Download>
 - PyCharm is already installed on LTS machines
 - **Command Line Editors**
 - nano <filename>
 - Creates a new filename if <filename> does not exist
 - Ctrl+X to exit, y to save, Enter to confirm
 - Other options: emacs or vim

Running python files

- **Running Python scripts (see Software handout) –**
<https://web.stanford.edu/class/cs279/handouts/Software.pdf>
 - `python hello_world.py <any arguments>`
 - `hello_world.py` is the **filename**
 - LTS users: **python3.9** instead of `python`
- Installing packages with pip
 - `pip install <package>` (for example, `pandas`)

Questions

Python



Variables

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- Types
 - Integer: -10, 0, 5
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- Operations: +, -, * (multiplication), / (division), ** (exponentiation)

Data Structures: Lists

- `my_list = [-1,3,3,4,5,6]`
 - Empty: `my_list = []`
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- Indexing
 - Lists are **zero-indexed**: `my_list[0] = -1`, `my_list[len(my_list) - 1] = 6`

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 - `my_list[2:4] = [3, 4]`

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- Other useful functions: [`sum\(my_list\)`](#), [`len\(my_list\)`](#), [`max\(my_list\)`](#), [`min\(my_list\)`](#)

Data Structures: Tuples

- Declaring a tuple: `my_tuple = (1,2,3)`
 - `my_var = 1, 2, 3` will generate a tuple by default
- Ordered, immutable data structure (tuples cannot be changed once created)
- Indexing and slicing identical to lists
- Common aggregate functions: `sum(my_tuple)`, `len(my_tuple)`, `max(my_tuple)`, `min(my_tuple)`

Data Structures: numpy Arrays

- pip install numpy (should already be installed if you use anaconda for python)
- import numpy as np
- Initialization
 - From python lists: `array_1d = np.array([1,2,3,4])`, `arr = np.array([[0,0,0],[0,0,0]])`
 - To a single value: `np.zeros` or `np.ones`
 - `zero_arr = np.zeros((2,3))`, `one_arr = np.ones((4,2))`
- Can do matrix operations and fast operations
- Indexing: `my_arr[row_index(s), col_index(s)]`: `my_arr[1:3,]`
- **Element-wise comparisons:**
 - `a = np.array([1,2,3])`, `b = np.array([2,3,4])`
 - `a > b`
 - `array([False, True, True])`
- Can do element-wise arithmetic as well and vectorized operations

Conditionals, Loops, Functions

If-else statements

- Boolean keywords: True and False
- Comparators
 - == equals
 - != not equals
 - < less than
 - > greater than
 - <= less than or equal to
 - >= greater than or equal to
- Combining Boolean values: *and*, *or*, *not*
- Membership: *in*
- **Careful with indentation!**

Loops

- For Loop: loop for a fixed number of times
 - `for i in range(4): #can also do range with (start, stop) or (start, stop, step_size)
 do_func()`
 - `for elem in list: #for-each loop
 do_func(elem)`
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- While loop
 - Loop many times while condition is true
 - `while (j > 4):`
`action()`
`j = j - 1`
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Functions

- def function_name(param1, param2):
 return param1 + param2
- Can return multiple values as a tuple

```
def func(param1, param2):  
    return (param1, param2)  
result = func(1,2) # result is (1,2)  
a, b = func(1,2) # a = 1, b = 2  
a, b, c = func(1,2) # throws error
```
- Can return lists, booleans, numpy arrays, or any type – do not need to specify
- **Careful with indentation!**

Questions

Resources

- Detailed python review from CS229: This has much more information than what is needed for the scope of this class, but some useful sections on plotting, more data structures, and in-depth numpy/list examples
- Tutorial for using python with VSCode
- Python and numpy tutorials