Python on the command line

DATA PROCESSING IN SHELL



Susan SunData Person



Python basics

Python

- comes pre-installed on MacOS, Linux
- needs to be user-install for Windows instructions here
- can be used with GUI interfaces (e.g Jupyter Notebook, Spyder, PyCharm, etc.)
- can also be accessed directly via the command line interface

Using Python documentation

Documentation:

```
man python

...
-V , --version
Prints the Python version number of the executable and exits.

python --version
```

Python 3.5.2

Using Python documentation

Example 1: using native Python

which python

/usr/bin/python

Example 2: using Anaconda Python

which python

/anaconda3/bin/python



The Python interactive session

To activate a Python interactive session in the terminal:

```
python
```

```
Python 3.5.2 (default, Nov 23 2017, 16:37:01)
[GCC 5.4.0 20160609] on linuxType "help", "copyright", "credits" or
"license" for more information.
>>>
```



The Python interactive session

Inside the interactive session, only use Python syntax:

```
>>> print('hello world')
hello world
```

To exit the Python session and return to terminal:

```
>>> exit()
$
```

Python interactive session alternative

Python interactive session:

- easy to activate, intuitive
- not good for code reproducibility

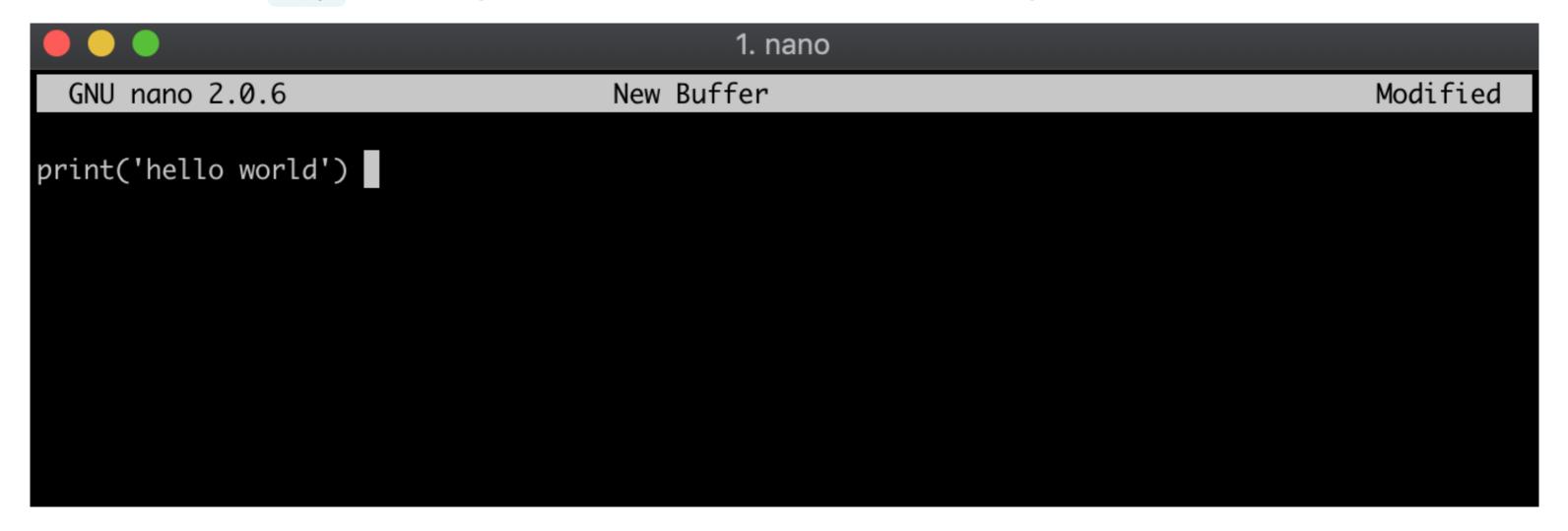
Alternative:

- save Python commands in a Python .py script
- execute script by calling python + script

Python script execution on the command line

Method 1

• Create a .py file using a text editor on the command line (e.g. nano, Vim, Emacs)



Python script execution on the command line

Method 2

• Create a .py file by echo -ing the Python syntax into the hello_world.py file, instantiating the Python file in the same step.

```
echo "print('hello world')" > hello_world.py
```

Sanity check file content:

```
cat hello_world.py
```

```
print('hello world')
```

Python script execution on the command line

Make sure in the same directory as the .py file:

ls

hello_world.py

Execute .py file by preceding filename with python:

python hello_world.py

hello world



Let's practice!

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Python package installation with pip

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Python standard library

Python standard library has a collection of:

- built-in functions (e.g. print())
- built-in packages (e.g. math, os)

Data science packages like **scikit-learn** and **statsmodel**:

- are NOT part of the Python standard library
- can be installed through pip, the standard package manager for Python, via the command line

Using pip documentation

Documentation:

```
pip -h
```

```
Usage:
 pip <command> [options]
Commands:
 install
                Install packages.
 uninstall
                Uninstall packages.
  freeze
                Output installed packages in requirements format.
  list
                List installed packages.
```



Using pip documentation

Documentation:

```
pip --version
```

pip 19.1.1 from /usr/local/lib/python3.5/dist-packages/pip (python 3.5)

python --version

Python 3.5.2

Upgrading pip

If pip is giving an upgrade warning:

```
WARNING: You are using pip version 19.1.1, however version 19.2.1 is available. You should consider upgrading via the 'pip install --upgrade pip' command.
```

Upgrade pip using itself:

```
pip install --upgrade pip
```

```
Collecting pip

|########################## 1.4MB 10.7MB/s

Successfully installed pip-19.2.1
```



pip list

pip list : displays the Python packages in your current Python environment

```
pip list
```

pip install one package

pip install installs the package specified and any other dependencies

```
pip install scikit-learn
```



pip install a specific version

By default, pip install will always install the latest version of the library.

pip install scikit-learn

Successfully built sklearn

Installing collected packages: joblib, scipy, scikit-learn, sklearn

Successfully installed joblib-0.13.2 scikit-learn-0.21.3 scipy-1.3.0 sklearn-0.0



pip install a specific version

To install a specific (or older) version of the library:

```
pip install scikit-learn==0.19.2
```

```
Collecting scikit-learn==0.19.2

Downloading https://files.pythonhosted.org/packages/b6/e2/a1e254a4a4598588d4fe88b45ab8

|############################# 4.9MB 15.6MB/s

Installing collected packages: scikit-learn

Successfully installed scikit-learn-0.19.2
```



Upgrading packages using pip

Upgrade the Scikit-Learn package using pip:

```
pip install --upgrade scikit-learn
```

```
Collecting scikit-learn

Downloading https://files.pythonhosted.org/packages/1f/af/e3c3cd6f61093830059138624dbc

|############################ 6.6MB 41.5MB/s

Requirement already satisfied, skipping upgrade: numpy>=1.11.0 in /usr/local/lib/python3

Collecting scipy>=0.17.0 (from scikit-learn)

Installing collected packages: scipy, joblib, scikit-learn

Successfully installed joblib-0.13.2 scikit-learn-0.21.3 scipy-1.3.0
```



pip install multiple packages

To pip install multiple packages, separate the packages with spaces:

pip install scikit-learn statsmodels

Upgrade multiple packages:

pip install --upgrade scikit-learn statsmodels

pip install with requirements.txt

requirements.txt file contains a list of packages to be installed:

cat requirements.txt

scikit-learn
statsmodel

Most Python developers include requirements.txt files in their Python Github repos.

pip install with requirements.txt

-r allows pip install to install packages from a pre-written file:

```
-r, --requirement <file>
Install from the given requirements file. This option can be used multiple times.
```

In our example:

```
pip install -r requirements.txt
```

is the same as

pip install scikit-learn statsmodel

Let's practice!

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Data job automation with cron

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What is a scheduler?

- Scheduler runs jobs on a pre-determined schedule
- Commercial schedulers: Airflow, Luigi, Rundeck, etc.
- cron scheduler is
 - simple
 - free
 - customizable
 - purely command-line
 - native to MacOS and Linux

What is cron?

Cron:

- is a time-based job-scheduler
- comes pre-installed in MacOS, Unix
- can be installed in Windows via Cygwin or replaced with Windows Task Scheduler
- is used to automate jobs like system maintenance, bash scripts, Python jobs, etc.

What is crontab?

Crontab is a central file to keep track of cron jobs.

crontab -1

no crontab for <username>

Documentation:

man crontab

Add a job to crontab

Method 1: modify crontab using a text editor (e.g. nano, Vim, Emacs)

Method 2: echo the scheduler command into crontab

```
echo "* * * * python create_model.py" | crontab
```

Check if the job is properly scheduled:

```
crontab -l
```

```
* * * * python create_model.py
```

Learning to time a cron job

The most frequent schedule for cron jobs is **one minute**.

Breaking down the time component for a cron job:

```
.----- minute (0 - 59)
| .----- hour (0 - 23)
| | .---- day of month (1 - 31)
| | | .---- month (1 - 12) OR jan, feb, mar, apr ...
| | | | .--- day of week (0 - 6) (Sunday=0 or 7) OR sun, mon, tue, wed ...
| | | | | |
* * * * * command-to-be-executed
```

Learning to time a cron job

```
* * * * python create_model.py
```

Interpretation:

- Run every minute of every hour of every day of every month and of every day of the week.
- In short, run every minute

Further resources:

• Use https://crontab.guru/ to see more ways to schedule a cron job

Let's practice!

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Course recap

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Data downloading on the command line

- How to download data files via curl and wget
- Documentations, manuals (e.g. man curl , wget --help)
- Multiple file downloads (e.g. wget --limit-rate=200k -i url_list.txt)

Data processing on the command line

- Introduction to command line data toolkit: csvkit
- Convert files to csv using in2csv
- Print preview using csvlook , csvstat
- Filter data using csvcut , csvgrep
- Append multiple data files using csvstack

Database manipulation on the command line

- Database manipulation using sql2csv , csvsql
- Advanced SQL-like ETL commands using csvkit

Building data pipelines on the command line

- Execute Python on the command line
- Python package management using pip
- Automate Python model and build pipelines with cron

Thank you! So long!

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