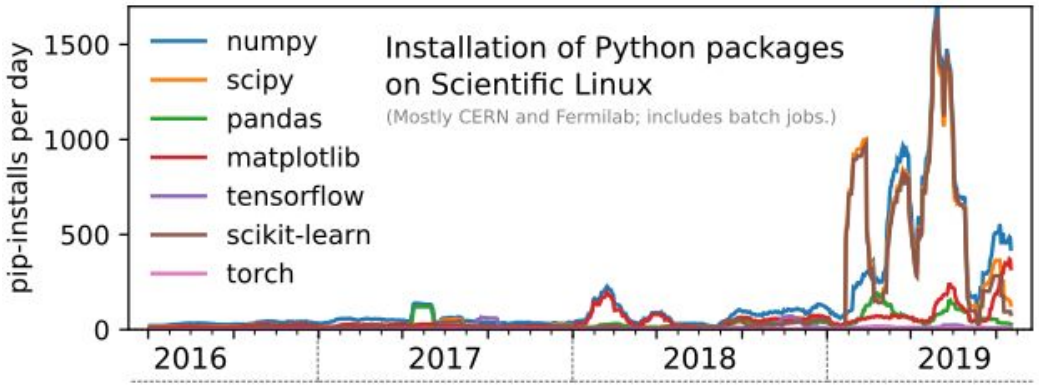
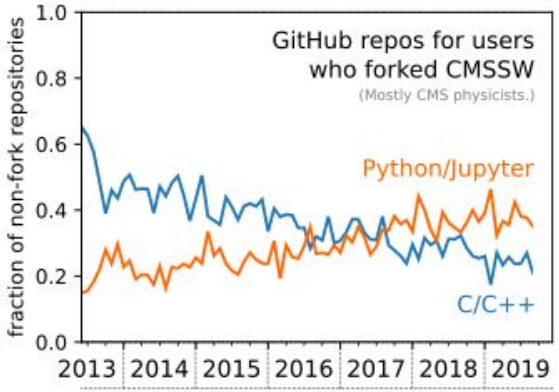
DEPARTAMENTO DE FÍSICA NUCLEAR E ALTAS ENERGIAS

Python and PyROOT

Why Python?





From Jim Privaski: https://indico.cern.ch/event/917675/

Why Python?

- Python is easy and quick to read and write
- Python has a large and active community of users and developers, and a large base of tools available
  - A huge community of data analysts contribute to Python tools
- Python is a common language to learn for physicists and other scientists
- Python is interactive: no compiling, iPython
- Loops, functions, classes and modules are all very easy
- No worrying about memory management or stress keeping track of types and type casting

```cpp
#include <iostream>
#include <string>
int main() {
  std::string words[6] = {"this", "is", "my", "array", "of", "words"};
  for  (int i=0; i<sizeof(words)/sizeof(words[0]); ++i) {
    std::cout << words[i] << std::endl;
  }
  return 0;
}
```

C++

```
arrayOfWords = ["this", "is", "my", "array", "of", "words"]
for word in arrayOfWords:
  print word
```

Shell (bash)

```
#!/bin/bash
ARRAY_OF_WORDS=(this is my array of words)
for WORD in ${ARRAY_OF_WORDS[@]}
do
  echo ${WORD}
done
```

Python

Comparison of a simple loop over elements in an array

PyROOT

- PyROOT is a Python binding for ROOT
- Use ROOT classes and functionality within Python
- PyROOT’s syntax very similar to the C++ version
  - Can use the same documentation

C++ ROOT to PyROOT

C++ ROOT:

```
TPad *pad3 = new TPad("pad3",
                      "The pad with the histogram", 0.03, 0.02, 0.97, 0.57);
```

It's nearly mechanical conversion to Python:

```
import ROOT as r
pad3 = r.TPad("pad3",
                       "The pad with the histogram", 0.03, 0.02, 0.97, 0.57)
```

Jupyter notebook vs interactive mode

- To run pyROOT in the interactive mode, type in terminal:

```
$ python
>>> import ROOT
```

- To exit the python prompt, type: `Ctrl+D`

OR

- To run pyROOT at jupyter notebook, type in terminal: `root --notebook`
- Then you'll see the application opening in the web browser on the following address: http://localhost:8888
- To execute a cell, press: `Shift+Enter`

Hands-on

- Python in 10 minutes: https://github.com/Analise-Dados-FAE/Aula-ROOT/blob/main/Python-in-10-minutes.ipynb
- Hands-on PyROOT: https://github.com/Analise-Dados-FAE/Aula-ROOT/blob/main/Intro-pyroot-2020-2.ipynb

References

- https://twiki.cern.ch/twiki/bin/viewauth/CMS/PyROOTHATSatLPC2020
- https://www.nevis.columbia.edu/~seligman/root-class/