

Python for Matlab Users

Thomas Hauser

Director of Research Computing

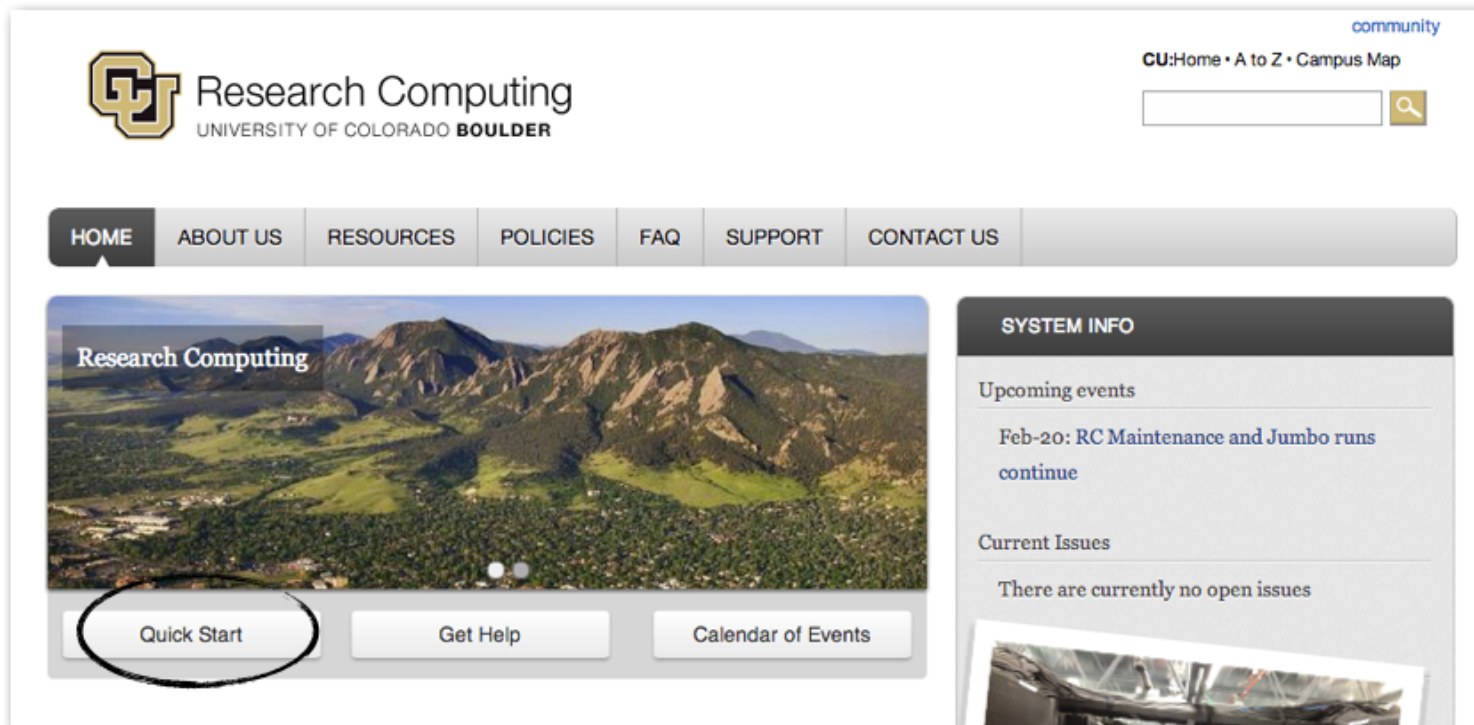
thomas.hauser@colorado.edu

Monte Lunacek

HPC Application Specialist

monte.lunacek@colorado.edu

Who are we?



- www.rc.colorado.edu
- JANUS ~16000 cores



What is Python?

What is Python?

- Flexible, powerful programming language
 - Object oriented
 - Runs everywhere
 - Testing framework
- Easy, clean syntax
- Very readable code
- Balanced high level programming with low-level optimization
 - Pyrex, Cython
 - F2py
- Large community of support
 - Modular system, large number of libraries
- Free as in **free beer**
- Free as in **free speech**

Minimum packages for computational science

- python: the base language
- numpy: arrays, fast operations on arrays
- scipy: higher level computational routines
- matplotlib: plotting
- ipython: notebooks, flexible shell, and **parallel**
- pandas: data analysis

What can you do with Python?

- OS support: manage files and directories
- Glue existing applications
- LAPACK and BLAS: access powerful C and Fortran libraries
- Parallel
- Data Analysis
- Visualization
- GUI programming
- Scrape websites
- Build websites
- **Anything!**

Outline

Part One

- Python Overview (30 minutes)
 - IPython and Notebook
 - Functions, lists, and Dictionaries
- Lab (10 minutes)
- Break (10 minutes)

Part Two

- Numpy (20 minutes)
- Plotting with Matplotlib (10 minutes)
- Lab (10 minutes)
- Data Analysis (20 minutes)

Python Overview

- Test driving three ways to interact with Python
- Functions, lists, dictionaries

Hello World

```
#!/Users/mlunacek/anaconda/bin/python
```

PYTHON

```
def say_hello():  
    print 'hello world'
```

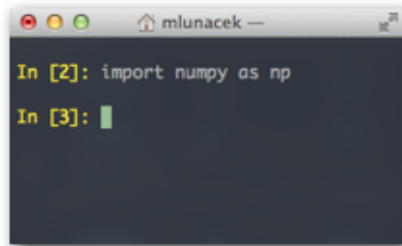
```
say_hello()
```

What do you notice about this code?

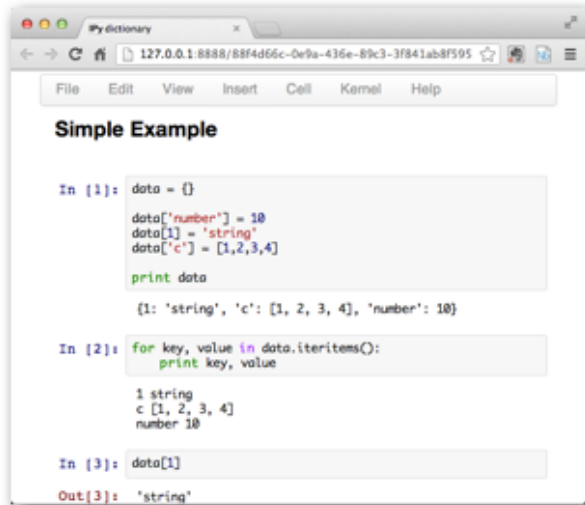
Three ways to run



1. text editor + terminal



2. text editor + IPython



3. IPython Notebook

Terminal

```
$ ls hello_world.py
```

BASH

```
hello_world.py
```

```
$ python hello_world.py
```

```
hello world
```

```
$ ./hello_world.py
```

```
hello world
```

```
bash-mac$
```

IPython shell

- OS support
- Formatted print
- Tab Completion
- `%run`
 - Persistence
- History
- Introspection (`?`, `??`)
- `%paste` and `%cpaste`

Quick Introduction to Python

- Functions
- Lists
- Dictionaries

How

- IPython terminal
- Notebook

IP[y]: Notebook

To import a notebook, drag the file onto the listing below or **click here**.

/Users/mlunacek/Documents/tutorials/python/python_hpc/Python4Matlab

[data analysis](#)

[dictionary and lab](#)

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Lab and Break

Dictionaries

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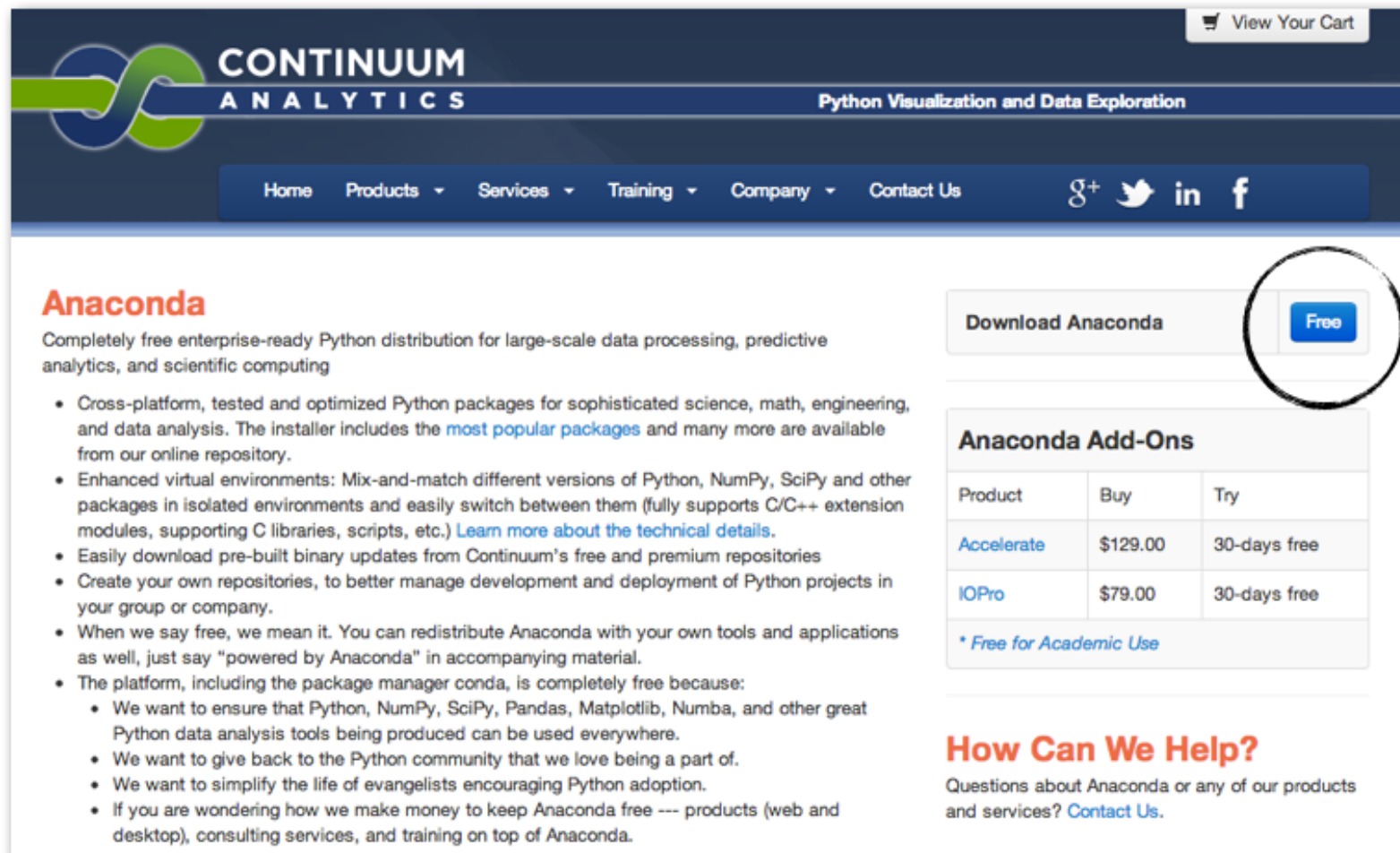
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Github

PUBLIC ResearchComputing / python_hpc

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Example code and slides

Clone in Mac ZIP HTTP SSH Git Read-Only https://github.com/ResearchComputing/python_hpc.git Read+Write access

branch: master Files Commits Branches 1 Tags

python_hpc / 6 commits

added a few intro slides

thomasahauser authored 12 hours ago latest commit 58b48881f4

01-introduction	9 days ago	Adding new files [mlunacek]
02-numpy	9 days ago	Adding new files [mlunacek]
03-ipython	9 days ago	Adding new files [mlunacek]
04-matplotlib	9 days ago	Adding new files [mlunacek]
05_pandas	3 days ago	pandas [mlunacek]
Python4Matlab	12 hours ago	added a few intro slides [thomasahauser]

https://github.com/ResearchComputing/python_hpc

Lab

- Go to the directory where you downloaded the code
- `unzip` the file
- Navigate to **Python4Matlab**
- Launch IPython Notebook
 - `ipython notebook`
 - `dictionary_and_lab`

IP[y]: Notebook

To import a notebook, drag the file onto the listing below or [click here](#).

 New Notebook

/Users/mlunacek/Documents/tutorials/python/python_4_matlab

[data_analysis](#)

Delete

[dictionary_and_lab](#)

Delete

[functions_and_lists](#)

Delete

[pandas_overview](#)

Delete

IP[y]: Notebook

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Numpy and Matplotlib

IP[y]: Notebook

To import a notebook, drag the file onto the listing below or **click here**.

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Lab 2

Numpy and Matplotlib

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Pandas

Data Analysis

IP[y]: Notebook

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What did we learn?

- Python's syntax is clean
- Notebook, IPython terminal
- **Data** structures
 - Lists, dictionaries,
 - numpy arrays
 - pandas DataFrame
- Ways to act on these containers
- Plotting with matplotlib

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 - [profiling](#)
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- Templates: [jinja2](#)
- SQL database: [sqlalchemy](#)
- Websites: [django](#)
- Hardware [Raspberry Pi](#)

References

- [Python Scripting for Computational Science](#)
- [Python Snakes Its Way Into HPC](#)
- [Andy Terrel: Getting Started with Python in HPC](#)
- [Python Tutorial](#)
- [Think Python](#)
- [Enthought](#)
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- [Data Analysis with Python](#)

Thank you!