Uni.lu HPC School 2018

PS10: Scientific computing using MATLAB and Mathematica

Uni.lu High Performance Computing (HPC) Team

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http://hpc.uni.lu

Latest versions available on Github:

UL HPC tutorials: https://github.com/ULHPC/tutorials

UL HPC School: http://hpc.uni.lu/hpc-school/

PS10 tutorial sources:

https://ulhpc-tutorials.rtfd.io.rtfd.io/en/latest/maths/matlab/basics/

Summary

Session Objectives

Better understand the usage of MATLAB on the Uni.lu HPC Platform

- running in interactive mode
  - ↪ with either the full graphical or the text-mode interface
  - ↪ using the XCS portal (xcs.uni.lux)
    - ✓ will be deprecated in favor of a new OnDemand platform

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  - ↪ several ways of submitting MATLAB jobs

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- using script (.m) files
- plotting data, saving the plots to file

Summary

Tutorial files

Sample MATLAB scripts used in the tutorial

- download only the scripts

```
mkdir $HOME/matlab-tutorial
cd $HOME/matlab-tutorial
wget https://raw.github.com/ULHPC/tutorials/devel/maths/\
     matlab/basics/code/
                          example1.m
                          example2.m
                          google_finance_data.m
                          file_data_source.m
                          AAPL.csv
```

- *or* download the full repository and link to the MATLAB tutorial

```
git clone https://github.com/ULHPC/tutorials.git
ln -s tutorials/maths/matlab/basics $HOME/matlab-tutorial
```

X Window System

In order to see locally the MATLAB graphical interface, a package providing the X Window System is required:

- on OS X: **XQuartz** `http://xquartz.macosforge.org/landing/`
- on Windows: **VcXsrv** `http://sourceforge.net/projects/vcxsrv/`

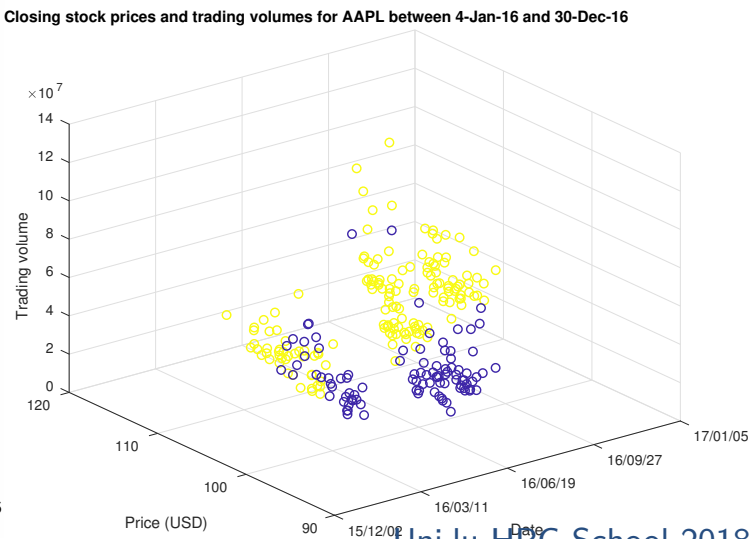
Now you will be able to connect with X11 forwarding enabled:

- on Linux & macOS: `ssh access-gaia.uni.lu -X`
- on Windows, with Putty: Connection → SSH → X11 → **Enable X11 forwarding**

Scripts and plots

example1.m: non-interactive script that shows

- the use of a stopwatch timer
- how to use an external function (financial data retrieval)
- how to use different plotting methods
- how to export the plots in different graphic formats



Parallelization

example2.m: non-interactive script that shows

- the serial execution of time consuming operations

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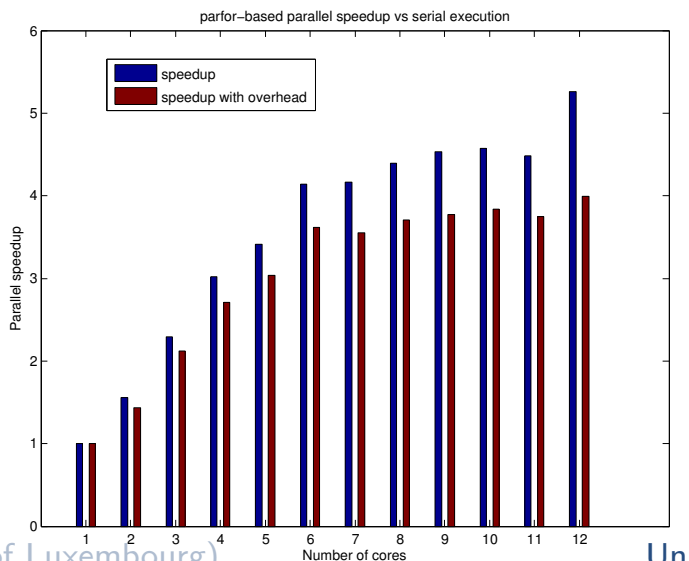
example2.m: non-interactive script that shows

- the serial execution of time consuming operations
- and revisited in the second part of the tutorial:
  - ↪ the parallel execution and relative speedup vs serial execution
  - ↪ setting the # of parallel threads through environment variables
  - ↪ GPU-based parallel execution



Exercises - your mission today

- Read and understand the MATLAB tutorial

  https://github.com/ULHPC/tutorials/tree/devel/maths/matlab

  ↪ all provided scripts are fully commented
- Run all the examples
  - ↪ launching interactive/passive mode MATLAB
  - ↪ plotting script
  - ↪ parallel execution script

Useful links

- Getting Started with Parallel Computing Toolbox

  http://nl.mathworks.com/help/distcomp/getting-started-with-parallel-computing-toolbox.html

- Parallel for-Loops (parfor) documentation

  https://nl.mathworks.com/help/distcomp/parfor.html

- GPU Computing documentation

  https://nl.mathworks.com/discovery/matlab-gpu.html

What we've seen so far

- MATLAB execution modes on the Uni.lu HPC Platform
- Checking for available toolboxes and licenses
- Basics of plotting

Perspectives

- Personalize the UL HPC launchers with the MATLAB commands
- Check example #2 M-file for insight into basic parallel execution
- Parallelize your own tasks using parfor/GPU-enabled instructions

Questions?

http://hpc.uni.lu

High Performance Computing @ uni.lu

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