Introduction to High-Performance Computing

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CAVEAT & instructions

- ✓ This is only an introduction stuff
- ✓ There’s much more under the hood
- ✓ These 8 lessons can only help you to introduce some basic ideas
- ✓ Needs more experience (and so many mistakes) to manage HPC
- ✓ Almost all examples are in Fortran but the reasons behind performance are (almost) language independent (I’m an boomer)
- ✓ Please write to g.amaticode@gmail.com to have your email
- ✓ material downloadable from: https://github.com/gamati01/HPCLessons

Course structure/1

These are the HPC topics covered in this course:

- ✓ HPC description
- ✓ Memory subsystem
- ✓ Floating point structure
- ✓ Algorithm vs. Implementation
- ✓ Compiler
- ✓ Parallel paradigm for CPU
- ✓ Parallel paradigm per GPU

Course structure/2

Topics not covered in here:

- ✓ OS
- ✓ Virtual Memory
- ✓ I/O
- ✓ ….

Example/exercises

Some example/exercises that will be presented here

- ✓ Matrix-Matrix Multiplication
- ✓ Matrix-Matrix Multiplication
- ✓ Matrix-Matrix Multiplication (again…)
- ✓ Laplace equation
- ✓ Travel Salesman problem
- ✓ Sieve of eratosthenes
- ✓ ….

Note: some exercises will be performed remotely through CoCalc infrastructure

Pre-requisites

What is requested:

- ✓ A Laptop/PC to perform some tests/execises
- ✓ A basic knowledge of a programming language
  - Fortran/C/matlab….
- ✓ To register to CoCalc (it will be used for some exercises(
  - https://cocalc.com/

Who we are?

Just to know where we come from…

- ✓ G. Amati
- ✓ A. Ceci

Material

https://github.com/gamati01/HPCLessons

You'll have access to

- ✓ PDF of the various presentations
- ✓ Code in fortran/C
  - to complete
  - to modify
  - to simply run