High Performance Computing
+
Cloud Computing A, B

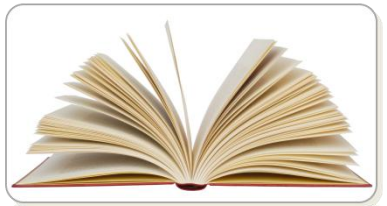
INSTRUCTIONS FOR USAGE

DATA SCIENCE &
ARTIFICIAL INTELLIGENCE

SCIENTIFIC &
DATA-INTENSIVE COMPUTING

2023-2024 @ Università di Trieste

Outline



What you will learn

How it works

Some common rules & principles

What you will learn

High Perform. Computing	Cloud Computing A	Cloud Computing B
simple introduction to HPC and parallel programming. propedeutic to Advanced HPC.	basic concepts of Cloud Computing	Kubernetes & HPC on cloud infrastructures
curriculum SDIC+DSAI	SDIC+DSAI	SDIC

What you will learn - HPC

What is High Performance Computing

Tools, basic and not-so-basic concepts

Modern computer architecture

Why is it there and what will be next; how, and why, to «optimize» a code for such an architecture

Parallel programming

Grow-up and use large HPC facilities to tackle large (and complex) problems

Attitude

Don’t be (only) a user of pre-cooked tools that you consider as black-boxes

What you will learn - Cloud Computing A

What is Cloud Computing

Tools, basic and not-so-basic concepts

Modern cloud architecture and infrastructure

Containers

Attitude

Don’t be (only) a user of pre-cooked tools that you consider as black-boxes

What you will learn - Cloud Computing B

Introduction to Kubernetes

Installing and managing Kubernetes

Porting client-server applications on Kubernetes

Installing and benchmarking HPC applications on Kubernetes

Outline

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How it works

The baseline is:

1) **lectures**: we prepare slides and examples and we expose them.

Some of the lectures are actually hands-on sessions and tutorials

The lectures will be recorded and you'll find the related files both in the Teams and on a Google Drive in the long-term.

The pdfs that we will use and the example codes will be put in a GitHub repository.

How it works

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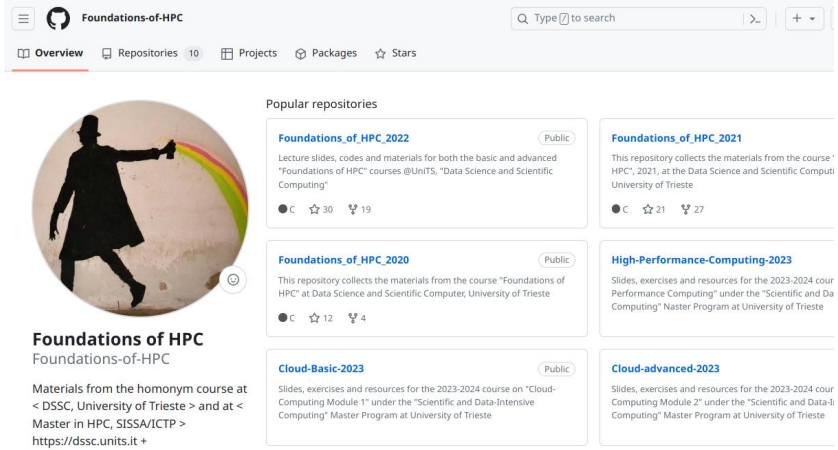

`github.com/Foundations-of-HPC`

`/High-Performance-Computing-2023`
`/Cloud-Basic-2023`
`/Cloud-Advanced-2023`

The repos are online and public; in the landing page you find the detailed list of the lectures.

How it works

The baseline is:

1) **lectures**: we prepare slides and examples and we expose them.
2) **questions**: you ask what you want whenever you want; if we say something wrong or stupid, you notice that and you raise your hand.

How it works

The baseline is:

1) **lectures**: we prepare slides and examples

2) **questions**: you ask what you want whenever you want

3) **discussions**: you ask to discuss much deeper some aspects or topics from previous/future lectures; you read other materials and bring them into the discussions.

How it works

The baseline is:

1) **lectures**: we prepare slides and examples

2) **questions**: you ask what you want whenever you want

3) **discussions**: you ask to discuss much deeper

4) **Office hours:** each of us will be available weekly an hour (we'll communicate which one). However, we are ready for chatting, Q&A or alike upon appointment

Outline

What you will learn

How it works

Some common rules & principles

Common rules & principles

1) **Don't be shy**, every question is legitimate and useful; ask what you do not understand (or we explain poorly), comment what you want to explore.
2) Our main focus is that you **learn**, not to grade you.
3) Learning is a **process**, not a result; we're interested in both your learning process *and* in your final level.
4) This course is gonna be **tough** for many, if not all, of you; it is because we'll challenge you to go beyond your (supposed) limits, and we'll consider you as intelligent adults not as *poor students*.

Common rules & principles

5) We (you and us) will be **honest** in all respects (giving/doing assignments, in the mutual relationships, …).
6) Nobody is perfect or always right: **errors and mistakes are natural**; what matters more is what will follow-up.
7) We're not the guardians of your life: you decide how much you want to learn and how much to profit from opportunities (among them there is following this course).

Common rules & principles

8) Although we firmly believe in **sharing and commons.**
Open source is among the greatest achievements in this field.
We all have learnt from other people's codes, but we all have learnt even more from our own mistakes and efforts.

We remind you that **learning is a process in our personal brain, not in others' one**.
We encourage you to **clash with your limits** long before you decide to take inspiration from available code (for sure you may find something useful for the assignments) online.

NOTE: *It may be risky supposing that at the examination we will be unable to spot whether you fully understand the code you have submitted or not..* :-)

Exam / 1

Eventually, this journey ends with an exam and an evaluation of your level of comprehension and acquired skills.

The evaluation consists in **2 steps**

1. You complete a final assignment that will be given before the end of the lecture;
2. you attend the exam session
   a) at the begin all the attendees will answer to some simple written questions on the topics covered in the lectures (~15min)
   b) every candidate will discuss individually its own assignment and the answers to the questions given at the begin of the exam

Exam / 2

The final assignment

We will prepare a set of exercises, and you will have to pick **2 for HPC**, **1 for CCa** and **1 for CCb**.

You must solve the problems, write a report about your work and send us the report 1 week before the exam session. You must also upload the code that you have written on a git.

No working group is allowed (i.e. everyone has to write its own report).

Exam / 3

You will be allowed to **repeat** the oral exam **without any constraint**.
However, please

(i) do not try multiple times in a short time span (save our time and take yours to digest better)

(ii) self-organize with your peers so to have groups of you that ask for an exam

(iii) there will be regular exam sessions, however usually we do prefer to agree with small groups of students to have exams whenever it ifts at best.

Exam / 4

Here is what ideally you should expect as final grade:

18–20	Too embarassing to mention
21–23	You got a basic understanding of the matter; slightly more advanced topics or unexpected facts put you in trouble
24–26	You have a robust understanding of the matter, upon thinking you can explore rough terrain
27	You have a firm comprehension of the matter, you sense the right direction and solution
28	Like 27 + you *see* the solution; some added shining
30	Like 28, but with shining
30*cum laude*	Like 30, but you really surprise us
29	Some accident happened along the route to 30

Resumé

Learning is a process that happens only together, among human beings.

Racism, sexism, homophobia, culturalism, discrimination in every sense are not allowed and definitely rejected.

Help us in building a better milieu and a wonderful experience in sharing this journey together.

Questions, comments, doubts, fears… ?

Now is the time (but another one will fit as well).

But, in case that later on you feel *l'esprit de l'escalier*, you can still contact us:

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giuliano.taffoni @ inaf.it
luca.tornatore @ inaf.it