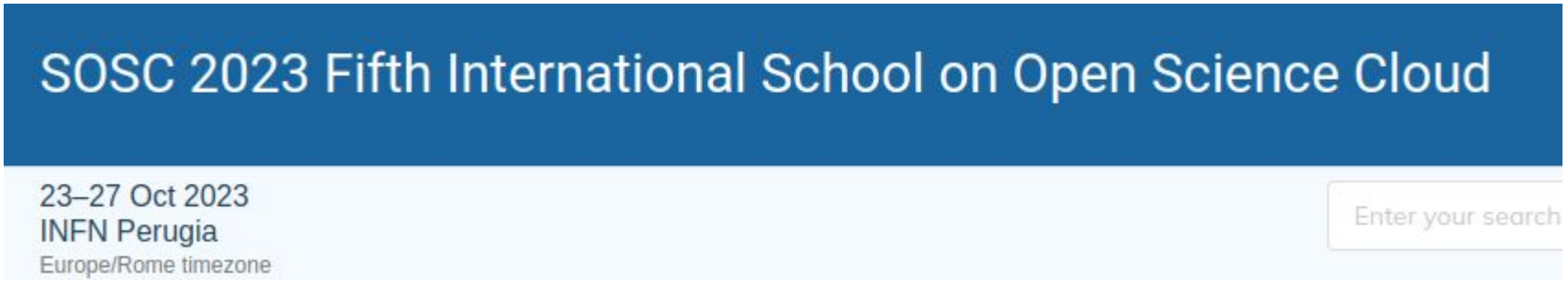
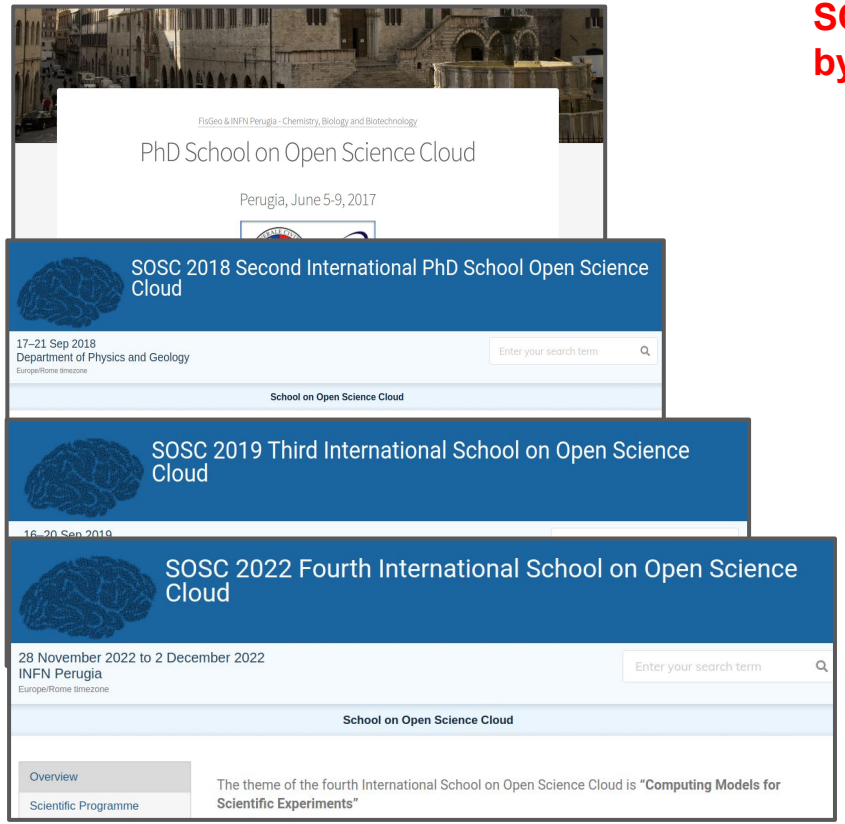


SOSC23 Welcome and Logistics

Daniele Spiga, INFN-Perugia
spiga@pg.infn.it

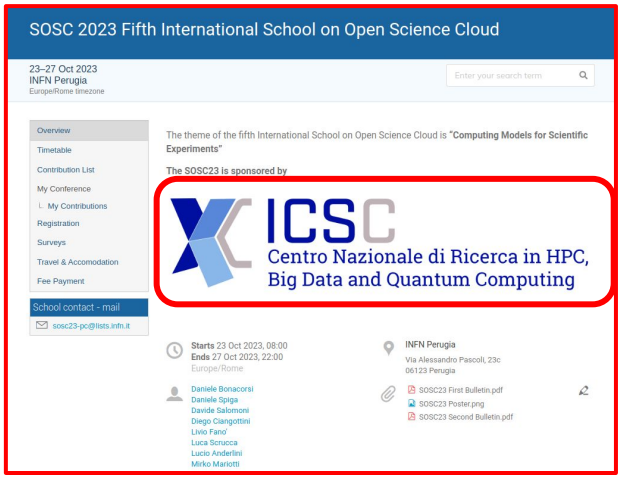
23 October 2023 to 27 October 2023
INFN Perugia

Welcome to Perugia and to SOSC 2023



SOSC (School on Open Science Cloud) is jointly organized by INFN, University of Perugia and University of Bologna.

- This is the fifth edition and is held in Perugia (Welcome)
- 32 students, few auditors from INFN and University staff, **a now traditional blending among theory and practice**

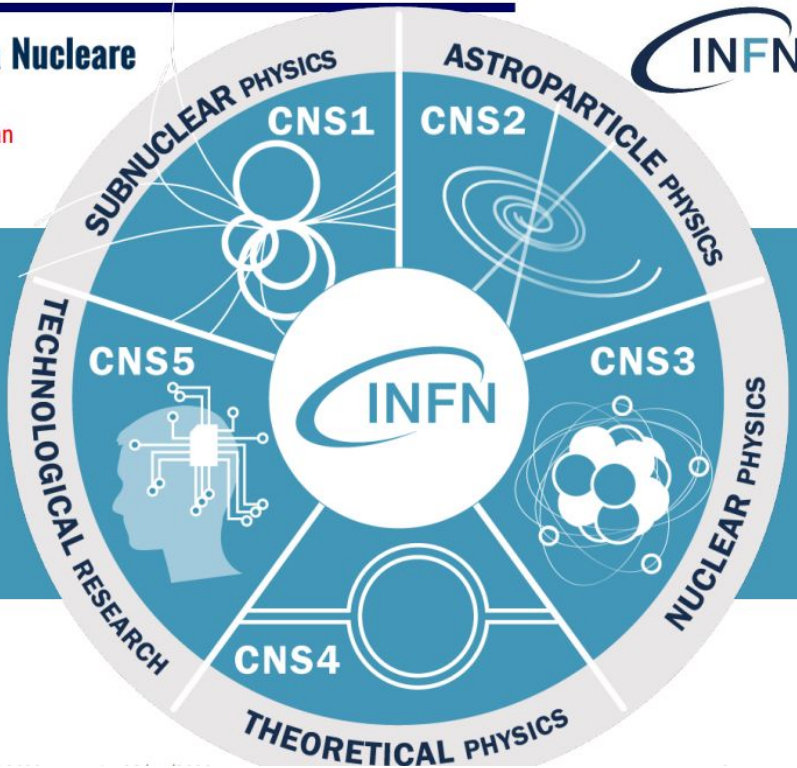


INFN in a Nutshell

INFN Istituto Nazionale di Fisica Nucleare

The **National Institute for Nuclear Physics** (INFN) is the Italian research agency dedicated to the study of the fundamental constituents of matter and the laws that govern them.

The **5 research lines**
and the INFN National Scientific Committees



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Computing @ INFN

1962 → The 60s → The 70s-80s → 1988-1995 → 2000-2005

In the 2000's, ten international centers were selected to host the Worldwide LHC Computing Grid (WLCG):

- In Italy, this was the Tier-1 at CNAF (red in the picture)
- 9 additional "Tier-2" centers were then added, at LNL, LNF, Turin, Milan, Pisa, Rome, Naples, Bari, Catania (yellow in the picture).
- Then came the GRID, the Cloud, and other technological developments.

- All these centers are still operational, even if their size has increased ~100x since then, and their interconnectivity now reaches multiples of 100 Gbps, thanks to the GARR-X network.
- Collectively, our distributed infrastructure currently offers about 140,000 CPU cores, 120PB of enterprise-level disk space, 100PB of tape storage.

All this is currently evolving!!

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The “National Center for Big Data, HPC and quantum Computing”

In the framework of the PNRR/NRRP

Within the 30BEur dedicated to Education and Research, 11BEur are for research (pure and applied)

1.6BEur are dedicated to 5 National Centers which aim to foster innovation in selected research fields, via the realization of large-scale, state-of-the-art infrastructures and labs

INFN (as the proposer) delivered on a bid for the National Center, under the name ICSC (Italian Center for Super Computing)

ICSC

Centro Nazionale di Ricerca in HPC, Big Data and Quantum Computing

Italian Research Center on High-Performance Computing, Big Data and Quantum Computing

Federazione Cloud

Kick off meeting

Modello: integrazione «debole» di cloud indipendenti
- In uso sulla cloud INFN
- Tutti i centri INFN adotteranno il modello nell'arco del progetto ICSC

Estensione a CINECA e ad altri provider del centro nazionale (CMCC, ...)
- Attività già iniziate nell'ambito del POR-FESR SUPER dell'Emilia Romagna
- Federazione integrata dei sistemi Tier1 e dei sistemi Europei di EuroHPC mediante rete ad iperconnettività

Proof of concept previsto a M8

INFN

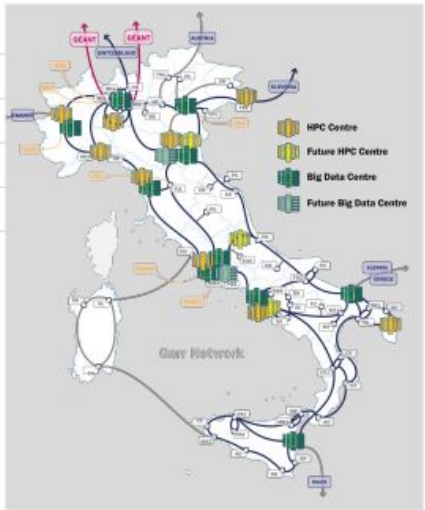
ICSC
Centro Nazionale HPC, Big Data e Quantum Computing

Approved !!!

Cloud national infrastructure for supercomputing.
Hub & Spoke organization:
10 vertical spokes for technology developments and software applications

320 + 41 M€ Total Budget
139 M€ Cloud Infrastructure
32 M€ Open Call
32 M€ Innovation & TT
42% investment South Regions

34 MUR Universities and Research institutions
15 Private Companies
1575 Researchers and engineers
250 New Temporary positions
250 New PhD
40 % Female

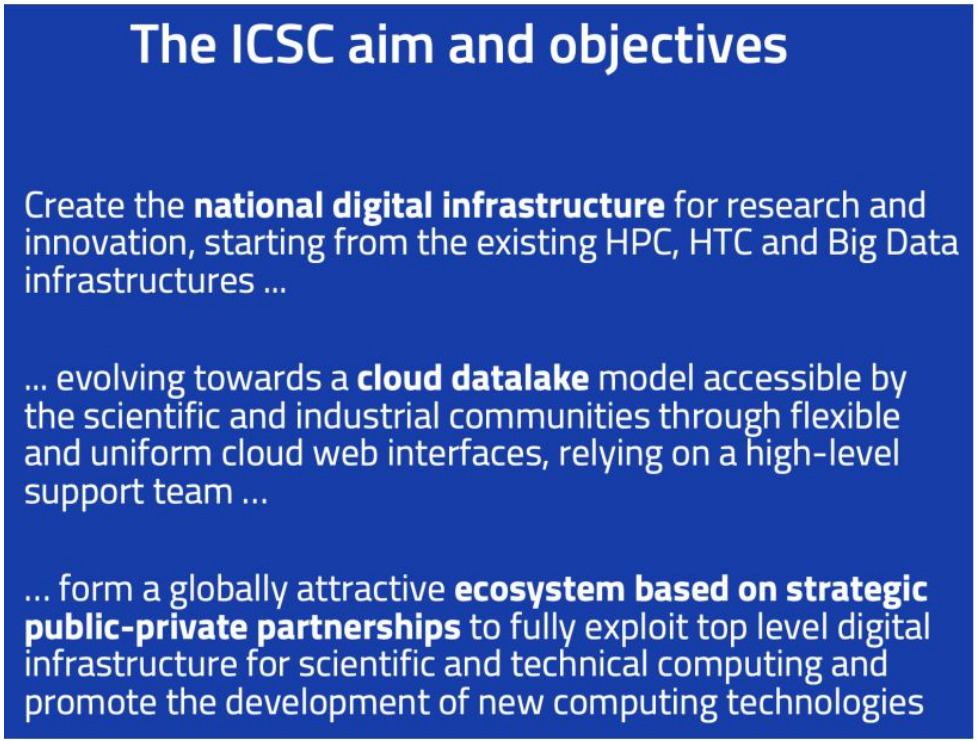


ICSC Kick-off Meeting
Bologna, 25-26/11/2022

Synergies…

At SOSC22, you will work with some of the state -of-the -art technologies that form the core of the INFN vision on computing.

- INFN has the ambition to create, evolve and operate a vendor - neutral, open, scalable and flexible “data lake” that serves much more than just INFN users and experiments.
- This will become a key asset for fundamental, applied and industrial research in Italy and beyond and will be based on continuing international cooperation .



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Theme and structure of the School

The SOSC 2023 theme is **“Computing Models for Scientific Experiments”**; the school programme is organized in three main tracks:

1. **Fundamentals ->** **Monday and Tuesday**
2. **Machine Learning ->** **Tuesday and Wednesday**
3. **Workflow Management and pipelines->** **Thursday**

The school is structured with **lectures in the morning** and **hands-on sessions (mainly but not exclusively) in the afternoon**.
A student project will be developed from Monday afternoon up until Thursday afternoon

Please refer to the SOSC 2023 agenda for details and for the official timetable. All presentations will be uploaded there.

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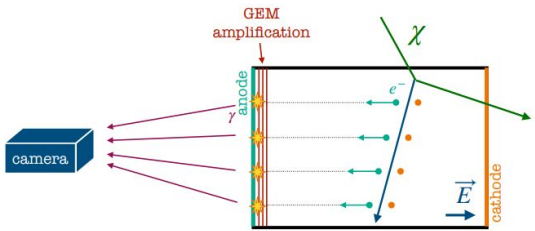
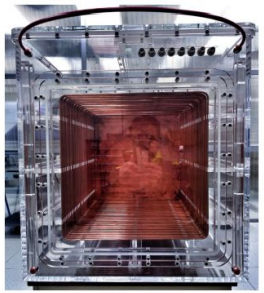
SOSC23 project is inspired by a real experiment

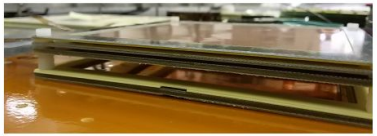
The CYGNO project

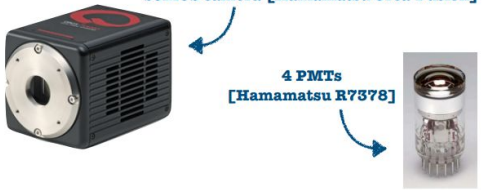
- **Aiming for** a large detector for high precision **3D tracking of rare low energy nuclear recoils** (keV) possibly induced by **dark matter** (DM) particles and solar neutrinos
- **Experimental challenges:** rate O(evt/kg/year), background rejection, and energy threshold (keV)
- **Strategy: photograph nuclear recoils** in a (1 atm) He:CF_4 TPC with a GEM amplification stage

➡ low energy events in 1 atm gas ⇒ visible tracks









2

Courtesy Stefano Piacentini

We/you will use Cygno images

Dott. Giovanni Mazzitelli will tell us all the interesting details about the Cygno Experiment

About The individual project

The SOSC23 foresees the development of a personal project.

- Upon successful completion of the project the School will issue an official **“SOSC School of Computing Diploma"**

The project is structured with Jupyter Notebooks that will include also exercises. While the first part of the notebooks will be guided by tutors, **the exercises will be developed just by you we will use a cloud environment (INFN-Cloud) to:**

- Simulate a Data Acquisition System (DAQ), or better the interaction with a DAQ
- pre-process acquired data to the analyze it
- analyze data
- automate the pipeline

You will need to provide us with your Jupyter Notebooks (each day you will have one to deliver)

NOTE: An **attendance certificate will be provided to the students attending the whole School programme**

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Hands-on: tools

You've been asked to **register** here:

- if you have not done so yet, please tell us and do it asap.

The provided cloud platform has been deployed via INFN-Cloud The platform will provide you with

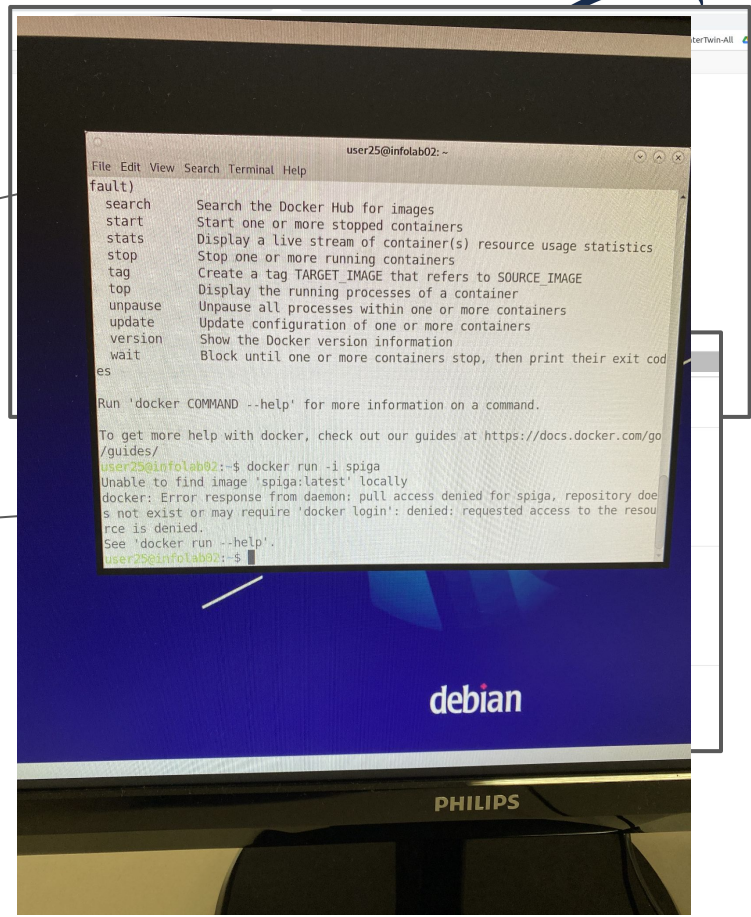
- **A Jupyter environment**

A Cloud storage service (MinIO)
A Cloud native messaging system (Nats)

All will be in form of "as a Service" systems.

- **At the end of the school we will provide you with all-in-one docker based deployment**

You will learn how to interact and operate with those services. We'll teach you.. That's part of the Fundamentals



And of course a working station where to do exercises and to connect to the cloud platform

How to access your Work Station?

Laboratory access

Every terminal is associated with a specific user and can be accessed without a password. For example, terminal post14 is assigned to user14. Therefore, please remember which terminal is yours to locate your files from previous days.

To access the laboratory terminal, click on the SOSC icon on the terminal chooser screen. If a dialog appears (possibly only the first time) asking to verify the SSH fingerprint, simply click 'Yes.'

In case the terminal locks due to inactivity, the password for everyone is:

We strongly suggest to keep the same seat for the whole week

Check the whiteboard

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Hands-on: Guided Exercise

The hands-on are meant as guided exercises that will treat most of the topics that will be required to develop your individual project. There will be hands-on several topics:

- Software packaging and software management
  - Container and docker, a pillars in the cloud-native applications
- Image handling in python and data pre-processing
  - SOSC23 data are images (Cygno images). We will learn how to manipulate images in Python. This is needed to prepare our data to be treated in a meaningful way.
- Manage data in a Cloud Environment Storage and message queue
  - We're in the cloud :) and thus we focus on S3 Cloud Storage
  - We also learn how to exchange data, segmented in the form of messages. Focus on publish and subscribe as a way to process data as they come from our camera/sensor
- Machine Learning technique to treat our data.
  - We will have a classification problem… need to distinguish electron recoil events from Nuclear Recoil events… in the end we're looking for Dark Matter
- Automation in a cloud environment
  - We will build a pipeline making our analysis reproducible

All this should provide you with material (code) needed to develop the individual project

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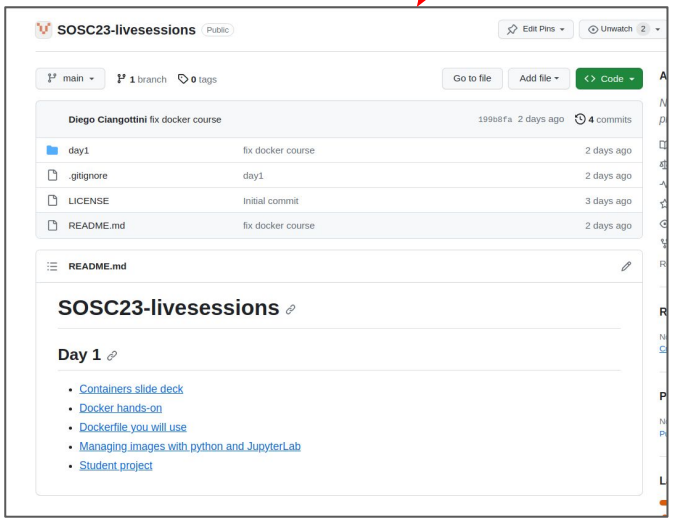
Hands-on and Individual Project: Material

All the material for the guided hands-on as well as the tracks of the individual project will be in form of Jupyter Notebooks. Everything will be made available via the [github repo of the SOSC23]

- You'll be guided to interact with git software repositories

We will push material the day itself

- Today is already available
- Tomorrow will be pushed before the school will start



During the Closing session on Friday

On Friday we shall have:

- An overall SOSC 2023 **evaluation questionnaire**.
- The delivery of a **SOSC 2023 certificate to the students attending** the whole school program.
- The delivery of the **Official SOSC School of Computing Diploma.**
  - For the students successfully completing the project

NOTE: we will keep the cloud platform accessible for a week (3.11.2023). After that, the systems will be destroyed. At the end of the school you should be able to gather all your material, however ask us for any support

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Logistic and Events

In order to attend the school, **you must register and check in**.

- If you have not done so yet, please tell us and we will take care of the registration process.

Wireless access is available either via **eduroam, or via a special SSID**.

- If you do not have eduroam, contact us and we will provide your credentials.

All the sessions of the school will be held in the “Aula di Informatica”

- feel free to choose your working station and keep it until friday

The school provides you with a **working station** to grant you the same environment for the hands-on & to develop the individual project (Thanks to INFN-Cloud resources)

- Nothing prevent you to use your laptop, we simply don’t suggest it

Given we also have international students, **the lectures will be in English**

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Logistic and Events (cont.)

Each morning you should **sign the presence**

Coffee breaks will be served here in this room at mid-morning and mid-afternoon (**included in the Fee**)

Events:

1. A welcome event with buffet **this night** in conjunction with a focus event on FPGA (**included in the Fee**)

2. Social Dinner on Thursday (**included in the Fee**)

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Lunch Breaks are not included in the fee

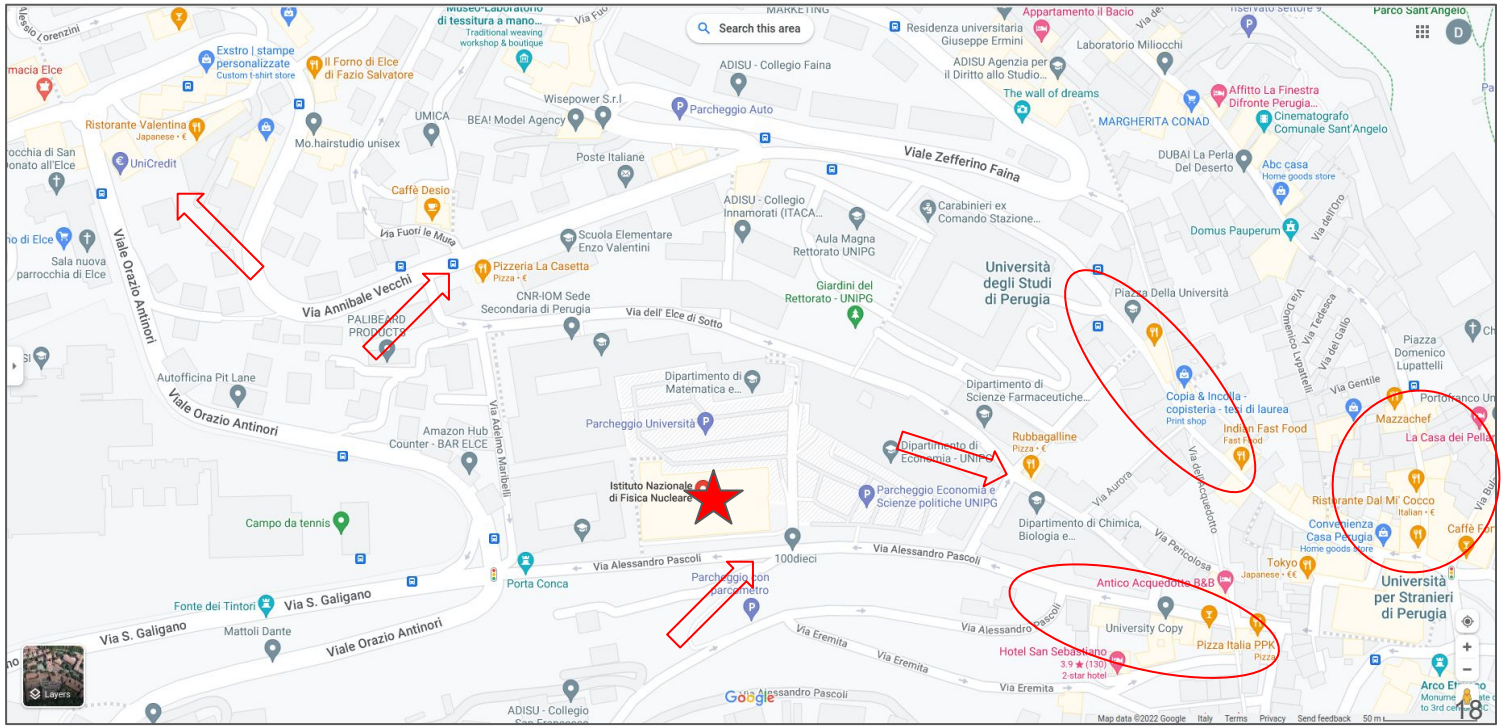
A Few Hints

The break for lunch is 1h and 20 min long (sharp), please come back on time

Brizi
Fiorucci
Rubagalline
110 Bar Cafè

Caffè Desio
caffè della conca
B-GOOD

Pizzeria la casetta
LD pizzeria
Pizzeria Paciotti
Pizza paradiso
Napoli pizza e sfizi



Tonight the first event. Why: Socialize and Relax

What: First Special Event: The theme is FPGA

Where: It will be held at **T-Trane record store** [details in the next slide]

When: Tonight at 19.00 **SHARP**

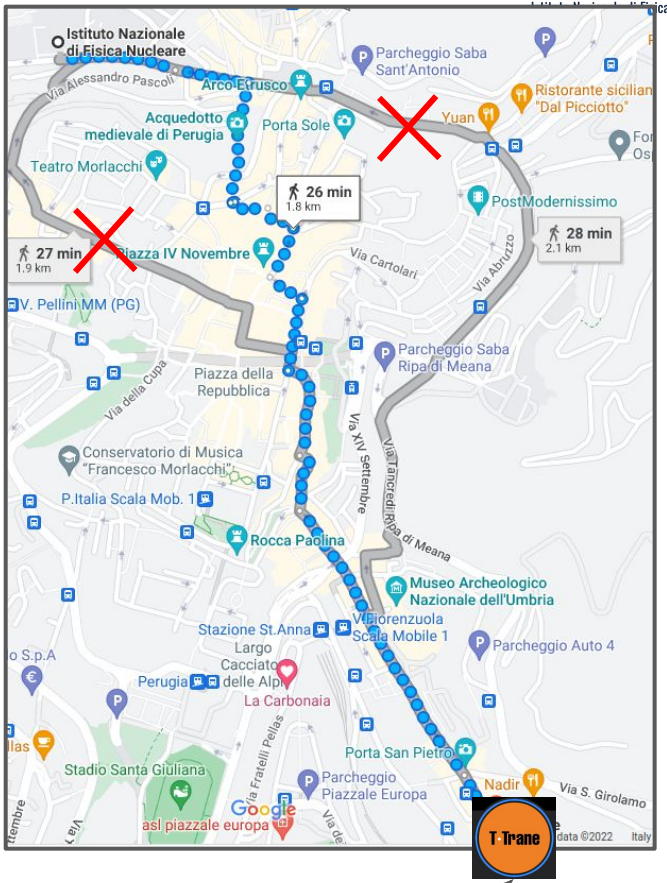
The event is organized in two sessions **plus a Buffet**.

- The **second session will be demo-style** and can/will start even if the **buffet is still running**, it is intended for socializing. ← **Why**

How to get there

25 minutes from here, Google Maps will help

Borgo XX Giugno, 44, 06126 Perugia PG



Social Dinner

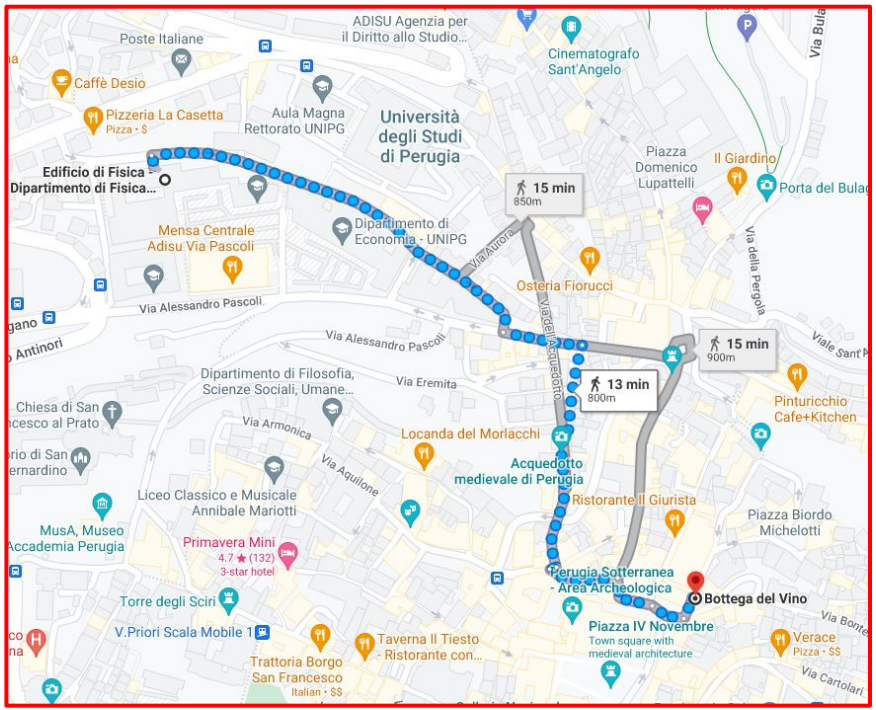
Where: It will be at La Bottega Del Vino

When: Thursday 26th at 20.00

- We will meet directly there

How to reach the restaurant: **Google Maps is your friend.**

- **15 minutes by foot**



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Recap

Useful info and links

1. SOSC23 **github** here: https://github.com/SOSC-School/SOSC23-livesessions
2. SOSC23 hands-on **Platform** here: https://sosc.131.154.99.220.myip.cloud.infn.it/
3. SOSC23 **agenda** of the school https://web.infn.it/SOSC23

Reach us here

spiga@pg.infn.it

And now let's start the SOSC23

Welcome again to SOSC 2023

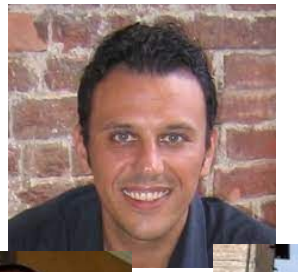
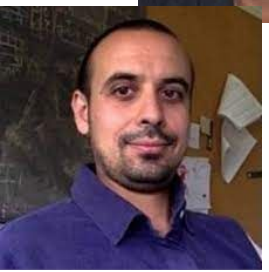
Hope you will have a fruitful week. Enjoy the school and the social events, enjoy Perugia and, of course, do not forget to have fun!

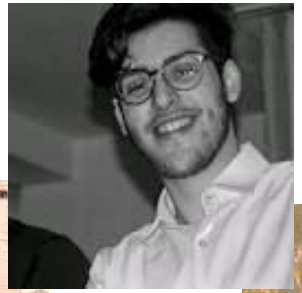
For any further information, see us here, or email the SOSC 2023 Program Committee at sosc23-pc@lists.infn.it

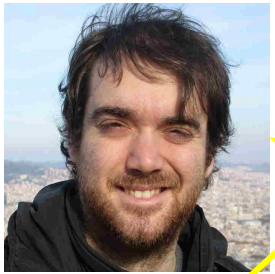
The SOSC 2023 Program Committee:

- **Lucio Anderlini** INFN Firenze
- **Daniele Bonacorsi**, University of Bologna
- **Diego Ciangottini** INFN Perugia
- **Livio Fanò**, University of Perugia
- **Mirko Mariotti**, University of Perugia
- **Davide Salomoni**, INFN CNAF
- **Luca Scrucca**, University of Perugia
- **Daniele Spiga**, INFN Perugia

Main teachers of the week





Caution.. Hazardous People. Handle with care! :)

Our FPGA Experts

SOSC23 Special Guest