Welcome to CERN School of Computing 2022

Sebastian Łopieński
CERN School of Computing director

CERN's mission

Innovation

Education

CERN
uniting people

Research

We are here

Accelerating beams
(accelerators)

→

Detecting particles
(experiments)

→

Large-scale computing
(analysis)

→ Discovery
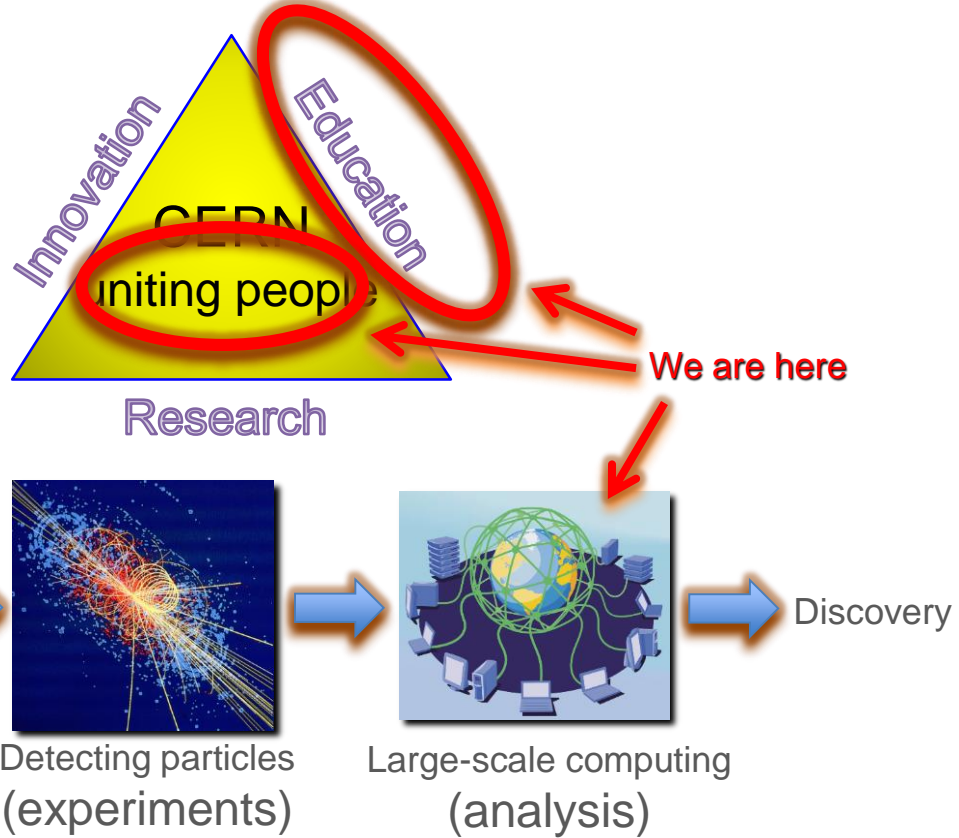
A school with a long history

- The school was created in 1970
  - 43rd edition in 2022

- 3000 students of ~80 different nationalities have followed the school

- The school has visited 22 countries
  - https://cern.ch/CSC/history/past-schools/
  - recently: France, Croatia, Romania, Israel, Spain, Belgium, Greece, Portugal …
  - **Poland hosted CSC 1978 and CSC 1999**

Bridging science and computing

- Technological evolution in computing empowers science
  - especially in data-intensive domains such as High Energy Physics
  - computing is the main strategy for many scientific fields to do research efficiently on a large scale

- It is nowadays essential that:
  - scientists master computing technologies as a main tool for their research
  - computer engineers understand the scientific needs in order to deliver computing services to research projects

Academic dimension

CERN School of Computing…

- is not a conference
  - lecturers do not present their work or promote their projects

- is not a training session
  - not a replication of training courses available at home institutes or online
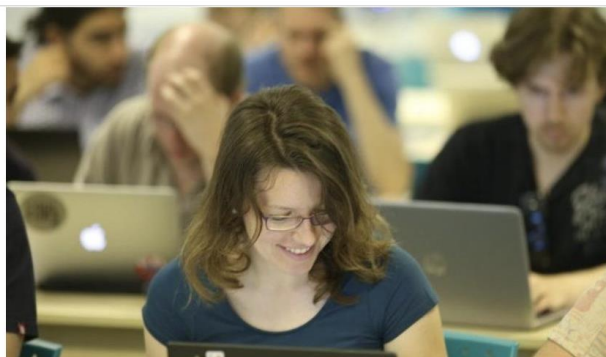 - focus on persistent knowledge, less on know-how

Three CERN Schools of Computing

tCSC 2022

Thematic School 10th edition, will take place at Cargèse, Corse-du-Sud (FR), from 1 to 7 May 2022 – Applications are now closed

tCSC security 2022

Thematic School on Security, will take place in Split, Croatia (HR), from 19 to 25 June 2022 – Applications are now closed

CSC 2022

Main School 2022 43rd edition will take place in Krakow (PL), from 4 to 17 September 2022 – Apply!

CSC 2022 local organisers

University of Science and Technology (AGH)

prof. Tomasz Szumlak

Institute of Nuclear Physics, Polish Academy of Sciences (IFJ PAN)

dr Agnieszka Dziurda

CSC Organizers

Joelma Tolomeo
Administrator

Kristina Gunne
Administrator

Jarek Polok
Technical Manager

Sebastian Lopienski
Director

A busy but fascinating 2-week programme

https://indico.cern.ch/event/1125271/timetable/

Monday, 5 September 2022	Tuesday, 6 September 2022	Wednesday, 7 September 2022	Thursday, 8 September 2022	Friday, 9 September 2022	Saturday, 10 September 2022	Sunday, 11 September 2022	Monday, 12 September 2022	Tuesday, 13 September 2022	Wednesday, 14 September 2022	Thursday, 15 September 2022	Friday, 16 September 2022
09:00 Opening Ceremony	09:00 Introduction to Physics Computing L2: Digital Data, Simulation and …	09:00 Data Analysis L1: Introduction - Toni Sculac	09:00 Data Management L3: Cryptography, authentication,	09:00 Data Management L4: Distributed Hash Tables, Data Replication,	09:00 (optional) CUDA training - Tomasz Szumlak	09:00 Excursion to Wieliczka salt mine + guided visit to Kraków	09:00 Machine Learning L1 - Kamila Kalecinska Tomasz Szumlak	09:00 Software Design L1: Parallelism in a Modern HEP Data Processing …	09:00 Software Design L2: Base Concepts of Parallel Programming: A Pragm…	09:00 Software Design L3: Understanding, Debugging and Profiling a	09:00 Data Visualization L2: Practical Applications of Theory and Multi-Dimen…
	10:00 Data Science L1: Tools for interactive data exploration	10:00 Data Management L1: Setting the scene: Storage technologies,	10:00 Data Analysis L2: Probability density functions and Monte …	10:00 Guest lecture: Heterogeneous computing			10:00 Data Management L5: Distributed Hash Tables, Data Replication,	10:00 Machine Learning L2 - Kamila Kalecinska Tomasz Szumlak	10:00 Machine Learning L3 - Tomasz Szumlak Kamila Kalecinska	10:00 Software Design L4: Patterns for Parallel Software Development	10:00 Announcements
10:45 Welcome coffee											10:15 Coffee break
											10:45 Data Visualization - exercises - Eamonn Maguire
11:15 Introduction to Physics Computing L1: Hadron Collider Physics	11:00 Coffee break	11:00 Coffee break	11:00 Coffee break	11:00 Coffee break	11:00 Coffee break	11:00 Coffee break	11:00 Coffee break	11:00 Coffee break	11:00 Coffee break	11:00 Coffee break	
	11:30 Announcements	11:30 Announcements	11:30 Announcements	11:30 Announcements	11:15		11:30 Announcements	11:30 Announcements	11:30 Announcements	11:30 Announcements	11:30 Announcements
12:15 Announcements	11:45 Data Science L2: Interactive exploration of non-numeric data	11:45 Data Management L2: Cryptography, authentication, authoriza…	11:45 Data Analysis L3: Parameter estimation and confidence intervals	11:45 Software Security L1: Introduction - Sebastian Lopienski			11:45 Software Security L2: Security in different phases of software de…	11:45 Data Technologies: Introduction - Andreas Joachim Peters	11:45 Software Security L3: Web application security, exercise debriefing	11:45 Data Visualization L1: The Theory Behind Data Visualization	
13:00 Lunch	13:00 Lunch	13:00 Lunch	13:00 Lunch	13:00 Lunch	13:00 Lunch		13:00 Lunch	13:00 Lunch	13:00 Lunch	13:00 Lunch	13:00 Lunch
14:00 Tools and Techniques L1: Introduction - Bob Jacobsen	14:00 Tools and Techniques - exercises - Bob Jacobsen	14:00 Student presentations	14:00 Free time	14:00 Data Analysis L4: Hypothesis testing and p-value	14:00		14:00 CSC School Photo	14:00 Data Technologies - exercises - Andreas Joachim Peters	14:00 Machine Learning - exercises - Tomasz Szumlak Kamila Kalecinska	14:00 Software Design - exercises - Stephan Hageboeck Andrei Gheata	
15:00 Self-presentation: 1 minute per person				15:00 Data Analysis - exercises - Toni Sculac			14:15 Software Security - exercises - Sebastian Lopienski				14:30 CSC examination
15:45 Coffee break	15:30 Coffee break	15:30 Coffee break					15:30 Coffee break	15:30 Coffee break	15:30 Coffee break	15:30 Coffee break	15:30 Coffee break
	15:45			16:00 Coffee break			15:45	15:45	15:45	15:45	
16:15 Self-presentation: 1 minute per person		16:00 Data Science - exercises - Bob Jacobsen		16:15							16:15 Graduation and closing ceremony
17:00 Tools and Techniques L2: Tools for Collaboration, Software Engineering A…								17:00 Traditional CSC football match			
		19:30 Dinner	19:30 Dinner	19:30 Dinner	19:30 Dinner		19:30 Dinner	19:30 Dinner	19:30 Dinner	19:30 Dinner	
20:00 Welcome dinner	20:00 Special dinner and pub quiz										20:00 Closing dinner
		20:45 Special evening session					20:45 Special evening talk: When Internet history meets philosophy - Francois Fluckiger				

CSC 2022 academic programme

https://indico.cern.ch/event/1125271/program

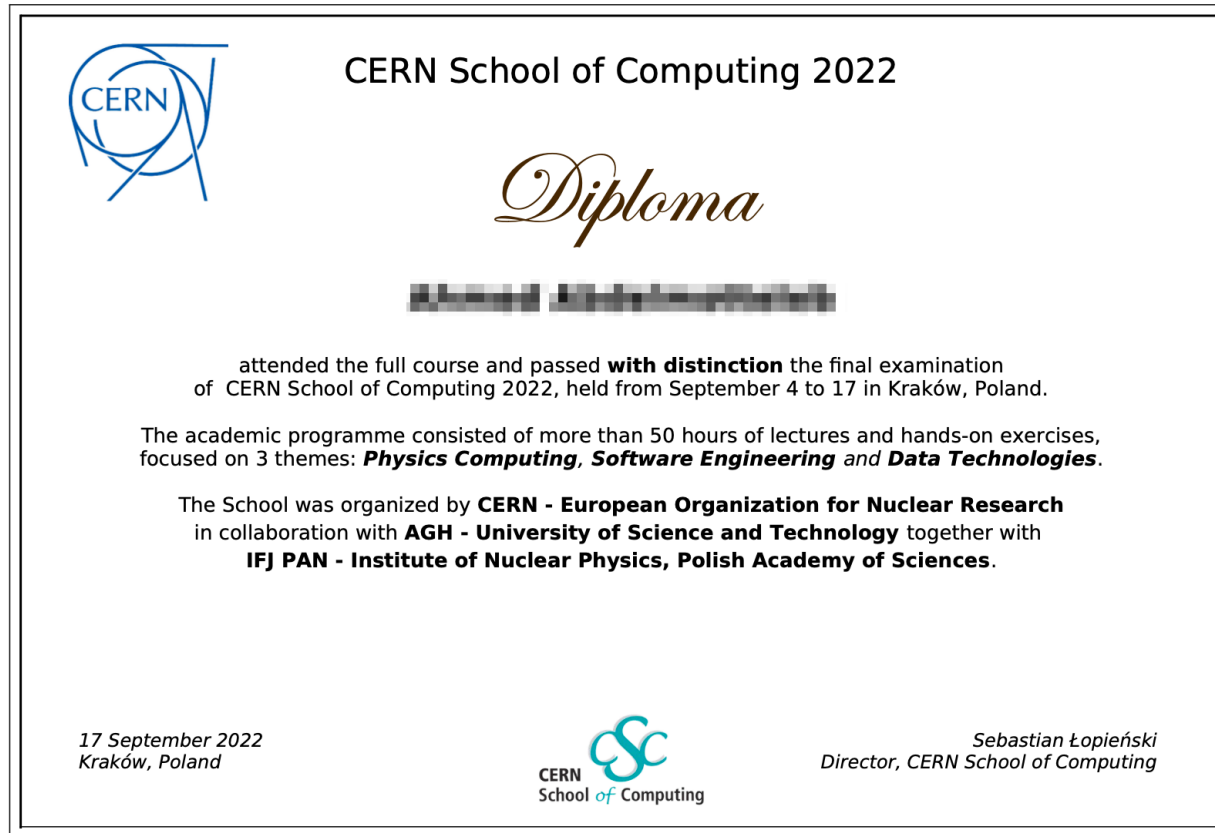|	
Physics Computing	Introduction to Physics Computing Data Science and Interactive Data Exploration Data Analysis Introduction to Machine Learning
Software Engineering	Tools and Techniques Software Design in the Many-Cores Era Creating Secure Software
Data Technologies	Data Management Data and Storage Technologies Data Visualization

CUDA training, student lightning talks, guest lectures

60 hours of classes

Exam → diploma and 5 ECTS points

CERN School of Computing 2022

Diploma

attended the full course and passed **with distinction** the final examination
of CERN School of Computing 2022, held from September 4 to 17 in Kraków, Poland.

The academic programme consisted of more than 50 hours of lectures and hands-on exercises,
focused on 3 themes: ***Physics Computing***, ***Software Engineering*** and ***Data Technologies***.

The School was organized by **CERN - European Organization for Nuclear Research**
in collaboration with **AGH - University of Science and Technology** together with
IFJ PAN - Institute of Nuclear Physics, Polish Academy of Sciences.

17 September 2022
Kraków, Poland

Sebastian Łopieński
Director, CERN School of Computing

But what gives the most value to the School?
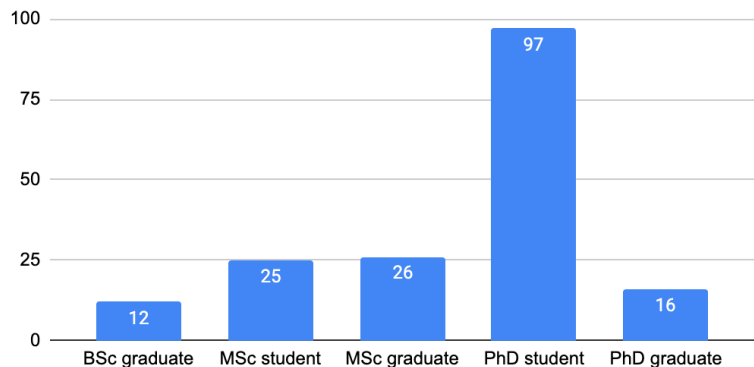
Participants (**you!**)
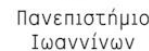
Applications 176 → 84 students selected and invited
(minus 2 late withdrawals)

- 42 different nationalities
- 33 female applicants (19%)

- 33 different nationalities
- 20 female participants
- 48 different institutes
  from 17 countries

**Diverse, talented, passionate
about science and technology**

Bar chart:
- BSc graduate: 12
- MSc student: 25
- MSc graduate: 26
- PhD student: 97
- PhD graduate: 16

It's a small world

All top scientists knows each other very well

One of the previous CSC schools

School rules

CSC Rule #1

Participate

- Attendance at all lectures and exercises is mandatory

- You should attend all meals and coffee breaks

- Taking part in social and sports events is optional
  - You must let us know whether you participate or not

CSC Rule #2

Be on time

Check what the schedule says:

– *"Lecture starts at 9:00"* => You must be in the room before 9:00

– *"The bus leaves at 18:00"* => It will leave at 18:00

If you're late, we won't wait

CERN
School *of* Computing

Wear your badge

Tom Dack

Science and Technology Facilities Council (STFC), United Kingdom

CERN School of Computing 2022
Kraków, Poland – 4-17 September

Elena Busch

Columbia University, New York City, United States

CERN School of Computing 2022
Kraków, Poland – 4-17 September

Ahmed Abdelmotteleb

University of Warwick, United Kingdom

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Kraków, Poland – 4-17 September

Mauricio Ayllon Unzueta

NASA Goddard Space Flight Center, United States

CERN School of Computing 2022
Kraków, Poland – 4-17 September

Maciej Giza

Institute of Nuclear Physics PAN, Krakow, Poland

CERN School of Computing 2022
Kraków, Poland – 4-17 September

Finn Feindt

DESY, Hamburg, Germany

CERN School of Computing 2022
Kraków, Poland – 4-17 September

ENJOY AND PROFIT FROM THE SCHOOL!

Thank you

4th to 17th September 2022
Kraków, Poland

CERN
School of Computing

https://indico.cern.ch/e/CSC-2022