

Welcome to

Inverted CERN School of Computing 2019

4-7 March - CERN IT Amphitheatre

Lectures:

Artificial Intelligence
Machine Learning
Pattern Recognition

Big Data
Container Orchestration
Tensor Networks

Computational Physics
Numerical Analysis
Track Finding

Hands-on exercises:

Keras TensorFlow FPGAs Kubernetes Hadoop Spark

<http://indico.cern.ch/e/iCSC-2019>

Sebastian Lopienski

CERN School of Computing director

Three CERN Schools of Computing

iCSC 2019



Inverted school

4 Mar - 6 Mar 2019

CERN

tCSC 2019



Thematic school

12 May - 18 May 2019

MEDILS

Split | Croatia

CSC 2019



Main school

15 Sep - 28 Sep 2019

Babeş-Bolyai University

Cluj-Napoca | Romania

- ✓ Have you ever heard of **Enterprise Computing**, is it relevant to physics computing?
- ✓ Do you know what **Design Pattern** is?
- ✓ Are you sure the software you write has no **security holes**?
- ✓ Are you sure that you know and master **modern debugging** tools?
- ✓ Do you know how to design (effectively) a **database schema**?
- ✓ What is the secret to writing an efficient **SQL** query?
- ✓ What is database **performance tuning**, why is it perceived as magic and how to tame it?
- ✓ Do you know how to read an **execution plan**?
- ✓ How does **Google** News work?
- ✓ Do you know, in practice how to expose your application as a **Web Service**?
- ✓ Are you sure your Web Services are **secure**?

All the answers at iCSC



inverted CSC-2005

"Where students turn into teachers"



23-25 February 2005, CERN*

- ▶ Data Management and Data Bases
- ▶ Advanced Software Development and Engineering
- ▶ Web Services in Distributed Computing

- a novel idea prototyped in 2005
- a three-day series of lectures proposed and delivered by selected students
- advanced topics, rarely taught at CERN before

Lecturers - all former CSC2004 students

Paolo Adragna	University of Siena
Miguel Anjo	CERN
Ioannis Baltopoulos	Imperial College
Gerhard Brandt	University of Heidelberg
Giovanni Chierico	CERN
Brice Copy	CERN,
Michal Kwiatek	CERN
Ruben Leivas Ledo	CERN
Sebastian Lopienski	CERN
Petr Olmer	CERN
Zornitsa Zaharieva	CERN

"Where students turn into teachers"

Back in 2005...

2019: the 12th edition of the iCSC

2005

3rd iCSC
CERN School of Computing
Inverted CSC-2005
"Where students turn into teachers"

23-25 February 2005, CERN*

- Data Management and Data Bases
- Advanced Software Development and Engineering
- Web Services in Distributed Computing

2006

4th iCSC
CERN School of Computing
Inverted CSC-2006
"Where students turn into teachers"

6-8 March 2006, CERN*

- Computational Intelligence for HEP Data Analysis
- The Art of Designing Parallel Applications
- Software Testing: Fundamentals and Best Practices

2008

5th iCSC
CERN School of Computing
Inverted CSC-2008
"Where students turn into teachers"

3-5 March 2008, CERN*

Register now to get the printed booklet
Free attendance but registration recommended

- Advanced Architectures
- Special Topics

2010

4th iCSC
CERN School of Computing
Inverted CSC-2010
"Where students turn into teachers"

6-9 March 2008, CERN*

- UML for developers
- OO Design patterns / Anti-patterns
- Git: make your software managing part easy
- Advanced multivariate analysis
- Systemic / Top-down / Bottom-up

2011

5th iCSC
CERN School of Computing
Inverted CSC-2011
"Where students turn into teachers"

3-4 March 2011, CERN*

- Virtualization: what it is, how it works
- Service Virtualization at work
- Cryptography
- Modern Software meets HEP

2013

6th iCSC
CERN School of Computing
Inverted CSC-2013
"Where students turn into teachers"

25-26 February 2013, CERN*

- GPU Computing in HEP
- Computer Vision
- Testing for large scale systems
- Grid Interpretations by LHC experiments

2014

7th iCSC
CERN School of Computing
Inverted CSC-2014
"Where students turn into teachers"

24-28 February 2014, CERN*

- LAN Programming: The history and the future of busy IPMI
- Building highly distributed systems
- Power Grids in an HEP context
- Power Grids in an HEP context

2015

8th iCSC
CERN School of Computing
"Where students turn into teachers"

23-24 February 2015

- Why CPUs have multiple levels of cache?
- Why GPUs have multiple levels of cache?
- Exploiting data and instructions using 8, 16-bit and beyond

2016

9th Inverted CERN School of Computing

29 February - 2 March 2016
CERN, IT Amphitheatre (31/3-004)

- Why CPUs have multiple levels of cache?
- Exploiting data and instructions using 8, 16-bit and beyond

2017

10th Inverted CERN School of Computing

6 - 9 March 2017
CERN, IT Amphitheatre (31/3-004)

- Why CPUs have multiple levels of cache?
- Exploiting data and instructions using 8, 16-bit and beyond

2018

11th Inverted CERN School of Computing

5 to 8 March 2018
CERN, IT Amphitheatre (31/3-004)

- Why CPUs have multiple levels of cache?
- Exploiting data and instructions using 8, 16-bit and beyond

2019

12th Inverted CERN School of Computing

4 to 7 March 2019
CERN, IT Amphitheatre (31/3-004)

- Why CPUs have multiple levels of cache?
- Exploiting data and instructions using 8, 16-bit and beyond

The logo for CERN iSc features a lowercase 'i' in red and 'Sc' in teal, with a light grey drop shadow effect behind the letters.

CERN
School *of* Computing **2019**

Academic topics

(iCSC is not a conference!)



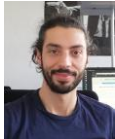
Artificial Intelligence, Machine Learning



Big Data, Hadoop, Apache Spark



Computational Physics, Tensor Networks



Container Orchestration



FPGAs (Introduction)



FPGAs + VHDL



Numerical Analysis, Finite Element Method



Pattern Recognition, Track Finding

Lecturers

<https://indico.cern.ch/event/766995/page/15075-speakers>



Daniel Campora
*CERN, and
University of
Seville (Spain)*



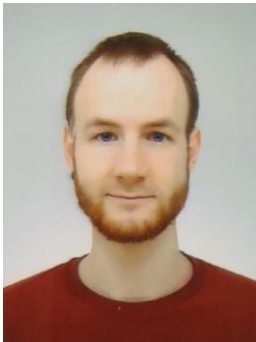
Patrick Emonts
*Max Planck Institute
of Quantum Optics
(Germany)*



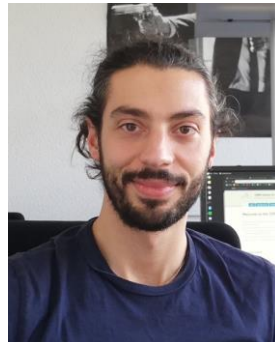
Giorgio Lopez
CERN



**Evangelos
Motesnitsalis**
CERN



Dmitry Neverov
*Nagoya University
(Japan)*



Riccardo Poggi
*University of
Geneva
(Switzerland)*



Alexander Ruede
*CERN, and
KIT-IPE
(Germany)*



Mikhail Sizov
*Budker Institute of
Nuclear Physics
(Russia)*

Schedule

<https://indico.cern.ch/event/766995/timetable>

Monday, 4 March 2019	
08:30	Welcome coffee
09:00	A word from the IT Department Head
09:10	Introduction to the Inverted CSC
09:15	A practical approach to Convolutional Neural Networks (lecture)
10:15	Coffee
10:45	A Scientist's Guide to FPGAs
11:45	Lunch break / WIT Diversity Talk
13:30	Global track finding algorithms
14:30	Hardware Acceleration Through FPGAs - Basic Concepts (lecture 1)
15:30	Coffee
16:00	A practical approach to Convolutional Neural Networks (exercise 1)
17:00	A practical approach to Convolutional Neural Networks (exercise 2)

Tuesday, 5 March 2019	
08:30	Welcome coffee
09:00	Hardware Acceleration Through FPGAs - Basics of VHDL (lecture 2)
10:00	Tensor Networks - Introduction and Matrix Product States (lecture 1)
11:00	Coffee
11:15	Tensor Networks - The iTEBD Algorithm (lecture 2)
12:15	Lunch break
13:30	Big Data Technologies and Physics Analysis with Apache Spark (lecture 1)
14:30	Big Data Technologies and Physics Analysis with Apache Spark (lecture 2)
15:30	Coffee
16:00	Hardware Acceleration Through FPGAs - First Experiments in VHDL (exercise 1)
17:00	Hardware Acceleration Through FPGAs - Easy DSP Applications (exercise 2)

Wednesday, 6 March 2019	
08:30	Welcome coffee
09:00	Tensor Networks - Singular Value Decomposition (exercise 1)
10:00	Tensor Networks - Application of the iTEBD Algorithm (exercise 2)
11:00	Coffee
11:15	How container orchestration can strengthen your micro-services: the approach of Kubernetes (lecture)
12:15	Lunch break
13:00	Data Centre visit
14:30	Efficient C++ implementation of custom FEM kernel with Eigen
15:30	Coffee
16:00	How container orchestration can strengthen your micro-services: the approach of Kubernetes (exercise 1)
17:00	How container orchestration can strengthen your micro-services: the approach of Kubernetes (exercise 2)

Thursday, 7 March 2019	
08:30	Welcome coffee
09:00	Big Data Technologies and Physics Analysis with Apache Spark (exercise 1)
10:00	Big Data Technologies and Physics Analysis with Apache Spark (exercise 2)

Lectures in IT Amphitheatre

Exercises in 513-1-024

Take your laptop

Today lunchtime: event by



WIT Diversity Talk with Tim Smith

Monday 4 Mar 2019, 12:00 → 14:00 Europe/Zurich

31-3-004 - IT Amphitheatre (CERN)

Description Everybody is welcome for this WIT Talk. As per usual, the talk will be followed by networking lunch. This time in R2.

A short biography of Tim Smith

Tim was smitten by CERN's unique environment in 1985 on a summer studentship, so returned in 1987 and hasn't left since! He obtained a PhD in Particle Physics and performed research on OPAL at the LEP accelerator for 10 years. He then joined the IT Department to lead teams innovating in computing farm management and physics data management. He now leads the Collaboration, Devices and Applications Group with a particular passion for Open Science where he is active in the wider scientific community promoting the tools and principles of open and collaborative research. In parallel he has been an active advocate of a fair and inclusive work environment, assuming various institutional roles including Chair of the Equal Opportunities Panel and Chair of the Harassment Investigation Panel.

Registration

 Participants

 Register

12:00 → 13:00 **Interview with Tim Smith**

 1h

Speakers: Sunje Dallmeier-Tiessen (CERN), Tim Smith (CERN)

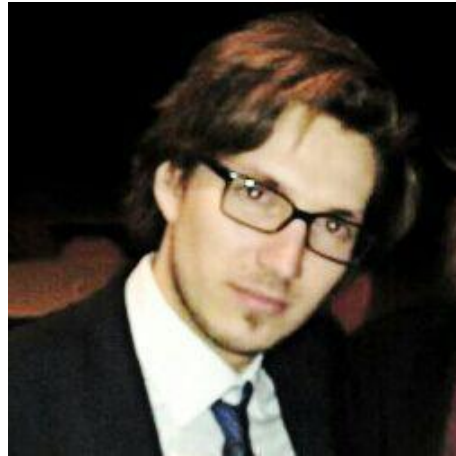
<https://indico.cern.ch/event/792031>

Everyone is welcome!

Conveners (session chairs)



Simone Mosciatti



Julien Collet



Tetiana Moskalets



Michael Davis



Benedikt Wurfner

Mentors (providing advice&feedback to lecturers)

<https://indico.cern.ch/event/766995/page/15076-mentors>



Danilo Piparo



Lorenzo Moneta



Sebastian Lopienski



Alberto Pace



Sebastien Ponce



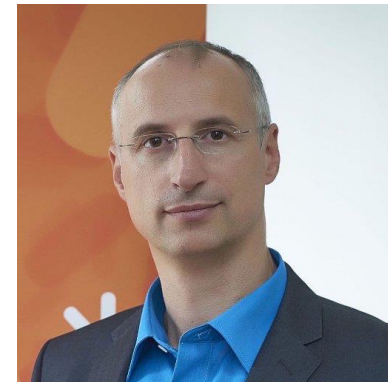
Are Strandlie



Thomas Keck



Enric Tejedor



Ivica Puljak

CSC Organizers




Joelma Tolomeo
(CSC Administrative Manager)

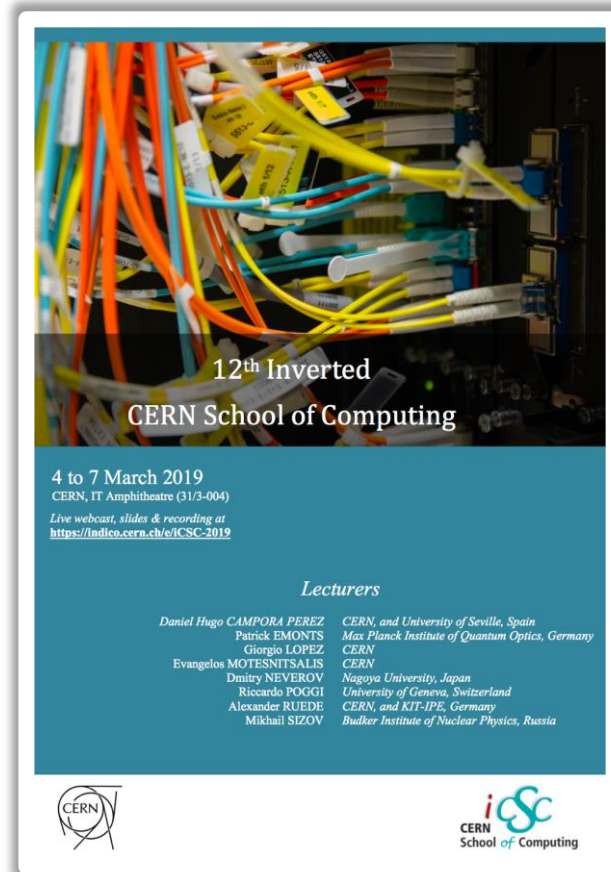


Nikos Kasioumis
(CSC Technical Manager)

Logistics

- You can attend any lectures or exercises of your choice
 - but **please be on time for the start**,
and avoid leaving in the middle of a lecture
- Please silence your phone A red circle with a diagonal slash over a black mobile phone icon, indicating that mobile phones should be silenced.
- Please use the microphone when asking questions
 - lectures are webcast and recorded
- Enjoy coffee and snacks
 - an opportunity to discuss with lecturers and colleagues

iCSC booklet



For the registered participants
... and others, if enough copies

Enjoy the School!

