Thematic CERN School of Computing on Machine Learning 2026

Report of Contributions

Contribution ID: **1** Type: **not specified**

Registration at Hotel

Sunday, 7 June 2026 15:30 (1h 30m)

We will greet students to the school at the Comfort Hotel Malmö
Carlsgatan 10 C, 211 20 Malmö, Sweden
Location: https://maps.app.goo.gl/fayc5oVwx9WtBgqJ8

Check in at the hotel is possible at all times, in case your room is not yet availble you can store your luggage at the hotel reception.

Contribution ID: **3** Type: **not specified**

Transport to Split

Contribution ID: **4** Type: **not specified**

Short walk in Malmö

Sunday, 7 June 2026 18:00 (1 hour)

Contribution ID: **5** Type: **not specified**

Welcome dinner

Contribution ID: **6** Type: **not specified**

Opening session

Monday, 8 June 2026 08:45 (1 hour)

Presenters: PACE, Alberto (CERN); Ms ANNERBY JANSSON, Annika (Region Skane)

Contribution ID: **7** Type: **not specified**

Machine learning methods: L1 Introduction to Statistics

Monday, 8 June 2026 09:45 (1 hour)

In this lecture we will go over key concepts in statistics which are the cornerstone of mathematical foundation of Machine Learning. We will define frequentistic and Bayesian probabilities, learn what is a PDF. We will also discuss parameter estimation with the Maximum Likelihood method and finish with the definition of Confidence Intervals.

Presenter: SCULAC, Toni (University of Split Faculty of Science (HR))

Contribution ID: **8** Type: **not specified**

Announcements

Monday, 8 June 2026 10:45 (15 minutes)

Contribution ID: **9** Type: **not specified**

Machine learning methods: L2 Statistics and Machine Learning

Monday, 8 June 2026 11:30 (1 hour)

We start this lecture with unfolding and hypothesis testing, another two key concepts from statistics. Key part of the lecture is the Neyman-Person lemma that paves a clear path for the needs of Machine Learning in statistics.

Presenter: SCULAC, Toni (University of Split Faculty of Science (HR))

Contribution ID: **10** Type: **not specified**

Malmö: from harbor industry to startup-city

Monday, 8 June 2026 17:00 (2 hours)

We will take a walk in the area around the University and discover the history of Malmö and discover the new start up landscape. We will end the walk by having dinner together.

Contribution ID: **11** Type: **not specified**

Machine learning methods: L3 Classical Machine Learning

Monday, 8 June 2026 13:30 (1 hour)

We continue tackling the problem of trying to know the likelihood ratio with the use of Classical Machine Learning. We try to solve it by brute force and then we move to Machine Learning techniques. We start with a Kernel Density Estimators. We continue by defining what is a decision tree, what is a leaf and we study how it works on a very simple example. We go further and explain the difference between classification and regression, as well as the need for pruning, bagging, and boosting. This main goal of this lecture is to remove the idea of the "black-box approach" and understand all of the details of a decision tree.

Presenter: SCULAC, Toni (University of Split Faculty of Science (HR))

Contribution ID: **12** Type: **not specified**

Machine Learning methods: excercise 1

Monday, 8 June 2026 14:35 (1 hour)

Presenters: VASELLI, Francesco (Scuola Normale Superiore & INFN Pisa (IT)); SCULAC, Toni (University of Split Faculty of Science (HR))

Contribution ID: **13** Type: **not specified**

Machine Learning methods: excercise 2

Monday, 8 June 2026 16:00 (1 hour)

Presenters: VASELLI, Francesco (Scuola Normale Superiore & INFN Pisa (IT)); SCULAC, Toni (University of Split Faculty of Science (HR))

Contribution ID: **14** Type: **not specified**

Machine Learning in Accelerator Technologies: Machine Learning for particle accelerators

Tuesday, 9 June 2026 08:45 (1 hour)

Main use cases and applications

Presenter: KAIN, Verena (CERN)

Contribution ID: **15** Type: **not specified**

Machine Learning in Accelerator Technologies: Bayesian Optimisation

Tuesday, 9 June 2026 09:45 (1 hour)

Presenter: KAIN, Verena (CERN)

Contribution ID: **16** Type: **not specified**

Announcements

Tuesday, 9 June 2026 10:45 (15 minutes)

Contribution ID: **17** Type: **not specified**

Machine Learning Methods: L4 Introduction to Deep Learning

Tuesday, 9 June 2026 11:30 (1 hour)

We introduce the concept of a Neural Network (NN) and study their application with a single-neuron network. This again allows us to avoid the "black-box approach" and really understand the key concepts of how a NN works. We discuss activation functions and how the NN learns with the help of the loss functions and backpropagation. We finish by discussing the basic idea of a Deep Neural Network and basic training concepts.

Presenters: VASELLI, Francesco (Scuola Normale Superiore & INFN Pisa (IT)); SCULAC, Toni (University of Split Faculty of Science (HR))

Contribution ID: **18** Type: **not specified**

Study time or daily sports

Tuesday, 9 June 2026 17:00 (2 hours)

Contribution ID: **19** Type: **not specified**

Machine Learning methods: exercise 3

Wednesday, 10 June 2026 11:30 (1 hour)

Presenters: VASELLI, Francesco (Scuola Normale Superiore & INFN Pisa (IT)); SCULAC, Toni (University of Split Faculty of Science (HR))

Contribution ID: **20** Type: **not specified**

Machine learning in accelerators: Exercise 1

Tuesday, 9 June 2026 14:35 (1 hour)

Presenters: SCHENK, Michael (CERN); KAIN, Verena (CERN)

Contribution ID: **21** Type: **not specified**

Machine learning in accelerators: Exercise 2

Tuesday, 9 June 2026 16:00 (1 hour)

Presenters: SCHENK, Michael (CERN); KAIN, Verena (CERN)

Contribution ID: **22** Type: **not specified**

Machine Learning in Accelerators: Introduction to Reinforcement Learning

Wednesday, 10 June 2026 08:45 (1 hour)

Presenter: SCHENK, Michael (CERN)

Contribution ID: **23** Type: **not specified**

Machine Learning in Accelerators: Advanced concepts for Reinforcement Learning

Wednesday, 10 June 2026 09:45 (1 hour)

Presenter: KAIN, Verena (CERN)

Contribution ID: **24** Type: **not specified**

Announcements

Wednesday, 10 June 2026 10:45 (15 minutes)

Contribution ID: **25** Type: **not specified**

Machine learning in accelerators: Exercise 3

Thursday, 11 June 2026 16:00 (1 hour)

Presenter: KAIN, Verena (CERN)

Contribution ID: **26** Type: **not specified**

Half day excursion

Wednesday, 10 June 2026 14:45 (7 hours)

Contribution ID: **27** Type: **not specified**

Transport back to medILS

Contribution ID: **28** Type: **not specified**

Machine learning in Data Analysis: Introduction to Machine Learning for HEP, Anomaly detection and real time applications

Thursday, 11 June 2026 09:45 (1 hour)

Presenter: Dr VALLECORSA, Sofia (CERN)

Contribution ID: **29** Type: **not specified**

Machine learning in Data Analysis: The data reconstruction step - a pattern recognition problem

Thursday, 11 June 2026 11:30 (1 hour)

Presenter: Dr VALLECORSA, Sofia (CERN)

Contribution ID: **30** Type: **not specified**

Announcements

Thursday, 11 June 2026 10:45 (15 minutes)

Contribution ID: **31** Type: **not specified**

Machine learning in Data Analysis: Generative Models for HEP

Friday, 12 June 2026 08:45 (1 hour)

Presenter: Dr VALLECORSA, Sofia (CERN)

Contribution ID: **32** Type: **not specified**

Study time or daily sports

Thursday, 11 June 2026 17:00 (2 hours)

Contribution ID: **33** Type: **not specified**

Coffee

Contribution ID: **34** Type: **not specified**

Machine learning in Data Analysis: Exercise 1

Thursday, 11 June 2026 13:30 (1 hour)

Presenter: Dr VALLECORSA, Sofia (CERN)

Contribution ID: **35** Type: **not specified**

Machine learning in Data Analysis: Exercise 2

Thursday, 11 June 2026 14:30 (1 hour)

Presenter: Dr VALLECORSA, Sofia (CERN)

Contribution ID: **36** Type: **not specified**

Machine learning in Data Analysis: Exercise 3

Friday, 12 June 2026 11:30 (1 hour)

Presenter: Dr VALLECORSA, Sofia (CERN)

Contribution ID: **37** Type: **not specified**

Lightning talks - part 1

Wednesday, 10 June 2026 08:15 (30 minutes)

Athar Khodabakhsh - The Value of Naive Questions in Multidisciplinary XAS Research
Jaroslaw Szumega - Machine Learning and Autoencoding Techniques in High-Energy Physics Irradiation Experiments

Presenters: KHODABAKHSH, Athar; SZUMEGA, Jaroslaw (CERN, Mines Paris - PSL)

Contribution ID: **38** Type: **not specified**

Machine learning in Data Analysis: Systematics in ML

Friday, 12 June 2026 09:45 (1 hour)

Presenter: Dr VALLECORSA, Sofia (CERN)

Contribution ID: **39** Type: **not specified**

Announcements

Friday, 12 June 2026 10:45 (15 minutes)

Contribution ID: **40** Type: **not specified**

Machine Learning Methods: L5 Advanced Deep Learning

Tuesday, 9 June 2026 13:30 (1 hour)

Presenters: VASELLI, Francesco (Scuola Normale Superiore & INFN Pisa (IT)); SCULAC, Toni (University of Split Faculty of Science (HR))

Contribution ID: **41** Type: **not specified**

Exam

Friday, 12 June 2026 13:30 (1 hour)

Contribution ID: **42** Type: **not specified**

Closing ceremony

Friday, 12 June 2026 15:00 (1 hour)

Presenter: PACE, Alberto (CERN)

Contribution ID: **43** Type: **not specified**

Sports and leisure time

Friday, 12 June 2026 16:00 (2 hours)

Contribution ID: **44** Type: **not specified**

Departures

Saturday, 13 June 2026 08:00 (3 hours)

Contribution ID: **45** Type: **not specified**

Group photo

Thursday, 11 June 2026 11:00 (5 minutes)

Contribution ID: **46** Type: **not specified**

Transport to half day excursion

Wednesday, 10 June 2026 13:45 (1 hour)

Contribution ID: **47** Type: **not specified**

Welcome and self presentation

Sunday, 7 June 2026 17:00 (1 hour)

Presenters: PACE, Alberto (CERN); NOWICKI, Andrzej (CERN); GUNNE, Kristina (CERN)

Contribution ID: **48** Type: **not specified**

Machine Learning in Data Analysis: Complex tasks, basic blocks. The importance of primitives in Machine Learning

Thursday, 11 June 2026 08:45 (1 hour)

Presenter: VASELLI, Francesco (Scuola Normale Superiore & INFN Pisa (IT))

Contribution ID: **49** Type: **not specified**

Lightning talks - part 2

Thursday, 11 June 2026 08:15 (30 minutes)

Giacomo Tangari - CLEAR, operational status and machine learning opportunities
Laurence Matthew Wroe - ML Applications in Compact Electron Linacs
Joao Ramiro - Life as a librarian

Presenters: TANGARI, Giacomo (Sapienza Universita e INFN, Roma I (IT)); RAMIRO, Joao; WROE, Laurence Matthew (CERN)