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# Lecture summaries

## Quantum field theory and the electroweak Standard Model

In these lectures we give an introduction and overview of the electroweak Standard Model (EWSM) of particle physics. We first introduce the basic concepts of quantum field theory necessary to build the EWSM: abelian and non-abelian gauge theories, spontaneous symmetry breaking and the Higgs mechanism. We also introduce some basic concepts of renormalization, so as to be able to understand the full power of electroweak precision tests and their impact on our understanding of the EWSM and its possible extensions. We discuss the current status of experimental tests and conclude by pointing the problems still existing in particle physics not solved by the EWSM and how these impact the future of the field.

## Statistics and machine learning for high-energy physics

These lectures introduce some of the main ideas of frequentist and Bayesian statistics as well as supervised machine learning with a focus on the probabilistic interpretation of the latter. The ideas are illustrated using simple examples from particle physics.

## Collider experiments: the LHC and beyond

The basic concepts of experimental particle physics at colliders are presented, over four introductory lectures, using examples taken from the highest energy collider in the world: the LHC at CERN. The physics motivation for collider experiments is discussed, followed by an introduction of the accelerators and experiments at CERN and elsewhere. An overview of the principles of particle detection and of the different types of detectors is given. The physics highlights at the LHC are discussed and an outlook beyond the Standard Model and the LHC is given.