



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## SYLLABUS DEL CORSO

### Physics at Colliders

2324-113R-05

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#### Title

Precision measurements and search for BSM physics at the LHC

#### Teacher(s)

Ilaria Brivio (Bologna University) and Davide Valsecchi (ETH Zurich)

#### Language

English

#### Short description

The experimental aspect: Machine Learning ingredients for precision Physics

Parametrized classifiers for EFT:

Introduzione a ML e deep learning

EFT weights morphing

Learning the likelihood ratio with a parametrized classifier for EFT

How to choose the best classifier

Transformer models for event interpretation

The transformer architecture

Using the transformer to analyze reconstructed particles and regress parton-level particles

How to use the correct losses for multi-target optimization and obtain the best multi-particle regression

The theoretical aspect: EFT simulation and fits

Advanced topics in SMEFT interpretation at LO

Quick SMEFT dim 6 recap

Constraints from EWPOs at LEP and the role of mW

State-of-the-art global fits and the role played by each ingredient: operator basis, predictions order, measurements, uncertainties, statistical methods.

Even more precision: higher-order SMEFT, in loops and in operator dimension

SMEFT at dim-6: RGE evolution, operator mixing and their impact in global fits

SMEFT at dim-8: motivation, technical challenges and case studies

## **CFU / Hours**

2 ECTS

## **Teaching period**

The course will be given in a blended form, with lectures given in presence and with remote connection at the same time.

Each chapter of the course will feature front lectures and exercises.

The experimental aspects will be discussed on Oct. 10 and 11, while the theory part will be discussed on Oct. 28 and 29.

The detailed timetable will be published soon.

## **Sustainable Development Goals**

QUALITY EDUCATION

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