Winter term 2023/24

Lecture and Tutorials

Computational techniques for loop diagrams

Prof. Dr. Tobias Huber

The course covers analytic and numerical methods for the calculation of loop integals, which appear in the computation of higher-order corrections in the perturbative expansion of quantum field theory.

Topics include:

- Introduction, dimensional regularization
- Tensor reduction
- Integration-by-parts relations and Laporta's algorithm
- Computing master integrals
  - Hypergeometric functions, harmonic polylogarithms, Mellin-Barnes representations, differential equations, sector decomposition, ...
- Latest developments
  - Canonical basis, generating vectors, methods from algebraic geometry, ...

Dates

Lecture:

Tuesdays 10:15 – 11:45h, starting 10.10.2023, room ENC-D 115

Fridays 12:30 – 14:00h, starting 13.10.2023, room ENC-B 030 (every other week)

Exercise class:

Fridays 12:30 – 14:00h, starting 20.10.2023, room ENC-B 030 (every other week)

Prerequisites are the compulsory lectures up to and including quantum mechanics, and the course "Theoretical Particle Physics I".