Solving $\mathrm{SU}(3)$ Yang-Mills theory on the lattice: a calculation of selected gauge observables with gradient flow

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- **Results.** We will present the results obtained from pure gauge calculations.

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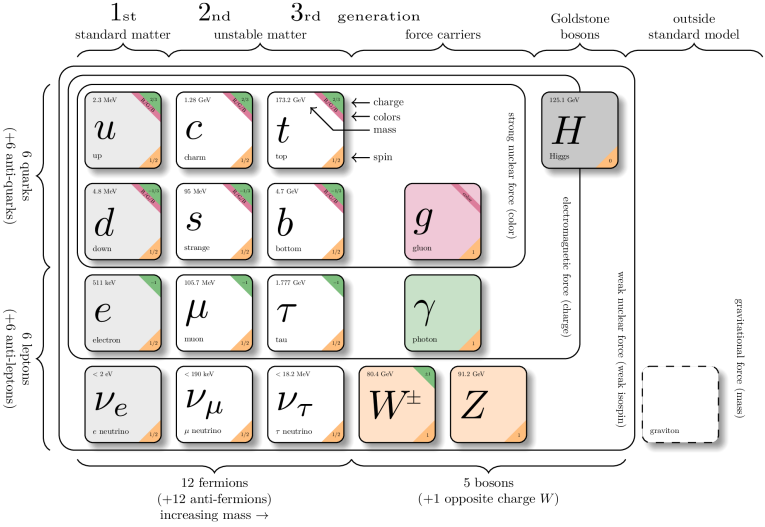
Introduction

Quantum Chromodynamics(QCD)

The standard model



SM. A pictorial illustration of the standard model of physics. Lattice QCD is all about exploring the QCD sector consisting of gluons and quarks. We will however focus on the gluons.

QCD

The path integral formalism

- A

Topology in QCD

- A

The Witten-Veneziano relation

- A

Lattice Quantum Chromodynamics(LQCD)

Discretizing spacetime

- A

Links

Pure gauge action

Recovering the continuum action action

Developing a code for solving $\mathrm{SU}(3)$ Yang-Mills theory on the lattice

The numerical challenge in lattice QCD

The path integral

The Metropolis algorithm

Link sharing

Shifts

Scaling

Measuring observables on the lattice

How to measure

Topological charge

Energy

Gradient flow

The flow equation

Solving gradient flow on the lattice

Smearing the lattice

Results

Ensembles

Energy and the scale setting

Topological charge

Topological susceptibility

The fourth cumulant

The topological charge correlator

The effective glueball mass

Conclusion