About Me

Born in 1994

2013-2018

Undergrads at UniCal

(Cosenza, Calabria, Italy)

2019-2022

PhD at University of Regensburg

with a Marie Curie scholarship

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No. 813942

EuroPLEx

H2020

Started in October 2022
my first Postdoc at DESY

During my PhD

- given ~ 13 talks at international conferences and upon invitation
- attended 4 Summer schools (China, Spain, + 2 online)
- 7-month secondment to IFT (Madrid)
- 2-week research stay at MIT in 2022 (during which I've visited also Fermilab)
- 2 peer reviewed papers (JHEP, PRD)
- Chairperson of European outreach team (check the Youtube video we made: "Scientists: How to become one")
- Had fun learning German (and I still do…)
- Hobby: Chess

My Current Work

Simulate the theory of the strong interactions (QCD)
by computing non-perturbative correlation functions like

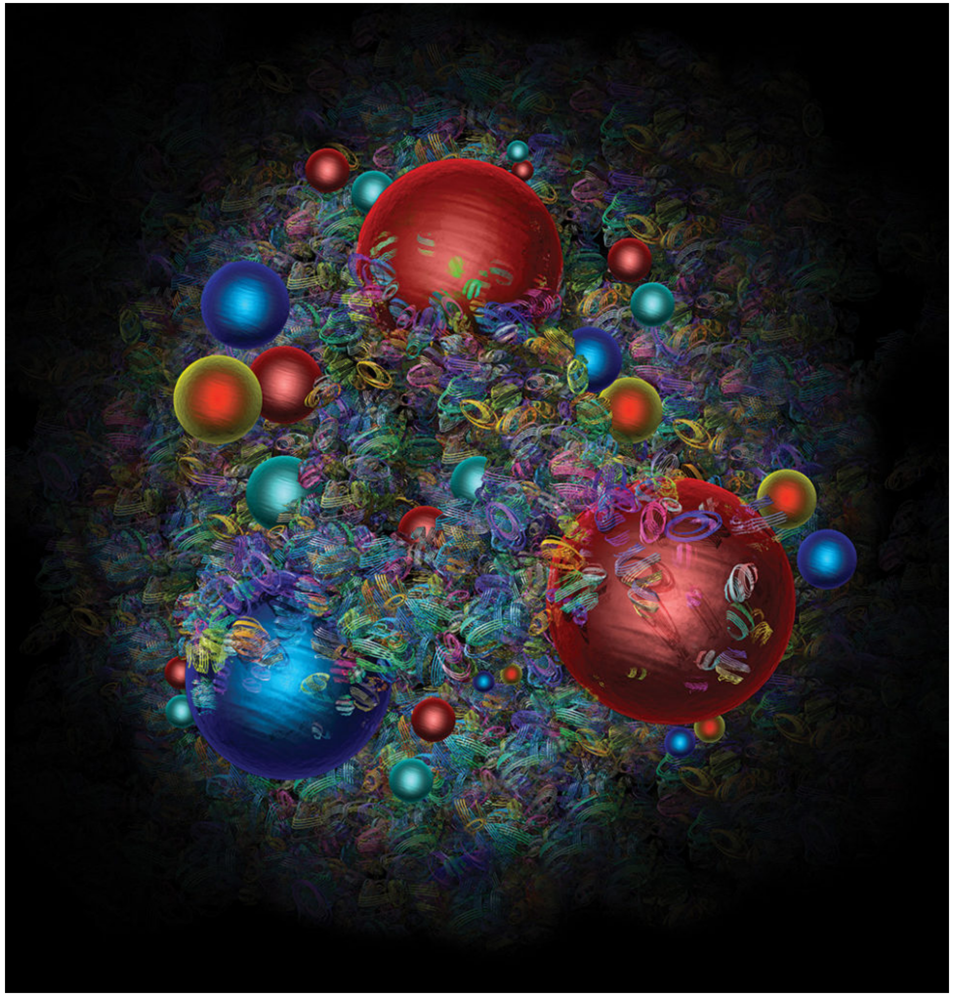
$$\langle \mathcal{J} \rangle = \frac{1}{\mathcal{Z}_{QCD}} \int [dU][d\psi][d\bar{\psi}]\, e^{-S_{QCD}}\, \mathcal{J}$$

with Monte Carlo simulations

$$\langle \mathcal{J} \rangle = \frac{1}{N} \sum_{i}^{N} \mathcal{J}[U_i] + \mathcal{O}\left(1/\sqrt{N}\right)$$

Current work is mainly on correlation functions for glueballs (hypothetic bound states of gluons!). These studies will certainly shed further light on the QCD vacuum.

The main challenge is the bad quality of the signal.
We adopt an old idea ('80) from Nobel prize winner Giorgio Parisi, which could exponentially reduce the statistical error.



Credit: CERN

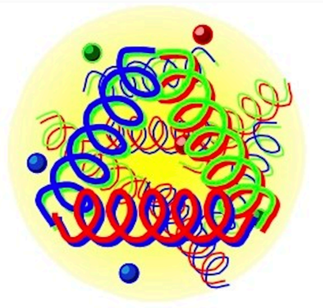
Artistic image of the proton:
composite particle made of 3 valences quarks and
a sea of strongly interacting quarks and gluons

What inspires me…
is the possibility to help answer fundamental questions

Yang–Mills Existence and Mass Gap. — i.e. glueballs

“Prove that for any compact simple gauge group G, a non-trivial quantum Yang–Mills theory exists on R^4 and has a mass gap $\Delta > 0$.”

See Sec. “Millenium Problems” at
http://www.claymath.org



Credit: University of Glasgow

via nobelprize.org

Neutrinos are very elusive particles and very high-precision is required for neutrino oscillation experiments.

What is the nature of neutrinos?

“Are neutrino Majorana or Dirac particles?”

“Can neutrino-antineutrino oscillation asymmetry explain (in part) matter-antimatter asymmetry in the Universe?”

“How do they acquire their very small masses?”

For the first time, we intend to compute input parameters (e.g. form factors for $N \to N\pi$) that are necessary for high-precision neutrino experiments.