# Annual report (XXXV cycle)

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Supervisor: Prof. Simone Marzani
Ph.D. cycle: XXXV
Year: second

## Research activity

My research activity is focused on theoretical aspects of Quantum Field Theories and High Energy Physics calculations oriented to LHC phenomenology.

I spent the first part of this second year learning to use some of the most common Monte Carlo event generator for LHC phenomenology such as Pythia and Sherpa (and also Rivet in order to standardize the analyses) under the supervision of Oleh Fedkevych.

After that I started working as a main contributor at the 'Tagging the initial state gluon' project. In this project we use angularity calculations developed in our previous paper in order to enhance the fraction of gluon in the initial state in the Z+Jet production at the LHC. During this work we worked in touch with part of the CMS/Atlas collaborations. Such activity has continued for all the summer up to now in conjuction with courses and others academic activity.

## Courses and exams

I attended the following courses:

- Ads/CFT (A. Amoretti)
- Black Holes thermodynamics (S. Giusto)
- Machine Learning for High Energy Physics (M. Pierini at Milano Bicocca)

I am going to prepare the exams for the first two courses. They are both 'one slot' courses.

## Publications

- Jet angularities in Z+jet production at the LHC, S. Caletti, O. Fedkevych, S. Marzani, G. Soyez, S. Shumann, D. Reichelt, V. Theeuwes, *J. High Energ. Phys.* 2021, 76 (2021). https://doi.org/10.1007/JHEP07(2021)076

- Tagging the initial state gluon, S. Caletti, O. Fedkevych, S. Marzani, D. Reichelt, e-Print: 2108.10024 [hep-ph]

## Posters and seminars

- Presenter for the "Jet Angularities in Z+Jet production at the LHC" seminar for the LHC Electroweak Working Group on Jets and Bosons, Online seminar, May 2021

- Presenter for the "Tagging the initial-state gluon in the Z+Jet process" poster for the LHCP2021 online conference, June 2021

## Conference and schools

I joined the followign schools/conference during my first year:

- LHC-EW Working Group on Jets and EW bosons.
  Online conference, Oct. 2020

- Wolfram Physics Winter School 2021
  Online school, Jan. 2021

- Standard Model at the LHC
  Online conference, Apr. 2021

- Jets and their Substructure from LHC data
  Online workshop, June 2021

- MITP Summer School 2021: the amplitudes games
  Online school, July 2021

- BOOST 2021
  Online conference, Aug. 2021

- Mcnet-CTEQ Summer School 2021 VIRTUAL
  Online school, Sept. 2021

## Comments and notes

In addition to my research activity I dedicated a lot of attention to improve my coding skills (Python in particular) and in learning how to use some tools relevant in the HEP framework. I want to underline that the Covid-19 emergency situation obviously made collaborating more complicated and reduced by much the possibilities of exchange with my colleagues.