

Experimental Physicist (Particle Physics)

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Research experience (*Teaching and research titles in Romania [here](#)*)

- Since Feb. 2020 Senior Research Fellow at CERN, ATLAS experiment
Fellowship Programme: Theoretical & Experimental Physics, [AFC-2019-2/RES](#)
European Organization for Nuclear Research, Geneva, Switzerland
- Since Sept. 2010 Scientific researcher II (since Sept. 2019)
Horia Hulubei National Institute for R&D in Physics and Nuclear Engineering (IFIN-HH),
Department of Elementary Particles Physics (DFPE), Bucharest, Romania
- Dec. 2015 – Post-doctoral researcher, ATLAS experiment
Dec. 2019 Université de Montréal, Physics Department, Montreal, Canada
- Sept. 2012 – PhD in Particle Physics awarded jointly by
Oct. 2015 Aix-Marseille Université, Marseilles, France and Universitatea Bucuresti, Bucharest, Romania
Center for Particle Physics of Marseilles (CPPM, France) and IFIN-HH (Romania)
Supervisors : Pascal Pralavorio (pralavop@cern.ch) and Calin Alexa (calexa@cern.ch)
Qualification : *Très honorable avec félicitations*
Several stays at CERN (ATLAS experiment)
- Sept. 2006 – Bachelor (4 years) and master (2 years) degrees in Physics
June 2012 Universitatea Bucuresti, Bucharest, Romania
Several stays at CPPM and CERN (ATLAS experiment) during the master studies

Leadership roles in ATLAS

- Convener of Strong Production subgroup (Since Apr. 2020). This subgroup of the Supersymmetry (SUSY) working group oversees the searches for strongly produced supersymmetric particles (gluinos, squarks of all generations) and for dark matter simplified models with heavy flavor quarks. It covers sixteen inclusive searches, from different final states
- Convener of Inclusive Squark/Gluino Production subgroup (Oct. 2019 – Mar. 2020), SUSY working group. It covers eight inclusive searches for gluinos and squarks (excluding third generation squarks), from different final states
- Convener of Isolation and Fake Forum (IFF, Aug. 2017 – Dec. 2019). This group addresses common matters on lepton/photon isolation and fake/non-prompt lepton backgrounds, and makes proposals for common strategies to the physics analysis (PA) groups. As coordinator, one crucial role was to improve the collaboration between this combined performance group and the PA groups, and bring more people to work in IFF
- Electron/Photon performance group liaison with the SUSY group (Apr. 2016 – Mar. 2021). In Feb. 2019 – Oct. 2019 period I was also the IFF group liaison with the SUSY group. The main objective is to communicate the needs from physics analyses to the performance groups, and ensure that the recommendations from the latter are followed
- Analysis contact of the same-sign / three leptons (SS/3Lep) analysis in the SUSY group (May 2016 – Nov. 2019, and again since Nov. 2020). The objective is to search for new physics, in particular SUSY, in final states with two leptons of same electric charge or three leptons and (b -) jets
- Co-coordinator of the review group for methods estimating the fake/non-prompt lepton background in SUSY group. The objective was to provide a common software tool and propose recommendations for the fake lepton background estimation, validation and systematic uncertainties, to be widely used in the SUSY group (May 2016 – Apr. 2017)

Other activities in ATLAS

Data analysis:

- Member of the charged Higgs search (since spring 2020). The singly and doubly charged Higgs bosons decay to $W^\pm Z^0$ or $W^\pm W^\pm$, and the considered experimental signatures involve same-sign leptons, three or four leptons, missing transverse energy and jets. I am involved in the analysis strategy and documentation, and in charge of the MC-based method for the electron charge flip and fake/non-prompt lepton backgrounds estimation. I am also one of the two 2021-paper editors
- Member of the RPV multi-lepton SUSY team (since Spring 2020). This analysis is searching for SUSY in final states consisting of one or more isolated leptons (no taus) and a large number of (b -) jets. I was involved in the MC signal samples re-generation, object and event selection, fake lepton background studies and same-sign leptons SRs optimization. I am also one of the two 2021-paper editors
- Member of the Multi b -jets SUSY team (since Spring 2016). This analysis is searching for new physics in final states dominated by 0 or 1-leptons and multiple b -tagged jets. With my expertise on background studies, I was able to bring new ideas for the event selection and lepton definition
- SS/3Lep analysis (since Spring 2012). I contributed to all major aspects of the analysis. I was also involved in several spin-off studies relating the analysis to the detector performance, or studying complementarity to closely related analyses
- Prospects for the constraints on the top Yukawa coupling in the second stage of LHC exploitation using signal regions targeting $t\bar{t}H$ processes and same-sign leptons final states. These studies were done (in 2014) using Monte Carlo simulations and were documented in an ATLAS internal note
- Estimation of the fake lepton background in the search for Supersymmetry in final states with at least one isolated lepton and jets, for the analysis of the whole 2011 dataset (Jan. 2012)

More activities:

- A precise calibration of energy measurement of photons and electrons plays a crucial role in various precision measurements carried out in ATLAS, such as the Higgs boson mass and couplings measurements in the di-photon channel or for a precise measurement of the W boson mass. One of the key inputs to the energy regression algorithm, is an estimate of the energy lost by electrons and photons when interacting with passive volumes of the detector before reaching the calorimeter (e.g. inner detector, cryostat walls...). This estimate is provided by the presampler, an active layer of liquid argon positioned in front of the electromagnetic calorimeters. My work focused on the in situ calibration of the presampler energy scale using muons from W or Z bosons decays recorded in LHC Run 2 data. If time allows, the measurement will extend to use muons from W and Z bosons decays and Rel22 reprocessed data.
- Performance studies for tracks in the core of the jets (Spring 2016 - Summer 2019, and again since summer 2021). My responsibility in the Clustering and Tracking in Dense Environments (CTIDE) group was to develop a method to measure the rate of fake tracks inside jets, and further assess uncertainties in the modeling of the rate of reconstructing fake tracks passing a certain selection
- Maintainer of the `IFFTruthClassifier` tool (since Summer 2018). It can be used to categorize leptons into different background classes, which can be used e.g. for investigation on lepton truth-compositions in the signal or control regions of an analysis or to measure the true real/fake efficiency or the true charge flip rates. Since summer 2019 it was migrated to the `TruthClassificationTool`
- Calibration of photon isolation variables (since Spring 2018). I am in charge of the combination of the photon isolation correction factors obtained from independent measurements, performed with radiative Z decays and inclusive-photon events. I was also responsible of the *track-only* photon isolation measurements with inclusive-photons events in Spring 2018 and again since Summer 2019
- Part of the team performing the Quality Control of the Micromegas readout boards (summer 2020). Carried out in the context of the New Small Wheel Phase-1 Upgrade, to replace the so-called "Small Wheels" of the ATLAS muon spectrometer
- Member of Distributed Analysis Support Team (DAST, since Spring 2017). DAST is a group of experts shifters that provide to user the first point of contact to address all the distributed analysis questions, including analysis tools related problems, DDM related problems and offline software problems

- Electron reconstruction (Fall 2012, for one year) and identification (Spring 2018, for half a year) efficiency measurements with the ATLAS data using $Z \rightarrow e^+e^-$ events. I was in charge of performing these measurements and providing correction factors to the simulation (and related uncertainties) applied by all ATLAS analyses relying on electrons. In 2018 and 2019, I was also leading the effort to understand the performance, in terms of signal efficiency and background rejection, of the electron isolation working points (used by the physics groups) and improve/select their definitions
- Qualification task in the ATLAS collaboration (Jul. 2012): maintenance and improvement of the software employed by the ATLAS Supersymmetry group to produce analyzable data and simulation samples under formats easily usable by the group members (the so-called SUSY D3PDs)

Grants / Awards

- IVADO grant¹, *Machine learning for the analysis of the Large Hadron Collider Data at CERN*, co-applicant, Montreal, Canada (Winter 2017 - Winter 2019)
- *ED352 Doctoral school thesis award*, attributed by École Doctorale Physique et Sciences de la Matière, Marseille, France (Apr. 2016)
- PhD grant from the French government for my Romania-France joint PhD, attributed by the French embassy in Bucharest and Institut français de Roumanie, covering a 12 months stay in France, distributed over three years (Fall 2012 – Fall 2015)
- *2014 Serban Titeica IFIN-HH award* for remarkable scientific contributions of young researchers (Dec. 2014)
- Grant attributed by the University of Bucharest, Romania, for outstanding academic performance (obtained every year, Fall 2006 – Fall 2015)

PhD thesis

- *Search for new physics in events with same-sign leptons and missing energy with ATLAS at LHC*, CERN-THESIS-2015-163, CPPM-T-2015-06, <https://cds.cern.ch/record/2060995>

Outreach

- ATLAS MasterClass (Mar. 2018), Cluj-Napoca (Romania), <https://indico.cern.ch/event/716175/>
- Tour guide (Nov. 2015) for ATLAS underground visit of Romania's Permanent Representative to the UN in Geneva (Switzerland), <https://cds.cern.ch/record/2102379>

¹<https://ivado.ca/en/fundamental-research-projects>