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Profile

I am a Rita Levi-Montalcini Assistant Professor in the Department of Physics at the University of Torino. I work in the field of theoretical particle physics. My interests focus on quantum chromodynamics, the theory that describes the strong force and the emergence of nucleons (protons and neutrons) from their elementary constituents, quarks and gluons. I conduct phenomenological investigations into the structure of nucleons, specifically to unveil how quarks and gluons are distributed inside them, and how this affects measurements performed by some of the largest ongoing high-energy physics experiments. I am interested in the development of the computational tools required by this endeavour, which encompass machine learning and artificial intelligence techniques. These techniques are widely used in data science, the interdisciplinary field focussed on extracting knowledge from typically large data sets. I have experience and attitude for teaching and mentoring and I am regularly involved in outreach activities.

Professional qualifications

Habilitation for Associate Professorship in Italian Universities, scientific field: 09/11/2020 - 09/11/2029
Theoretical Physics (Abilitazione Scientifica Nazionale — FIS 02/A2)

Work experience

Rita Levi-Montalcini Assistant Professor	01/07/2022 - ongoing
Department of Physics, Università degli Studi di Torino (IT)	
Research Associate (Line Manager: Prof. R.D. Ball)	01/10/2020 - 30/06/2022
School of Physics and Astronomy, The University of Edinburgh (UK)	
Marie Curie Fellow (Line Manager: Prof. P.J. Mulders)	01/09/2018 - 30/09/2020
National Institute for Subatomic Physics (Nikhef) Amsterdam (NL)	
Postdoctoral Research Assistant (Line Manager: Prof. R.D. Ball)	05/11/2017 - 31/08/2018
School of Physics and Astronomy, The University of Edinburgh (UK)	
Postdoctoral Research Assistant (Line Manager: Dr. J. Rojo)	05/11/2015 - 04/11/2017
Department of Physics, University of Oxford (UK)	
Assegnista di Ricerca (Research Fellow) (Advisor: Prof. G. Ridolfi)	01/09/2014 - 31/08/2015
Department of Physics, University of Genoa (IT)	

Education

Ph.D. in Physics, Astrophysics and Applied Physics	28/02/2014
Specialisation field: Theoretical Particle Physics	
University of Milan (IT) Supervisor: Prof. Stefano Forte	
Thesis title: Unbiased spin-dependent Parton Distribution Functions	
M.Sc. in Physics of Fundamental Interactions (110/110 cum laude)	06/10/2010
20/S - Classe delle lauree specialistiche in fisica - D.M. 509/1999	
University of Turin (IT) Supervisor: Prof. Mauro Anselmino	
Thesis title: General formalism for studying the nucleon transverse structure in SIDIS	
B.Sc. in Physics (110/110 cum laude)	01/10/2008
25 - Classe delle lauree in scienze e tecnologie fisiche - D.M. 509/1999	
University of Turin (IT) Supervisor: Prof. Carlo Angelantonj	
Thesis title: WKB approximation and instantons in Quantum Mechanics (in Italian)	

Teaching activity

I hold an open badge on *Quality Teaching in presence and at a distance, evaluation and inclusion*.

Lecturer for the course *Precorso*, from 2022 — 30 hours

B.Sc., Department of Physics, University of Torino (IT)

Lecturer for the course *Machine Learning for Applied and High Energy Physics*, from 2022 — 24 hours

M.Sc., Department of Physics, University of Torino (IT)

Lecturer for the course *Fisica*, from 2022 — 28 hours

B.Sc., Department of Computing Sciences, University of Torino (IT)

Advisor for the course *Research methods in Physics*, 2021-2022 — 20 hours

M.Phys., School of Physics and Astronomy, The University of Edinburgh (UK)

Tutor at the *BUSSTEPP50* School, 11/01/2021 - 04/02/2021 — 20 hours

50th British Universities Summer School in Theoretical Elementary Particle Physics – online

Lecturer on *Fragmentation Functions and Global QCD Fits*, 30/05/2017 - 16/06/2017 — 6 hours

The 32nd Annual Hampton University Graduate Summer Program, JLab, Newport News (USA)

Lecturer for the *Introductory Course in Mathematics*, 2011-2014 — 21 hours

1st-year candidates for the B.Sc. in Chemistry and Biology, Faculty of Sciences, University of Milan (IT)

Tutor in *Theoretical Particle Physics*, 2011-2014 — 20 hours

1st year M.Sc. students in Theoretical Physics, Department of Physics, University of Milan (IT)

Tutor in *General Physics*, 2011-2013 — 18 hours

2nd year B.Sc. students in Computing Sciences, Department of Computing Sciences, University of Milan (IT)

Supervision of graduate and undergraduate students

Supervision of [Tanishq Sharma](#), Ph.D. candidate, University of Torino, 2022-2025

Supervision of [Amedeo Chiefa](#), M.Sc. candidate, University of Torino, 2022-2023

Co-supervision of [Jamie Turnbull](#), M.Sc. candidate, Higgs Centre, 2022 (with R.D. Ball)

Co-supervision of [Hayden Hollenbeck](#), M.Sc. candidate, Higgs Centre, 2021 (with R.D. Ball)

Co-supervision of [Ferran Faura-Iglesias](#), M.Sc. candidate, Nikhef, 2019-2020 (with J. Rojo)

Co-supervision of [Samuel van Beek](#), M.Sc. candidate, Nikhef, 2018-2019 (with J. Rojo)

Co-supervision of [Rosalyn Pearson](#), D.Phil. candidate, Higgs Centre, 2017-2021 (with R.D. Ball)

Co-supervision of [Daniel Shipley](#), M.Sc. candidate, University of Oxford, 2017 (with J. Rojo)

Publications

A complete and up-to-date list of publications is available from the INSPIRE database, according to which my 65 publications (40 peer-reviewed journal papers, 13 contributions to conference proceedings, 11 reports and 1 Ph.D. thesis) have a total of about 5000 citations. My 40 peer-reviewed journal papers have an average of about 130 citations each. My h-index is 30 (as of 1 July 2023).

Invited talks at international conferences

I gave more than 50 talks at international conferences and workshops, of which 20 were invited plenary overview or summary talks. In addition, I was an invited seminar speaker at the University of Pavia (IT), Genoa (IT), Milan (IT), Oxford (UK), Edinburgh (UK), at the JLab Theory Centre (USA), and at Nikhef (NL). I also presented several informal talks at various meetings and events (*e.g.* NNPfD meetings, journal clubs, etc.).

Participation to international scientific collaborations

NNPDF Collaboration: Member (since October 2014); in the Steering Committee (since July 2022)
The NNPfD Collaboration determines the structure of the proton by means of advanced artificial intelligence and machine learning tools. It is made of about ten theoretical physicists (postdocs and faculty members) and around ten PhD students, all affiliated to graduate schools. As such, it effectively provides an educational service. I am in charge of coordinating the activities related to the analysis of a wide range of experimental data. I am also actively involved in the management of the Collaboration, specifically in relationship with the organisation of weekly work meetings and with the supervision of students.

Electron-Ion Collider Users Group: Nikhef Institutional Board Representative (January 2019 - September 2020); member (since October 2020) The Electron-Ion Collider (EIC) Users Group consists of more than 1000 physicists from over 200 laboratories and universities from around the world who are working together to realise the EIC, a powerful new collider to study how gluons bind all the visible matter in the Universe. The US Department of Energy recently approved the construction of the EIC in Upton, NY. As Nikhef Institutional Board Representative, I coordinated the Nikhef contribution to the scientific and technical design of the EIC, recently documented in a Yellow Report.

SMEFiT Collaboration: Member (since December 2018)

The SMEFiT Collaboration develops theoretical and computational strategies to detect New Physics by analysing the LHC data in light of the Standard Model Effective Field Theory. The Collaboration is currently made of eight members, among whom two Ph.D. students.

MAP Collaboration: Founder and member (since January 2020)

The MAP collaboration aims at extracting information about the distribution of partons inside hadrons across multidimensional momentum and configuration spaces. Key objects of study include Transverse Momentum Distributions (TMDs), Generalized Parton Distributions, and Fragmentation Functions. The collaboration is currently made of twelve members, among whom four Ph.D. students.

Refereeing activities

2023: External reviewer for the Swiss National Science Foundation.

2021: Member of the INFN (NSC1) reviewing committee of the project COMPASS++/AMBER.

2021: External reviewer of Chiara Bissolotti's Ph.D. Thesis, University of Pavia (IT) (supervisor Prof. Alessandro Bacchetta) and of Hakim Khoudri's M.Sc. Thesis, École Normale Supérieure de Paris (FR) (supervisor Dr. Valerio Bertone).

2021: Reviewer for the 13th Call for Proposals for Production Access to HPC Resources, Cyclone.

2018: Member of the selection committee for the best poster presentation, Gordon Research Conference on Photonuclear Reactions, Holderness School, New Hampshire (USA).

Since 2014 I am a referee for the following journals: Physical Review C and D, Physical Review Letters, Physics Letters B, European Physical Journal C, EPJPlus, Nuclear Physics A and B, Computer Physics Communications, JSTAT and International Journal of Modern Physics. Since 2014 I have been a referee of about 35 journal articles.

Organisational activities

24-29 September 2023: Conference convener for *Session 2: Nucleon helicity structure* The 25th International Spin Symposium, Duke University (USA)

2021 – 2022: Scientific organiser of the weekly seminar of the Higgs Centre.

I have coordinated the proposal and the invitation of the speakers for the weekly PPT seminar series.

2018 – 2020: Scientific organiser of the weekly seminar of the Nikhef Theory Group.

I have coordinated the proposal and the invitation of the speakers for the weekly Nikhef Theory Group seminar.

Organisation of the workshops *Parton Distributions and Lattice Calculations* (PDFLattice 2019), 25-27 September 2019, Michigan State University (USA) and *Parton Distributions and Lattice Calculations in the LHC era* (PDFLattice 2017), 22-24 March 2017, University of Oxford (UK).

I proposed and promoted the two workshops with the help of some colleagues in order to bring together the two communities of physicists whose efforts are devoted to the determination of parton distributions: the lattice and the global fitter communities. The two workshops were successful: as a result, the corresponding scientific activities were summarised in two self-contained documents that could serve as a reference in the coming years. As a co-editor of the documents, I led the effort towards their writing, by coordinating the activities of the various contributors and by securing publication in high-profile journals. The first of such documents is already published in *Progress in Particle and Nuclear Physics* (it has more than 150 citations); the second has been accepted for publication in the same journal and is currently in press.

25-30 September 2016: Conference convener for *Session 2: Nucleon helicity structure* The 22nd International Spin Symposium, University of Illinois and Indiana University (USA)

11-15 April 2016: Conference convener for *WG6: Spin Physics*

XXIV International Workshop on DIS and Related Subjects, DESY Hamburg (DE)

Awards, prizes and distinctions

European Physical Journal C, distinguished referee (2019).

JLab visiting stay (6 k€, January – February 2018).

I was invited to spend six weeks at the JLab Theory Center as an expert on Fragmentation Functions. The cost of my visit was entirely covered by the US Department of Energy, which supports JLab.

Contribution to travel expenses (7 k€, 2017 – 2018).

The costs of the invited participation to the following conferences were covered by the host institutions: Gordon Research Conference - Photonuclear Reactions, 5 – 10 August 2018, Holderness School, Holderness (USA); 13th Conference on the Intersections of Particle and Nuclear Physics, 29 May – 3 June 2018, Hyatt Regency Indian Wells Conference Center, Indian Wells (USA); 5th Workshop on Transverse Polarization Phenomena in Hard Processes, 11 – 15 December 2017, Laboratori Nazionali di Frascati, Frascati (IT); ICAS Institute on the Spin of the Proton, 18 – 21 September 2017, International Centre for Advanced Studies, Buenos Aires (AR).

Living allowance award, University of Milan (2 k€/year, 2011 – 2013).

The living allowance support is awarded to the two best students from outside the Milan area.

Funding obtained for the research activity

Programma per Giovani Ricercatori Rita Levi-Montalcini (Bando 2019)

Grant agreement D.M. n. 1152 13/10/2021; awarded funding: 203k€, 2022-2024; role: Principal Investigator.

Marie Skłodowska-Curie Individual Fellowship (H2020-MSCA-IF-2016)

Grant agreement 752748; awarded funding: 166 k€, 2018 – 2020; role: Principal Investigator.

Italian Ph.D. scholarship

Awarded funding: 13 k€/year, 2011 – 2013; role: Ph.D. student.

Participation to research projects funded by public bodies

I have participated into: an Italian PRIN 2008 (2008EKLACK 004) and an Italian PRIN 2010-2011 (2010YJ2NYW 002 and 2010YJ2NYW 004) funded by the Italian Ministry of University and Research, as a Ph.D. student; an UK STFC Rutherford Grant ST/M003787/1, as a postdoctoral research assistant; and an UK STFC Consolidated Grant ST/P000630/1 and ST/T000600/1, as a postdoctoral research assistant.

Outreach activity

Nikhef Jamboree, 2019, Annual interdepartmental Nikhef meeting

2 full days — Pakhuis De Zwijger, Amsterdam (NL)

Every year, Nikhef organises an informal meeting in which the activities of the various groups are presented; I have been in charge of presenting the activities of the Theory Group at the 2019 event.

Nikhef Open Day, 2019, Scientific popularisation for children and young adults

1 full day — Amsterdam Science Park (NL)

Every year Nikhef organises an open day with scientific popularisation activities for children and young adults. I have participated into these activities in 2019.

British Physics Olympiad, 2016-2017, Marking of BPhO sheet round 1

10 hours — University of Oxford (UK)

I graded sheets for the 2016 and 2017 national selection phase of the British Physics Olympiad.

An introduction to Special Relativity, 2015, A mini-course for high school students

6 hours — University of Genoa (IT)

Every year the University of Genoa organises various scientific popularisation activities to attract the best students from local high schools. In the context of such activities, I taught a mini-course on Special Relativity in 2015.

Language skills

Mother tongue **Italian**

Other languages **English, French**

Self-assessment European level (Common European framework of reference (CEF) level)

	Understanding		Speaking		Writing
	Listening	Reading	Spoken interaction	Spoken production	
English	C1	C2	C1	C1	C2
French	C2	C2	C1	C1	C2