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Curriculum Vitae — Juan Rojo

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Contents

Executive Summary

A career in a nutshell

I am a particle physicist working on **theoretical calculations, modelling, and interpretation** of high-energy particle collisions supported by cutting-edge artificial intelligence and machine learning algorithms. I have achieved groundbreaking results with long-lasting impact in various areas of particle physics, from the determination of the quark and gluon structure of the proton, the discovery of charm quarks in the proton, evidence for new dynamics in high-energy QCD, effective field theories, Higgs boson studies, and neutrino interactions for astroparticle physics. I have been awarded several prestigious grants and fellowships, including ERC Starting and Advanced Grants, a STFC Rutherford Fellowship, several NWO grants, a Visiting Professorship at Oxford, and I am was elected Fellow of the Young Academy of Europe.

From Barcelona to Amsterdam. Subsequently to my Ph. D. studies in Barcelona in 2006, I held postdoctoral research positions first at LPTHE (Paris) and INFN (Milano), and then in 2011 I secured a Marie Sklodowska-Curie personal Fellowship to carry out my research at the Theory Division of CERN, the European Laboratory for Particle Physics. In 2014 I joined the University of Oxford faculty as tenure-track Rutherford Fellow and Lecturer at Balliol College, where I assembled a strong research group in theoretical particle physics. In October 2016 I joined the VU Amsterdam and the Nikhef Theory group, being then promoted to Associate Professor (*Universitair Hoodfdocent 1*) in 2018 and to Full Professor (*Hoogleraar*) in 2022. From January 2025 I am the Head of the Physics and Astronomy department, which consists of around 150 FTEs (of which 40 PIs) and has a yearly turnover of € 17M.

My research as a PI has been supported by several personal grants, including ERC Starting and Advanced Grants, a STFC Rutherford Fellowship and Grant, NWO Physics Projectruimte, ENW OC-KLEIN-2, eScience ASDI (*Accelerating Scientific Discoveries*) award, and a co-investigator grant with the Swiss National Science Foundation among others, adding up to around **€ 8.5M in personal funding secured as PI**.

Lines of research. The overarching theme of my research is pushing forward the frontier of theoretical calculations in high-energy particle collisions. The ultimate goal is boosting our knowledge of the **fundamental laws of nature at the zeptospace** (10^{-21} m), involving distances 10^{15} times smaller than a bacterium. My main research lines are:

- The determination of the quark and gluon substructure of protons using machine learning tools. Here I address outstanding open questions in our understanding of the strong nuclear interactions, such as the strange and heavy quark content of nucleons, and provide improved predictions for key processes in high-energy collider experiments that are of paramount importance for *e.g.* the study of the Higgs boson properties.
- Model-independent searches for New Physics beyond the Standard Model (SM) by means of the Effective Theory framework. The motivation is to either uncover deviations within the fundamental laws of the SM or to provide the the most stringent constraints on particles and interactions that might lie beyond it.
- To exploit the interplay between high-energy collider and astroparticle processes to provide state-of-the-art theoretical predictions for the latter. Carrying out these high-precision calculations and their software implementation is essential for discoveries in neutrino and cosmic ray astrophysics, such as the origin of galactic neutrinos.

These lines share in common *(i)* a close connection with experimental data, *(ii)* the deployment of cutting-edge methodologies and machine learning tools, and *(iii)* the development of public scientific software tools for the whole community. I often interact with my experimental colleagues, fruitful collaborations that have resulted in several joint publications.

Research achievements. I am recognised as a leading expert in the phenomenology of collider particle physics, with key achievements including the development of the NNPDF framework for global analyses of the quark and gluon structure of the proton and of applications of Machine Learning in particle physics. Already during my PhD work I demonstrated how neural networks could be trained using genetic algorithms to constrain the proton structure. I am currently the Physics Coordinator of the NNPDF Collaboration, whose results have been extensively adopted by the particle physics community, in particular by the LHC experiments. Further achievements include:

- The most extensive combined interpretation of the properties of top quarks and Higgs bosons using EFTs.
- The first determination of the proton structure accounting for the effects of higher-dimensional EFT operators.
- Providing unambiguous evidence for the presence of charm quarks as constituents of the proton.
- Demonstrating statistically significant nuclear effects, in particular shadowing and anti-shadowing.
- Providing evidence for a non-zero polarisation of gluons and thus of their contribution to the total proton spin.

- The most precise theoretical modeling of the interactions and propagation of high-energy neutrinos in matter.
- Obtained evidence for a novel dynamical regime of the strong interactions (BFKL dynamics).

Mentoring and supervision. I have supervised 11 PhD candidates (seven completed, three ongoing) with two more starting soon, and more than 25 MSc students. Two of my most recent PhD candidate to graduate, Rabah Abdul Khalek and Giacomo Magni, were awarded the Summa Cum Laude distinction (given only to the best 5% of PhD theses in The Netherlands). I have mentored 9 postdocs working in my group, with two of them having secured their own independent funding (NWO Veni & MC-IEF) to join my group. I have been external opponent of several international PhD theses. Between December 2021 and July 2025 I served as the chairperson of the National Graduate School of Subatomic Physics as well as of Nikhef's Education Committee, overseeing individual and collective training and supervision activities for the around 150 PhD candidates of Nikhef and partner universities.

Scientific leadership and footprint in the HEP community

I have given more than 80 invited talks at international conferences and colloquia, including plenary talks at the yearly collaboration meetings of the ATLAS, CMS, and LHCb experiments. I am one of the very few particle theorists who have been granted Scientific Associateship of the two LHC general-purpose experiments, ATLAS and CMS. I have developed several widely-used HEP software tools, from the APFEL and HOPPET PDF evolution libraries and the aMCfast interface to aMC@NLO to NuPropEarth for high-energy neutrino propagation in matter and SMEFiT for global analyses of the Standard Model Effective Field Theory. I play a leading role in the scientific exploitation and planning of present and future particle colliders. For the former, I am active in the PDF, top quark, and Effective Theory working groups of the LHC. In the latter, I have authored the Conceptual Design Reports of the High-Luminosity LHC, the Future Circular Collider, and the Electron-Ion Collider, and I am one of the leaders of the ongoing effort towards realising a Future Physics Facility (FPF) operating simultaneously with the HL-LHC. My research is frequently highlighted in Dutch (NRC, De Volkskrant, New Scientist) and international (Science News, Quanta, Scientific American) media outlets.

Scientific management, conference organisation, and refereeing. I have been member of the Nikhef's Scientific Advisory Council, served in the NWO-Veni, NWO-Vidi and NWO-KLEIN grant assessment committees, and represent the VU at the Governing Board of the DRSTP graduate school. I frequently referee for the most important journals of my field (JHEP, EPJC, NPB, ...) and nd serve in grant & fellowship committeess for the national science foundations of The Netherlands, France, Germany, USA, Spain, Italy, United Kingdom, and Israel among others. I have been member of several search committees (BAC) for faculty positions. I have organised and convened several international conferences and workshops, including PDFLattice2017 (Oxford) and FYSICA 2019 (Amsterdam), and I was the co-chair of the DIS2021 (virtual) conference with 700 participants.

Membership of experimental collaborations. The relevance of my research in theoretical particle physics has been recognised with the membership of three large experimental collaborations. Between 2012 and 2014, I was appointed Affiliate Scientist in the **CMS Collaboration** of the LHC, contributing analysis in the SM, QCD, top, and electroweak working groups, and co-convening the CMS PDF forum, and co-authoring 6 CMS publications. Between 2015 and 2018, I was appointed Short Term Affiliate (STA) in the **ATLAS Collaboration** of the LHC, participating in PDF fit forum studies and Higgs boson characterisation activities, and co-authoring one ATLAS publication. Since 2024, I am member of the **FASER Collaboration** at CERN, focusing on measurements and interpretation of high-energy neutrino scattering.

Teaching and university management. As indicated in my overview of teaching activities, I have been coordinator and (co)-teacher of several courses in the Amsterdam UvA/VU Physics and Astronomy joint BSc program, including *Quantum Mechanics 2* and *Machine Learning for Physics and Astronomy*, as well as in the Medical Natural Sciences (MNW) BSc program at the VU with *From Quantum to Molecule*. I have taught several MSc courses, first in Oxford and then in Amsterdam, such as "Quantum Chromodynamics", "Standard Model", "Quantum Field Theory" and "Particle Physics 2", as well as advanced courses and specialised lectures for graduate schools in topics from machine learning and effective theories to future colliders. I also served Bachelor Coordinator and member of the program committee (OLC) of the MNW program, and in 2019 I obtained my Senior Teaching Qualification (SKO) certification. From September 2020 to December 2024 I was a member of the Management Team of the Department of Physics and Astronomy, first in charge of the Research Portfolio and then of the Education and Management Portfolio. From January 2025 I serve Head of the Department of Physics and Astronomy (4 year term), in charge of managing a department with ~ 150 FTEs (including PhD candidates and postdocs) and with an annual budget of around € 17M.

General Information

Personal Information

- Date and place of birth: Barcelona (Spain), 15/02/1980.
- Civil status: Married, two children.
- Home address: Luxemburghof 21, 2628 ZT Delft, The Netherlands.
- ORCID identifier: 0000-0003-4279-2192.

Education

3. **(2006)** Ph. D. in Theoretical Physics, Universitat de Barcelona, Spain. Supervisors: Prof. Jose Ignacio Latorre (Universitat de Barcelona) and Prof. Stefano Forte (Università di Milano).

2. **(2004)** Diploma d'Estudis Avancats (DEA), Universitat de Barcelona, Spain. Equivalent to a current MSc degree.

1. **(2002)** Degree in Physics, Universitat de Barcelona, Spain. Equivalent to a current BSc degree. Achieved the highest overall grade among my cohort and awarded the *Premi Extraordinari de LLicenciatura* (Extraordinary Degree Award.

Professional Experience

12. **(2025-current)** Head of Department (Chair), Department of Physics and Astronomy, VU Amsterdam, The Netherlands.

11. **(2022-current)** Full Professor of Theoretical Physics (*Hoogleraar Theoretische Natuurkunde*), Department of Physics and Astronomy, VU Amsterdam, The Netherlands.

10. **(2018-2022)** Associate Professor (*Universitair Hoofddocent 1*), Department of Physics and Astronomy, VU Amsterdam, The Netherlands.

9. **(2016-current)** Staff Member and Group Leader, Theory group, Nikhef, The Netherlands.

8. **(2016-2018)** Assistant Professor, Department of Physics and Astronomy, VU Amsterdam, The Netherlands.

7. **(2014-2016)** Lecturer in Physics, Balliol College, University of Oxford, Oxford, UK.

6. **(2014-2016)** STFC Rutherford Fellow Junior Faculty, Rudolf Peierls for Theoretical Physics, Physics Department, University of Oxford Oxford, UK.

5. **(2013-2014)** Research Fellow, Theory Unit, Physics Department, CERN, Switzerland.

4. **(2011-2013)** Marie Curie Research Fellow, Theory Unit, Physics Department, CERN, Switzerland. Supervisor: Prof. Michelangelo Mangano.

3. **(2010-2011)** Postdoctoral research fellow, Dipartimento di Fisica Università degli studi di Milano, Italy. Supervisor: Prof. Stefano Forte.

2. **(2008-2010)** Postdoctoral research fellow, Sezione di Milano, Instituto Nazionale di Fisica Nucleare, Italy. Supervisor: Prof. Stefano Forte.

1. **(2006-2008)** CNRS postdoctoral research fellow, LPTHE, Universite Pierre et Marie Curie (Paris VI) and Denis Diderot (Paris VII), Paris, France. Supervisors: Prof. Matteo Cacciari and Prof. Gavin Salam.

Language Skills

- Spanish and Catalan: proficient (both mother tongues).
- English: proficient, both oral and written (C2 level). Achieved the Cambridge Certificate for Proficiency.
- Dutch: proficient, both oral and written (C2 level).
- Italian: proficient, both oral and written (C2 level)..
- French: advanced. Achieved official certificate *Diplome d'Etudes en Langue Francaise* (DELF) level B1.

Publication Track Record

Overview

I am the author of 167 peer-reviewed publications, including of two of the ten most cited papers published in theoretical particle physics since 2010, and the highest cited paper on machine learning for particle physics. In this section, the number of publications, citation counts, and other bibliographic metrics have been extracted either from my InspireHep database profile, which represents the standard in the particle physics community, or from my Google Scholar profile. According to the InspireHep database, my peer-reviewed publications add up to **42904 citations**, with 48, 18, 12, and 4 papers with more than 100, 250, 500, and 2000 citations respectively, leading to an h-index of 92 (h=107 from the Google Scholar database). Bibliographic information is accurate as of June 22, 2026.

Publication Overview and Citation Metrics

The complete list of my publications, with full bibliographic information, is listed in Appendix A of this CV. Here I provide an overview of my publication track record and provide a number of relevant citation metrics and other statistical estimators. Further bibliographic information, including cross-linked references, is accessible through my InspireHep database profile.

- According to the InspireHep database, my peer-reviewed publications add up to **42904 citations**, with 48, 18, 12, and 4 papers with more than 100, 250, 500, and 2000 citations respectively, leading to an h-index of 92. Please see below for the detailed breakdown of my publication figures as provided by InspireHep.

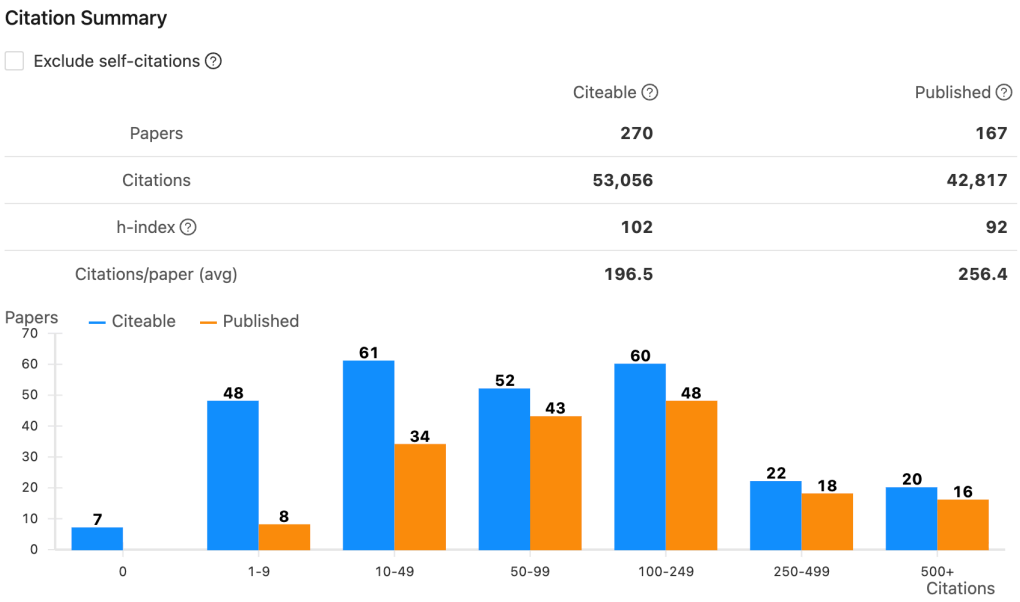

Figure 1: Bibliographic overview from my InspireHep database profile, as of June 22, 2026.

- Two of my publications, namely the NNPDF2.3 and NNPDF3.0 determinations of the proton structure, with 3166 and 4546 citations respectively, are among the ten most cited papers published in my research field, theoretical particle physics, since 2010.
- As also indicated from the InspireHep database, my profile corresponds to one of the highest-cited researchers in the theoretical high-energy physics, with an average of **256 citations for peer-reviewed publication**.
- According to the Google Scholar ranking, my profile belongs to the **12 best cited academics within the whole VU Amsterdam** university. Below I indicate an overview of my bibliographic information as provided by my Google Scholar profile.

	All	Since 2021
Citations	76014	37207
h-index	107	77
i10-index	220	177

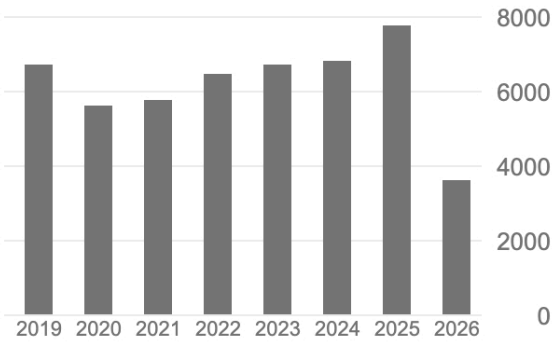

Figure 2: Bibliographic overview from my Google Scholar profile, as of June 22, 2026.

Representative Publications

Here I provide 10 representative publications, with a brief motivation justifying their relevance and impact. As mentioned above, the complete list of my publications is listed in Appendix A of this CV. In high-energy physics, papers are signed in alphabetical order. All my peer-reviewed publications are available Open Access thanks to the SCOAP3 initiative.

1. R. D. Ball, L. Del Debbio, S. Forte, A. Guffanti, J. I. Latorre, **J. Rojo**, and M. Ubiali, "A first unbiased global NLO determination of parton distributions and their uncertainties," Nucl. Phys. B **838**, 136 (2010) doi:10.1016/j.nuclphysb.2010.05.008, arXiv:1002.4407 [hep-ph].

   First-ever global determination of the proton's parton distributions using machine learning tools. Results were obtained thanks to the NNPDF analysis methodology that I had been developing since my Ph. D. work. Based on data from a wide range of processes, I obtained the first unbiased model-independent predictions for proton-proton collisions at the LHC. These results were adopted by the PDF4LHC Working Group in their recommendations for PDF usage during the LHC Run I. As with all NNPDF releases, it is publicly available via the `LHAPDF` library.

2. R. D. Ball, V. Bertone, S. Carrazza, C. S. Deans, L. Del Debbio, S. Forte, A. Guffanti, N. P. Hartland, J. I. Latorre, **J. Rojo**, and M Ubiali, "Parton distributions with LHC data," Nucl. Phys. B **867**, 244 (2013), doi:10.1016/j.nuclphysb.2012.10.003, arXiv:1207.1303 [hep-ph].

   The first PDF determination that included LHC measurements, NNPDF2.3 has been extensively employed for data analysis and interpretation by the LHC experiments. The NNPDF2.3 determination was adopted as baseline for the popular `MadGraph_aMC@NLO` and `Pythia8` Monte Carlo event generators, as well as for the `Monash` tune of soft and semi-hard physics in `Pythia8`.

3. R. D. Ball, S. Forte, G. Ridolfi, E. R. Nocera, and **J. Rojo**, "A first unbiased global determination of polarized PDFs and their uncertainties," Nucl. Phys. B **887**, 276 (2014), doi:10.1016/j.nuclphysb.2014.08.008, arXiv:1406.5539 [hep-ph].

   The first global determination of the polarised proton PDFs using machine learning. There I demonstrated that, as opposed to common lore at the time, the gluon contributes to the overall spin budget of the proton. These findings were highlighted in various popular science outlets, such as Science News and Scientific American.

4. R. D. Ball, V. Bertone, S. Carrazza, C. S. Deans, L. Del Debbio, S. Forte, A. Guffanti, N. P. Hartland, J. I. Latorre, **J. Rojo**, and M Ubiali, "Parton distributions for the LHC Run II," JHEP **1504**, 040 (2015), doi:10.1007/JHEP04(2015)040, arXiv:1410.8849 [hep-ph].

In this work the next-generation NNPDF3.0 PDF determination was presented, based on a complete restructuring of the NNPDF analysis framework in `C++` and `Python`. The robust statistical interpretation of PDF uncertainties was demonstrated using closure tests.

5. J. Butterworth, S. Carrazza, A. Cooper-Sarkar, A. De Roeck, J. Feltesse, S. Forte, J. Gao, S. Glazov, J. Huston, Z. Kassabov, R. McNulty, A. Morsch, P. Nadolsky, V. Radescu, **J. Rojo**, and R. Thorne, "PDF4LHC recommendations for LHC Run II," J. Phys. G **43**, 023001 (2016), doi:10.1088/0954-3899/43/2/023001, arXiv:1510.03865 [hep-ph].

   As a leading member of the PDF4LHC Working Group, I coordinated and implemented its official recommendations for PDF usage official recommendations for PDF usage during the LHC Run II data-taking period. The main delivery of this work, the `PDF4LHC15` sets, were developed with PDF combination and compression software tools that I developed, `CMC-PDFs` and `MC2H`.

6. R. Gauld and **J. Rojo**, "Precision determination of the small-x gluon from charm production at LHCb," Phys. Rev. Lett. **118**, no. 7, 072001 (2017) doi:10.1103/PhysRevLett.118.072001, [arXiv:1610.09373 [hep-ph]].

   By exploiting the information contained in the production of charmed mesons from the LHCb experiment, I achieved the most precision determination ever of the gluon PDF at small momentum fractions. This work represent the foundation for several astroparticle physics studies from my group, from ultra-high energy neutrino-matter cross-sections to complete predictions for neutrino propagation on Earth. My results have been implemented in the dedicated software packages `PromptNuFlux`, `BGR18`, and `NuPropEarth`.

7. J. Gao, L. Harland-Lang and J. Rojo, "The Structure of the Proton in the LHC Precision Era," Phys. Rept. **742** (2018), 1-121 doi:10.1016/j.physrep.2018.03.002 [arXiv:1709.04922 [hep-ph]].

   This invited review article constitutes the state-of-the-art report for modern studies of the quark and gluon structure of protons. It covers all relevant topics in the field, from its theoretical underpinnings to the various methodological strategies and to the implications for precision phenomenology at the LHC and elsewhere.

8. R. D. Ball, V. Bertone, M. Bonvini, S. Marzani, **J. Rojo** and L. Rottoli, "Parton distributions with small-x resummation: evidence for BFKL dynamics in HERA data," Eur. Phys. J. C **78**, no. 4, 321 (2018) doi:10.1140/epjc/s10052-018-5774-4 [arXiv:1710.05935 [hep-ph]].

   In this work I presented the discovery of BFKL dynamics in HERA data, a new regime of the strong nuclear force that had been hypothesized for more than 40 years but never before unambiguously identified. These results, whose relevance was recognised with an article in The Guardian, are crucial for our understanding of QCD at high energies and for the interpretation of data from future colliders.

9. N. P. Hartland, F. Maltoni, E. R. Nocera, **J. Rojo**, E. Slade, E. Vryonidou and C. Zhang, "A Monte Carlo global analysis of the Standard Model Effective Field Theory: the top quark sector," JHEP **1904**, 100 (2019), doi:10.1007/JHEP04(2019)100, [arXiv:1901.05965 [hep-ph]].

   In this work I developed the SMEFiT framework for global EFT analyses. There I achieved the most extensive interpretation to date of top quark production measurements from the LHC, improving the existing constraints on higher-dimensional operators by up to several orders of magnitude. Crucially for future developements, I designed this framework with the flexibility required to explore an arbitrarily large number of directions in the theory parameter space.

10. S. Carrazza, C. Degrande, S. Iranipour, **J. Rojo**, and M. Ubiali, "Can New Physics hide inside the proton?," Phys. Rev. Lett. **123**, no. 13, 132001 (2019), doi:10.1103/PhysRevLett.123.132001, [arXiv:1905.05215 [hep-ph]].

    There I demonstrated for the first time how to simultaneously extract the proton structure and the EFT Wilson coefficients from a joint analysis of deep-inelastic structure functions. This analysis, summarised in this YouTube video, highlighted the crucial interplay between proton structure studies and searches for new physics beyond the SM in the LHC precision era.

Scientific Software Development

Overview

I am a developer of several widely-used open source software tools for particle and astroparticle physics, from the NNPDF parton distribution functions to the APFEL and HOPPET PDF evolution codes and the NuPropEarth and BGR18 calculations of high-energy neutrino interactions and propagations in matter.

My main scientific software development activity concerns tools devoted to the determination of parton distributions, and related quantities such as fragmentation functions, in the framework of the NNPDF Collaboration. Detailed information about the NNPDF efforts and outcomes is provided by the Collaboration website, with related public code packages available via its GitHub repository. Public releases of the NNPDF sets are available from the LHAPDF library interface.

In addition to this NNPDF effort, other scientific software tools whose development I have contributed to include the following:

- **(2023)** NNSFν
  The NNSFν software framework makes possible the determination of inelastic neutrino structure functions in the complete ranges of energies E_ν relevant for phenomenology, from oscillation measurements in the GeV range to astroparticle physics in the EeV range.

- **(2022)** ML4EFT
  ML4EFT is a general open-source framework for the integration of unbinned observables into global fits of particle physics data. It makes use of machine learning regression and classification techniques to parameterise high-dimensional likelihood ratios, and can be seamlessly integrated into global analyses of, for example, the Standard Model Effective Field Theory and Parton Distribution Functions.

- **(2020)** EELSfitter
  EELSfitter is an open-source Python-based framework developed for the machine learning analysis and interpretation of Electron Energy Loss Spectroscopy (EELS) measurements in Transmission Electron Microscopy (TEM), developed in collaboration with TU Delft experts. The code is publicly available from its GitHub repository with the corresponding online documentation available here.

- **(2020)** NuPropEarth
  A Monte Carlo event generator that evaluates the impact of matter effects in the propagation of high energy neutrinos, with precise calculations of the neutrino-nucleon cross-sections are provided by the HEDIS module of GENIE. The code is publicly available from its GitHub repository.

- **(2019)** SMEFiT
  A framework to carry out global analyses of the Standard Model Effective Field Theory and to provide statistical interpretation of its results. Public SMEFiT tools are available from its GitHub repository, and its online project documentation can be found in the SMEFiT website.

- **(2018)** BGR18 ultra-high energy neutrino-nucleus cross-sections
  State-of-the-art calculation of neutrino-nucleus interactions at high-energies. Structure function grids, dedicated fits of parton distributions, and integrator code available from this url.

- **(2016)** SMPDF online Graphical User Interface
  Online Graphical User Interface for the Specialised Minimal PDF library, providing sets of PDFs with reduced number of eigenvectors for tailored LHC applications.

- **(2016)** PromptNuFlux
  This code provides a state-of-the-art calculation of the prompt atmospheric neutrino fluxes for a wide range of neutrino energies and various models for the cosmic ray flux, including the corresponding scale and PDF theoretical uncertainties.

- **(2014)** APFEL online Graphical User Interface
  Online Graphical User Interface for the APFEL library. APFEL Web allows to perform a wide variety of comparisons for PDFs, parton luminosities and DIS structure functions with many different PDF sets.

- **(2014)** aMCfast
  aMCfast provides the automation of fast interfaces to fixed order NLO and NLO matched to parton shower computations for PDF fits, and is publicly available via its HepForge website. This automation is achieved thanks to the `MadGraph5_aMC@NLO` framework,interfaced with the `APPLgrid`. aMCfast allows to include arbitrarily complex NLO and NLO+PS observables in global PDF analysis.

- **(2013)** EPS09MC
  Monte Carlo versions of the EPS09 nuclear parton distribution set. Can be used to quantify constraints of new data on nuclear PDFs. Available from this url.

- **(2013)** APFEL
  A Partonic Function Evolution Library with QED corrections, available from HepForge. APFEL implements PDF evolution including QED effects and the calculation of DIS structure functions up to NNLO in a variety of general mass variable flavour number schemes.

- **(2010)** FONLLDIS
  $x-$space implementation of the FONLL General-Mass heavy quark scheme for deep–inelastic structure functions.

- **(2008)** JETQUALITY
  Interactive tool to assess the performance of jet definitions for kinematic reconstructions at the Large Hadron Collider, `http://quality.fastjet.fr/`. This tools is intended to help visualize how the choice of jet definition impacts a dijet invariant mass reconstruction at LHC.

- **(2008)** HOPPET

  A Higher Order Perturbative Parton Evolution Toolkit, available from the HepForge repository. HOPPET is a Fortran 95 package for carrying out QCD DGLAP evolution and other common manipulations of parton distribution functions. Good speed and accuracy are obtained through the representation of splitting functions in terms of their convolution with a set of piecewise polynomial basis functions.

Publications in quantum material science

Complementing my core research activities in theoretical particle physics, I have also developed a successful research line in quantum material science, in close collaboration with TU Delft researchers. These activities focus on exploiting machine learning techniques developed for particle physics in the context of data processing and interpretation in measurements of quantum materials within transmission electron microscopy and electron energy loss spectroscopy.

1. Bart van der Wielen, Jeroen J. M. Sangers, Samuel Mañas-Valero, Juan Rojo, and Sonia Conesa-Boj, "Uncertainty-aware machine learning for core-loss background subtraction in EELS", NPJ Computational Materials in press, `https://www.nature.com/articles/s41524-026-02145-3` (2026)

2. van der Lippe, S., Brokkelkamp, A., Rojo, J., Conesa-Boj, S., "Localized Exciton Anatomy and BandGap Energy Modulation in 1D MoS2 Nanostructures". Adv. Funct. Mater. 2023, 2307610. https://doi.org/10.1002/adfm.202307610.

3. H. La, A. Brokkelkamp, S. van der Lippe, J. ter Hoeve, J. Rojo and S. Conesa-Boj, "Edge-Induced Excitations in Bi_2Te_3 from Spatially-Resolved Electron Energy-Gain Spectroscopy," Ultramicroscopy, Volume 254, 2023, 113841, https://doi.org/10.1016/j.ultramic.2023.113841. [arXiv:2305.03752 [cond-mat.mes-hall]].

4. A. Brokkelkamp, J. ter Hoeve, I. Postmes, S. E. van Heijst, L. Maduro, A. V. Davydov, S. Krylyuk, J. Rojo and S. Conesa-Boj, "Spatially-Resolved Band Gap and Dielectric Function in 2D Materials from Electron Energy Loss Spectroscopy," J. Phys. Chem. A **126** (2022), 7 doi:10.1021/acs.jpca.1c09566 [arXiv:2202.12572 [cond-mat.mtrl-sci]].

5. S. E. van Heijst, M. Mukai, E. Okunishi, H. Hashiguchi, L. I. Roest, L. Maduro, J. Rojo, S. Conesa-Boj, "Illuminating the Electronic Properties of WS2 Polytypism with Electron Microscopy", Ann. Phys. (Berlin) 2021, 533, 2000499, doi:10.1002/andp.202000499.

6. L. I. Roest, S. E. van Heijst, L. Maduro, J. Rojo and S. Conesa-Boj, "Charting the low-loss region in Electron Energy Loss Spectroscopy with machine learning," Ultramicroscopy **222** (2021), 113202 doi:10.1016/j.ultramic.2021.113202 [arXiv:2009.05050 [cond-mat.mtrl-sci]].

Funding, Awards, and Fellowships

Overview

My research has been supported by several personal grants, including a Marie Curie Fellowship at CERN (€200K), an ERC Starting Grant at Oxford (€1.33M), an ERC Advanced Grant (€2.5M), a STFC Rutherford Fellowship and Grant (€1M), a NWO Physics Projectruimte (€420K), an ENW OC-KLEIN-2 award (€700K), a eScience Accelerating Scientific Discoveries grant (€500K), and a co-investigator grant of the Swiss National Science Foundation ((€1300K)), totaling around €8.5M in funding secured as PI via competitive calls. Furthermore, I have been awarded a Visiting Professorship at the University of Oxford and elected Fellow of the Young Academy of Europe. I am one of the very few particle physics theorists who have been awarded Scientific Associateship of the two LHC general-purpose experiments, ATLAS and CMS.

Funding ID as PI

- **(2026)** European Research Council (ERC) Advanded Grant (AdG). Total funding of **€ 2500K** for a period of 5 years, awarded to the project *Unlocking the Strong Interactions with Collider Neutrinos* (UNICORN).
- **(2024)** Swiss National Science Foundation (SNSF) Co-Investigator Award. Total funding **€ 1350K** for a period of 4 years, awarded to the project *Fingerprinting Neutrinos and Feebly Interacting Particles with FASER at the LHC*, with co-PI Prof. Dr. Anna Sfyrla (University of Geneva).
- **(2024)** Scientific Associating at CERN. Total funding **€ 50K**, supporting a stay at CERN for four months (October 2024 to January 2025) to work on the Feasibility Study of the Future Circular Collider.
- **(2021)** Nederlands eScience Center Accelerating Scientific Discovery (ASDI2020) award. Total funding: **€ 500K** for a period of three years starting in Oct 2021. This award supported a three-year postdoc and 2.5FTE of eScience Center Software Engineers.
- **(2020)** Nederlands Organisation for Scientific Research (NWO) ENW-KLEIN-II grant. Total funding: **€ 700K** for a period of four years starting in Oct 2020. This award funded a three-year postdoc and a four-year Ph. D. candidate, in addition to a **€ 160K** investment in computing resources hosted by Nikhef.
- **(2017)** Nederlands Organisation for Scientific Research (NWO) Physics Projectruimpte award. Total funding: **€ 420K** for a period of four years starting in Sep 2017. This award funded a two-year postdoc and a four-year Ph. D. candidate.
- **(2014)** United Kingdom Science and Technologies Facilities Council (STFC) Rutherford Grant. Total funding: **€ 300K** for a period of three years, starting Sept 2015. This award funded a two-year postdoctoral research assistant and investments in the Oxford Theory computing cluster.
- **(2014)** Ramon y Cajal Fellowship awarded by the Ministry of Science from Spain. Total funding: **€ 380K** for a period of five years, starting Sept 2014. This award would have funded a five-year tenure-track faculty position at a Spanish university (*declined*).
- **(2013)** United Kingdom Science and Technologies Facilities Council (STFC) Rutherford Fellowship. Total funding: **€ 700K** for a period of five years, starting March 2014. This award funded for five years my salary as junior faculty at the Physics Department of the University of Oxford.
- **(2013)** European Research Council Starting Grant. Total funding: **€ 1330K** for a period of five years, starting in June 2014. This ERC Starting Grant funded 3 Ph. D. studentships stationed in Oxford and four postdocs, first based in Oxford and subsequently in Amsterdam.
- **(2010)** Marie Curie Intra European Fellowship (IEF). Awarded a personal Marie Curie IEF for the project *Discovery@LHC*, hosted by the CERN TH Division. Total funding: **€ 200K** for a period of two years.

Funding ID as co-PI

- **(2025)** COST action CA24146: "Machine Learning and Quantum Computing for Future Colliders", co-PI. Awarded € 600K for the period 2025-2029, funding networking and coordination activities such as workshops and meetings and short-Term Scientific Missions in the topic of ML and Quantum Computing for future particle colliders.

- **(2024)** The Marie Skłodowska-Curie Actions - Staff Exchanges (SE) European Award, *High-Energy Intelligence (HeI)*. Total funding awarded: € 700K. Participation as co-PI and member of the Nikhef node (10% of total awarded funds).
- **(2018)** Dutch National Roadmap for Large Scientific Infrastructures, *KM3NET2.0: the next-generation neutrino tescoscope*. Total funding awarded: € 12.73M. Participation as member of the Nikhef node, with PI Stan Bentvelsen.
- **(2015)** AMVA4NewPhysics Marie Curie Initial Training Network (ITN). Total funding awarded: € 2.3M. Participation as member of the Oxford Node of the network, with PI T. Dorigo.
- **(2010)** HEPTOOLS MC Research training network, (MRTN-CT-2006-035505), network member as part of the Milano node, PI G. Degrassi.
- **(2010)** Colisions de ions pesados no LHC (INCITE08PXIB296116PR). PI: C. Salgado.
- **(2008)** Red Tematica del LHC, (FPA 2008-01699-E),Plan Nacional I+D+I. PI: B. Adeva.

Awards and Fellowships

- **(2024-2025)** Awarded a four-month Scientific Associateship (SA) at the Theory Division of CERN, in order to contribute to the final report on the Feasibility Study of the Future Circular Collider (FCC).
- **(2024-2025)** Appointed Short Term Affiliate (STA) in the ATLAS Collaboration at the LHC, contributing to the ATLAS efforts in the HL-LHC projections for the European Strategy Update process.
- **(2022-2024)** Visiting Professorship, Institute of Cosmos Science (ICC), University of Barcelona. Distinction awarded by the University of Barcelona to support short research and collaboration visits at the ICC.
- **(2017-2020)** Visiting Professorship, University of Oxford. Awarded by the Mathematical, Physical and Life Sciences (MPLS) Division of the University of Oxford for a duration of three years.
- **(2014-2018)** Appointed Short Term Affiliate (STA) in the ATLAS Collaboration at the LHC, participating in the PDF fit forum studies, the Higgs boson characterisation activities, and in the Monte Carlo physics validation group.

  Such STAs are exceptionally awarded to selected theorists, granting them access to experiment-internal information, and their appointment needs to be approved by the heads of all institutes participating in the ATLAS experiment.
- **(2012-2014)** Appointed Affiliate Scientist in the CMS Collaboration of the LHC, contributing to the CMS experimental analysis in the Standard Model, QCD, top and Electroweak working groups. Specifically, I was coordinator of the CMS PDF forum for PDF related studies within CMS.

  As in the case of ATLAS, the Affiliate Scientist recognition in CMS is seldomly awarded to external theorists.
- **(2002)** FPU Fellowship, awarded by the Ministerio de Educación y Ciencia (Spain) to support a Ph. D. thesis in the period between 2002 and 2006. Total funding: **€ 60K** for a period of four years.
- **(2002)** Undergraduate Award of the Physics Faculty of the University of Barcelona, awarded to the undergraduate student with the highest overall qualifications at the Faculty level in the academic period 1998-2002.

Membership of Scientific Societies

- **(2017)** Member of Dutch Research School of Theoretical Physics (DRSTP).
- **(2016)** Elected Member of the Young Academy of Europe (YAE), http://yacadeuro.org/.
- **(2016)** Member of the Dutch Physical Society - Nederlandse Natuurkundige Vereniging (NVV).

Short-listing in Grant Applications

Here I list grant applications where as (co-)PI the proposal has been assessed to be of excellent (and sufficient) quality, but ultimately not granted due to the limited availability of funding.

- **(2022)** ENW Vici, *An Effective Pathway to a New Standard Model*, Invited to submit full proposal and to the interview, proposal assessed with overall score 1.8 (“very good”) but failing beyond the threshold for funding. Budget of the full proposal: € 1.5M.

- **(2021)** Netherlands Wetenschappelijke Agenda Research by Consortia (NWA-ORC), *NextGrasPP: Netherlands Initiative for Next Generation Signal Identification in Particle Physics.* Co-PI, core writing team member, and leader of one of the Work Packages. Invited to submit full proposal and to the interview, proposal assessed with a high overall score but failing beyond the threshold for funding. Budget of the full proposal: € 5.5M.
- **(2021)** ENW Vici, *An Effective Pathway to the New Standard Model,* short-listed, invited to interview, and proposal assessed with overall score 1.9 ("very good"). Budget of the full proposal: € 1.5M.
- **(2020)** ENW GROOT, *Towards the zeptouniverse using theoretical particle physics as quantum microscope,* co-PI, member of core writing team and participant at the interview. After successfully assessed pre-proposal, invited to submit full proposal and interview. Overall score "very good", failing beyond the threshold for funding.
- **(2018)** ERC Consolidator Grant, *Machine Learning the Global Analysis of Non-Perturbative QCD,* short-listed, invited to interview in Brussels, and proposal assessed with highest possible mark (A) therefore deemed deserving funding from the ERC, but not funded due to budget limitations.

Outreach, Dissemination, and Valorisation

Overview

I am passionate for scientific dissemination and reaching out to public audiences. I am frequently involved in outreach activities, from talks at schools to blogging and social media, and I wrote a popular science book about particle physics (in Spanish originally, and then translated to several other languages). My research if frequently showcased in **national and international media outlets**, with recent examples including articles/interviews for NRC, Volkskrant, New Scientist, and a PBS Youtube video with more than 1.5M visualizations. Furthermore, while my research driver is fundamental science, I am keen on exploring practical applications of my AI know-how to other fields, and I have stablished a fruitful collaboration with TU Delft experts where my particle physics machine learning techniques are deployed for the characterisation of novel quantum materials.

Media Appearances

- **(2026)** Physicists resolve a long-standing puzzle over the size of a proton, expert contribution to New Scientist piece on progress towards a resolution of the proton radius puzzle.
- **(2026)** Study: FCC accelerator will call for new approaches to particle discovery, Nikhef press release on recent studies from my group in the context of the Update of the European Strategy for Particle Physics on future high-energy colliders.
- **(2025)** Welcome to the Collider Neutrino Era, invited article for the Newsletter of CERN Experimental Physics Department on recent progress in the new field of collider neutrinos with FASER and SND@LHC.
- **(2025)** *The mistery of the proton dance*, article in the Nederlands Tijdschrift voor Natuurkunde (Dutch Journal of Physics) describing to a broad physics readership the NNPDF analysis of polarised parton distributions NNPDFpol2.0.
- **(2025)** *Top-quark pairs at ATLAS could shed light on the early universe*, expert interview in Physics World over the ATLAS observation of top quark pair production in lead-lead collisions at the LHC.
- **(2024)** *De kracht van Amsterdam*, feature article about the contribution of the VU and the UvA to the Nikhef partnership, Fall 2024 edition of the Nikhef Dimensies magazine
- **(2023)** *First detections of collider neutrinos generate excitement*, interview in this article for Physics World about the recent observation of LHC neutrinos by FASER and SND@LHC.
- **(2023)** *Looking forward at the LHC*, invited article at the CERN Courier magazine about the 6th workshop of the Forward Physics Facility community at CERN, which took place in June 2023.
- **(2023)** *De mysterieuze binnenwereld van het proton*, article and interview in the NRC newspaper, weekend edition (in Dutch) about my recent research on proton structure (August 2023). See also the corresponding url here (paywall).
- **(2023)** *Did AI prove our proton models wrong?* PBS YouTube video showcasing my research on the charm content of the proton (June 2023), with more than 1.6M visualisations as of October 2023.
- **(2022)** *Lekker lesgenven* and *Een charmanter proton*, interviews for the Nikhef Dimensies magazine, Autumm 2022 edition.
- **(2022)** *Proton's stretchiness is a puzzle for particle physicists*, expert opinion on New Scientist UK about this Nature paper on the anomaly on the electromagnetic structure of the proton.
- **(2022)** *Inside the proton, the 'most complicated thing you could possibly imagine',* interview for Quanta Magazine about a feature piece on recent discoveries concerning proton structure.
- **(2022)** Focus article in the *Nederlands tijdschrift voor Natuurkunde* (Dutch Journal of Physics) on my *Evidence for intrinsic charm quarks in the proton* research.

- **(2022)** The following media pieces describe the findings of our Nature publication *Evidence for intrinsic charm quarks in the proton* (open access):
  - Physics World (UK): Protons contain intrinsic charm quarks, machine-learning analysis suggests
  - German National Radio (DE): Protonen mit Charm: Auch schwere Quarks finden sich in Kernbausteinen
  - Volkskrant (NL): Proton bevat een wonderlijk extra deeltje: de 'charm quark'
  - Kijk Magazine (NL): Bevat het proton deeltjes die zwaarder zijn dan hijzelf?
  - New Scientist (UK version): Physicists surprised to discover the proton contains a charm quark
  - Science News (US) : Protons contain intrinsic charm quarks, a new study suggests
  - Nikhef press release(NL/EN) : Bewezen: het proton heeft een beetje inwendige charme
  - VU Amsterdam press release (NL/EN) : New Nature paper proves: the proton has some intrinsic charm
- **(2021)** Simpele waterstofkern blijkt verrassend charmant, interview in the Dutch edition of New Scientist about the NNPDF4.0 global PDF analysis and the LHC measurement of Z+charm indicating intrinsic charm in the proton, September 2021.
- **(2021)** Geniale fases volgen standaardpatroon, interview in the Dutch edition of New Scientist about a machine learning quantification of creativity presented in the paper *Understanding the onset of hot streaks across artistic, cultural, and scientific careers*, September 2021.
- **(2021)** *The simple proton proves more than ever to be a world unto itself*, interview about the NNPDF4.0 global PDF analysis, Nikhef press release, available in English and in Dutch, September 2021.
- **(2021)** *Svelare la struttura del protone con l'intelligenza artificiale al Large Hadron Collider*, press release of the Universita degli Study di Milano, Italy, September 2021.
- **(2021)** *Onthuld: de bizarre wereld in het binnenste van protonen, bouwstenen van alles om ons heen*, interviewed for an article in De Volkskrant about the *Asymmetry of antimatter in the proton* paper published in Nature by the SeaQuest collaboration.
- **(2021)** *Vreemde verdeling antimaterie in protonen*, interviewed for an article in New Scientist (Dutch edition) about the *Asymmetry of antimatter in the proton* paper published in Nature by the SeaQuest collaboration.
- **(2021)** *Decades-Long Quest Reveals Details of the Proton's Inner Antimatter,* interviewed for an article in Quanta Magazine about the *Asymmetry of antimatter in the proton* paper published in Nature by the SeaQuest collaboration.
- **(2021)** Guest article in Anthropos, the magazine of the Medische Natuurwetenschappen (MNW) bachelor program study association, discussing the recent excitement concerning the flavours anomalies reported by the LHCb experiment at CERN.
- **(2020)** Interview in Nikhef Dimensies magazine featuring Nikhef's Theory group.
- **(2020)** Interview in the Nikhef press release *Nieuwe botsingstheorie maakt neutrinotelescopen beter*.
- **(2019)** Interview for Science News, featured in *Physicists aim to outdo the LHC with this wish list of particle colliders,* article available here.
- **(2018)** Interview for Science News: *Three new physics experiments could revamp the standard model*.
- **(2017)** *After 40 years of studying the strong nuclear force, a revelation,* The Guardian, Science section. Article about our discovery of the onset of BFKL dynamics in the HERA structure function data, presented in this publication.
- **(2017)** Interview for Science News, interview in the context of a feature article recent developments in the internal structure of protons.
- **(2015)** COPE Pirineos Radio, Interview about the Benasque Center for Science and the *Parton Distributions for the LHC*, podcast available here.
- **(2015)** Report and Interview at the regional Aragon TV Evening News. Report and interview about the *Parton Distributions for the LHC* workshop that I organized in the Benasque Center for Science. Available from the Youtube Channel of the Benasque Center for Science.

- **(2015)** *What goes on inside a proton?* The Guardian, Science section. Article by Prof. Jon Butterworth about the *Parton Distributions for the LHC* conference that I organized in the Benasque Center for Science.
- **(2014)** *Proton Spin Mistery Gains a New Clue,* interview for Scientific American/ Available online at this url. This research is also mentioned the following article in Physics World.
- **(2014)** *Beyond the Boson: Higgs discovery and the next steps for particle physics*, outreach article for the Physics Department Newsletter, University of Oxford. Alan Barr and Juan Rojo. Autumn 2014 issue. Available online at this url.
- **(2010-2012)** Scientific journalist for the electronic newspaper *Il Sussidiario*. My articles appearing in this publication can be found in this link and in this one.
- **(2013)** i-CPAN, ERC Starting Grant Award, press release.

Outreach Activities

- **(2024)** *And Now What?*, outreach event organized by the Spanish Association of Scientists in the Netherlands on science careers in academia, industry and beyond, Instituto Cervantes Utrecht, November 2024, .
- **(2023)** *Physics Research at VU Amsterdam*, introduction to the research at the Physics and Astronomy department of the VU Amsterdam to the 1st year students of the Natuur- en Sterrenkunde BSc program, Amsterdam, February 2024.
- **(2023)** *Why should you study Physics?* Contribution to the Career Fair of the Rotterdam International Secondary School (RISS), Rotterdam, February 2024.
- **(2023)** *De vele gezichten van het verbazingwekkende proton*, outreach public lecture (Dutch) at the Leiden Science Cafe.
- **(2023)** Public Youtube lecture on *The Secret Inner Life of Protons*, organized in the context of the STRONG2020 European Research Network. Broad audience from high school students to physicists.
- **(2022)** TikTok video in the channel of Dr. Clara Nellist explaining the main findings of our determination of evidende for intrinsic charm quarks in the proton.
- **(2021)** Guest lecturer in the Workshop *How to Stay in Science*. Participation as guest speaker in a workshop organized by the PhD candidates and postdocs of Nikhef aimed to provide mentoring and guidance about how to develop a successful career in academic science. Slides available here.
- **(2019)** Guest lecturer, International Primary School of Delft (ISD), "Artificial intelligence from basic research to real-life applications", lecture to group 6 (10 years old) children at ISD.
- **(2019)** Plenary speaker, kick-off event of the Spanish Scientists in the Netherlands association, *Ciencia y Vivencias de los Cientificos Espanoles en Paises Bajos*, VU Amsterdam, October 2019. Lecture slides.
- **(2019)** Featured in the Nikhef's PaperClips initiative, a 3-minute video explainer of a recent publication, in this case my paper *Can New Physics Hide Inside the Proton*, available in Youtube.
- **(2019)** Radio Interview, Cadena SER (Spain), Interview about my personal experience in particle physics in Spain and abroad, podcast available in the radio website.
- **(2018)** Guest blogger of the Particle People blog, managed by Interactions.org, the communication resource from the world's particle physics laboratories. My blog entries can be found here, and also as guest entries in the Nikhef blog.
- **(2017-2018)** Guest scientist at the Twitter account @HeroesOfPhysics, an initiative of the Communications team of the NWO Domain Science to showcase the daily experiences of Dutch physicists to the general public.
- **(2017-2018)** International School of Den Haag, *The Large Hadron Collider: the world's most powerful microscope,* Special outreach lecture and guided visit to Nikhef for IGSCE and IB students, slides available here.
- **(2017-2018)** Rotterdam International Secondary School, *The Large Hadron Collider: the world's most powerful microscope,* invited outreach lecture for IGSCE and IB students,

Figure 3: Outreach invited lecture at the International School of Den Haag.

- **(2017)** Interview for the "Eureka: the adventure of scientific discovery" exhibitLondon Encounter, video recording available in YouTube, London June 2017.
- **(2017)** Interview in the New Scientist magazine, as part of the feature article: *What if the diminutive electron isn't as small as it gets?*.
- **(2016)** Author, scientific popularization book, *La vida íntima de las partículas* (The inner life of particles, in Spanish), Colección "Descubrir la Ciencia" (Discovering Science), number 31. Originally in Spanish, the book has also been translated to Italian and Portuguese.

Figure 4: Cover of my popular science book about particle physics.

- **(2016)** Contributor to the AMVA4NP Network blog, the outreach blog of the AMVA4NP MSC Innovative Training Network (ITN), of which I was part in the Oxford node.
- **(2015)** St Aloysius Catholic Primary school, Science Fair, *Particle Physics and CERN,* guest lecture for Year 5 and 6 students in the context of the school Science Fair.
- **(2015)** St Aloysius Catholic Primary school, *Particle Physics and CERN*Special lecture for Year 4 (age 10) students.
- **(2015)** Oxford Work Experience, Oxford Council program to provide work experience for high-school students in Year 10 to Year 13 (ages 15 to 18). Two students spend their internship in my research group.
- **(2015)** *Exploring the Energy Frontier at the Large Hadron Collider,* popular science talk part of the Saturday Mornings of Theoretical Physics, Oxford Physics event dedicated to alumni. Video recording and podcast of the lecture available from this link.
- **(2013)** As member of the CERN Theory group, I was moderator of the International Masterclasses 2013, "Hands on Particle Physics".

- **(2012)** Scientific popularization talk: *What the LHC is teaching us* (in Catalan)Escola Pia High School, Vilanova i la Geltru, Barcelona, November 2012.

- **(2010-2014)** Editor–in–chief of the Euresis Journal, a multidisciplinary, online, open-access journal edited by the Euresis Association, whose main scope is to promote, at an academic level, an understanding of science as a fully human pursuit, rooted into the universal human quest for beauty and meaning. This novel journal provides an opportunity to share with the largest number of people the experience of the conferences and workshops that are part of the activities of the Euresis Association.

- **(2010)** Organizer of the public lecture: *Two paths towards the Big Bang: from quarks to cosmic radiation*, with the presentations of Marco Bersanelli (Milano, scientific responsible, PLANCK mission) and Albert de Roeck (CERN, CMS deputy spokespersons), at the Barcelona Science Museum - CosmoCaixa, Saturday 4th September 2010. Public lecture organized as part of the Activities of the Taller de Altas Energias 2010. These public lectures can be found at the TAE 2010 webpage.

- **(2009)** Organizer of the public conference: *The adventure of scientific research*, Facultat de Fisica of the Universitat de Barcelona, February 19th 2009, with M. Bersanelli (Milano), J. I. Latorre (U.B.), Lluis Victori (Institut Químic de Sarrià), as presentation of the spanish translation of the book *Only Wonder knows: the adventure of scientific research*, authored by M. Bersanelli and M. Gargantini.

Valorisation Activities

While my research driver is fundamental science, I am keen on applying my AI expertise to other fields. In this context, I have established a fruitful collaboration with the group of Dr. Sonia Conesa-Boj (Kavli Institute of Nanoscience, TU Delft), where machine learning techniques which I developed for particle physics are now deployed for the characterisation of novel Quantum Materials such as van der Waals materials.

I have already presented the first proof-of-concept publications, where the information provided by electron energy-loss spectroscopy (EELS) after subtracting the zero-loss peak background using deep neural networks was used to determine for the first time the bandgap of polytypic WS_2 . Our results, implemented in the open source PYTHON package EELSFITTER and summarised in Fig. 5, are now being extended to determine local electronic properties, such as the band gap, across a entire nanomaterial.

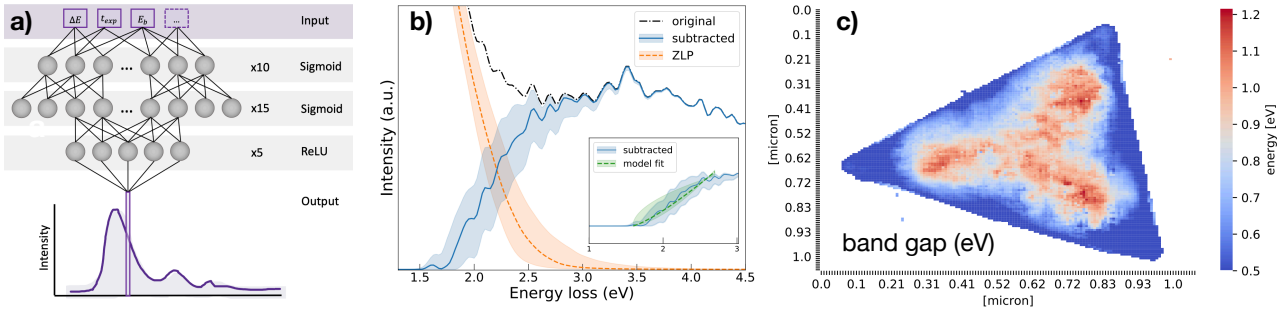

Figure 5: *a)* Schematic of the AI model for the zero-loss peak. *b)* Subtracted EELS spectrum with the associated uncertainty bands. *c)* Determination of band gap energy across entire nanomaterial.

The ultimate goal of this valorisation effort is to formulate new paradigms in electron microscopy boosted by artificial intelligence, and then integrate our algorithms into commercial tools from leading companies in the field such as *e.g.* JEOL and GATAN.

Supervision and Mentoring

Overview

I have (co-)supervised 12 Ph. D. candidates (3 ongoing and 2 open vacancies) as well as multiple MSc students and 10 BSc theses. I have also mentored 9 postdocs in my group, in some cases assisting them to acquire their own personal funding. I have chaired the National Graduate School of Subatomic Physics (OSAF) as well as the Education Committee of Nikhef, overseeing and organizing training activities for Ph. D. candidates, and as C3 member I frequently act as external mentor of other Ph. D. candidates within the Nikhef institute.

I consider myself as a devoted mentor engaged in the nurturing and education of future scholars, from my bachelor students to the several Ph. D. candidates and postdocs that I have successfully supervised. I am particularly proud that most of my MSc and Ph. D. students have moved to successful careers either in academia, in prestigious institutions such as CERN or ETH Zurich, or in industry, having landed high-profile data scientist jobs in companies such as GlaxoSmithKline, Rabobank, ASML, or Picnic. I also assist the postdocs that want to join my group in securing personal external funding: two of my recent postdocs joined the research group via NWO-Veni and MC IEF grants. Furthermore, the BSc and MSc students in my group carry out state-of-the-art research which often contributes to peer-reviewed publications, e.g. three recent examples of papers co-signed by MSc students are available here.

In this section, I provide the details of my experience with supervision and mentoring of Ph. D. candidates, postdoctoral researchers, bachelor and master students, and summer internships. I also indicate my participation in the reading and evaluation committees of national and international Ph. D. thesis.

Supervision of Ph. D. Candidates

13. **(2026–2030)** open vacancy, *Modelling of high-energy hadronic interactions at Auger, KM3NeT, and FASER,* Ph.D. Thesis, VU Amsterdam and Radboud University Nijmegen *(to start in Fall 2026)*. Co-promotor, together with Prof. Charles Timmermans (Nijmegen).

12. **(2027–2031)** Paulina Hernandez Sainz, *High energy neutrinos and New Physics Searches at the LHC,* Ph.D. Thesis, Cambridge University and Nikhef *(to start in Jan 2027)*. Co-supervisor, with main supervisor being Prof. Maria Ubiali (Cambridge University).

11. **(2025–2029)** Kamil Laurent, *The structure of the proton from precision LHC measurements,* Ph.D. Thesis, VU Amsterdam and Nikhef *(ongoing)*.

10. **(2025–2029)** Jelle Koorn, *Quantum Chromodynamics with high-energy neutrinos at the LHC,* Ph.D. Thesis, VU Amsterdam and Nikhef *(ongoing)*.

9. **(2022–2026)** Peter Krack, *Proton Structure and QCD under the LHC Neutrino Microscope,* Ph.D. Thesis, VU Amsterdam, *(ongoing)*. Upon completion of his PhD, Peter was awarded a competitive postdoctoral fellowship from the Swiss National Science Foundation (SNSF Postdoc Mobility) supporting a 2-year postdoctoral position at the University of Oxford (UK).

8. **(2020–2024)** Jaco ter Hoeve, *Fingerprinting New Physics with Effective Field Theories,* Ph.D. Thesis, VU Amsterdam and Nikhef, main supervisor *(completed)*.

7. **(2020–2024)** Giacomo Magni, *A High Resolution Imaging of the Collinear Substructure of the Proton,* Ph.D. Thesis, VU Amsterdam and Nikhef, main supervisor. The PhD thesis of Dr. Magni was awarded the **Cum Laude** distinction, which in The Netherlands is exceptional and awarded only to the 5% of best PhD theses in the corresponding field.

6. **(2017–2021)** Rabah Abdul Khalek, *Nuclear parton distributions with LHC data,* Ph.D. Thesis, VU Amsterdam and Nikhef, main supervisor *(completed)*. Link thesis. The PhD thesis of Rabah Abdul Khalek was awarded the **Cum Laude** distinction, which in The Netherlands is exceptional and awarded only to the 5% of best PhD theses. Currently postdoctoral researcher at the Thomas Jefferson National Laboratory (JLab), USA.

5. **(2016–2020)** Emma Slade, *Precision fits at the LHC and beyond,* Ph.D. Thesis, University of Oxford, main supervisor *(completed)*. link thesis. Now Data Scientist at GlaxoSmithKline.

4. **(2014–2018)** Francesco Giuli, *Study of the Drell-Yan process with the ATLAS detector at the LHC,* Ph.D. Thesis, University of Oxford, main supervisor, together with Prof. Amanda Cooper-Sarkar *(completed)*, link thesis. Currently postdoctoral researcher at the University of Rome III (Italy).

3. **(2014–2018)** Luca Rottoli, *Precision QCD at the LHC: from the structure of the proton to all-order resummations,* Ph.D. Thesis, University of Oxford, main supervisor *(completed)*, link thesis. Now Ambizione long-term postdoctoral fellow at ETH Zurich (Switzerland).

2. **(2010–2014)** Emanuele Roberto Nocera, *Unbiased spin-dependent Parton Distribution Functions,* Ph.D. Thesis, Università di Milano, co-supervisor together with Prof. Stefano Forte *(completed)*, link thesis. Now Rita Levi Montalcini Fellow and Assistant Professor at the University of Turin (Italy).

1. **(2009–2013)** Francesco Cerutti, *Neural network parton distributions for the LHC,* Ph.D. Thesis, Universitat de Barcelona, Spain, co-supervisor together with Prof. Jose Ignacio Latorre *(completed)*.

Mentoring of Post-doctoral Researchers in my Group

10. **(2025-2028)** Elie Hammou, VU Amsterdam and Nikhef, funded by the Swiss National Science Foundation project *Fingerprinting Neutrinos and Feebly Interacting Particles with the FASER Experiment at CERN*.

9. **(2021-2025)** Tanjona Rabemananjara, VU Amsterdam and Nikhef, funded by the eScience Accelerating Scientific Discoveries 2020 project *Unravelling Proton Structure with Hyperoptimised Machine Learning*.

8. **(2021-2024)** Tommaso Giani, VU Amsterdam and Nikhef, funded by NWO via the ENW-KLEIN-2 project *Fingerprinting the Higgs Sector with Effective Theories*.

7. **(2018-2020)** Emanuele Roberto Nocera, Nikhef, funded by the ERC via a Marie Sklodowska-Curie Intra-European Fellowship.

6. **(2018-2021)** Rhorry Gauld, Nikhef, funded by NWO via a Veni fellowship.

5. **(2018-2021)** Jacob Ethier, VU Amsterdam and Nikhef, funded by NWO via the Physics Projectruimte *Nuclear Parton Distributions with LHC Data*.

4. **(2015-2017)** Emanuele Roberto Nocera, University of Oxford, funded by the STFC via my Rutherford Grant project *Parton Distributions with Electroweak Effects*.

3. **(2015-2017)** Valerio Bertone, University of Oxford and VU Amsterdam, funded by the ERC via the Starting Grant *Parton Distributions in the Higgs Boson Era*.

2. **(2014-2017)** Nathan P. Hartland, University of Oxford and VU Amsterdam, funded by the ERC via the Starting Grant *Parton Distributions in the Higgs Boson Era*.

1. **(2014-2016)** Marco Bonvini, University of Oxford, funded by the ERC via the Starting Grant *Parton Distributions in the Higgs Boson Era*.

Master Theses

32. **(2026-2027)** Khoi Pham, *Neural Simulation-Based Inference with LHC neutrinos at FASER,* Master project, Theory Track, UvA/VU Physics and Astronomy MSc program. (*starting Sept 2026).*

31. **(2026-2027)** Rowan van der Brink *Disentangling New Physics at the LHC from QCD Uncertainties with SIMUnet,* Master project, Theory Track, UvA/VU Physics and Astronomy MSc program. (*ongoing).*

30. **(2026)** Paulina Hernandez Sanz, *Determination of Structure Functions in Muon DIS at FASER,* Master project, GRAPPA Track, UvA/VU Physics and Astronomy MSc program. (*ongoing).*

29. **(2025-2026)** Wopke Telman, *Effective Field Theories to Unravel New Physics at the HL-LHC and Future Colliders,* Master project, GRAPPA Track, UvA/VU Physics and Astronomy MSc program. (*ongoing).*

28. **(2025)** Bart van der Wielen, *Uncertainty-aware ML for backfground substraction in core-loss EELS,* MSc project, Delft University of Technology and Nikhef, jointly supervised with Dr. Sonia Conesa-Boj.

27. **(2024-2025)** Jelle Koorn, *A data-driven determination of the forward neutrino fluxes at the LHC from Machine Learning,* Master project, GRAPPA Track, UvA/VU Physics and Astronomy MSc program.

26. **(2024-2025)** Jukka John, *A data-driven determination of the forward neutrino fluxes at the LHC from Machine Learning,* Master project, Theory Track, UvA/VU Physics and Astronomy MSc program.

25. **(2024)** Gijs van Seeventer, *Proton structure analyses with normalised flows,*Master project, Theoretical Physics Program, University of Utrecht.

24. **(2023-2024)** Valentina Schütze Sanchez *The LHC as a Neutrino Collider,*Master project, Theory Track, UvA/VU Physics and Astronomy MSc program.

23. **(2023-2024)** Eva Groenendijk *Unravelling non-linear QCD with LHC neutrinos,*Master project, GRAPPA Track, UvA/VU Physics and Astronomy MSc program.

22. **(2023-2024)** Toon Hasenack, *Unraveling the proton spin structure with machine learning,*Master project, Theoretical Physics Program, University of Utrecht.

21. **(2023)** Philip Fredriksz, *Denoising of high-resolution transmission electron microscopy images with deep learning,*Master project, Applied Physics MSc progream, TU Delft, jointly supervised with Dr. Sonia Conesa-Boj.

20. **(2022-2023)** Stijn van der Lippe, *Automation of electron energy gain spectroscopy data analysis,*Master project, Applied Physics MSc progream, TU Delft, jointly supervised with Dr. Sonia Conesa-Boj.

19. **(2022-2023)** Maaike Bakker, *SMEFT projections for future high-energy colliders,* Master project, UvA/VU Physics and Astronomy MSc program.

18. **(2022-2023)** Steven Niedenzu, *Neutrino interactions and proton structure at the Forward Physics Facility,* Master project, UvA/VU Physics and Astronomy MSc program.

17. **(2022-2023)** Adrianne Schaus, *Machine learning determination of proton structure with lattice QCD calculations,* Master project, UvA/VU Physics and Astronomy MSc program.

16. **(2022-2023)** Pim Herbschleb, *A SMEFT global analysis with flavour and low-energy data,* Master project, UvA/VU Physics and Astronomy MSc program.

15. **(2022-2023)** Josep Sola, *Probing small-x QCD with TeV neutrinos at the Forward Physics Facility,* Master project, UvA/VU Physics and Astronomy MSc program.

14. **(2021-2022)** Charlie Bender, *Combined EFT interpretation of flavour data and high-pT observables at the LHC,* Master project, UvA/VU Physics and Astronomy MSc program.

13. **(2021)** Isabel Postmes, *Automated pattern recognition for EELS spectral images,* MSc project, Delft University of Technology and Nikhef, jointly supervised with Dr. Sonia Conesa-Boj.

12. **(2020)** Laurien Roest, *Machine Learning for Electron Energy Loss Spectroscopy,* MSc project, Delft University of Technology and Nikhef, jointly supervised with Dr. Sonia Conesa-Boj.

11. **(2020)** Giacomo Magni, *Dimensional reduction with machine learning in the SMEFT,* Master Thesis, Università di Milano, supported by Erasmus grant to carry out his project at Nikhef.

10. **(2019-2020)** Gijs van Weelden, *Pertubative QCD calculations for heavy quark hadrons in cosmic ray collisions,* Master project, Leiden Physics MSc program.

9. **(2019-2020)** Ferran Faura Iglesias, *Impact of the NOMAD data on the strangeness in the proton,* Master project, UvA/VU Physics and Astronomy MSc program, link thesis.

8. **(2019-2020)** Jaco J. ter Hoeve, *Machine Learning Effective Field Theories at the LHC,* Master project, Utrecht Physics and Astronomy MSc program.

7. **(2018-2019)** Samuel van Beek, *Stress-testing the Standard Model at the High-Energy Frontier with bayesian inference,* Master project, UvA/VU Physics and Astronomy MSc program.

6. **(2017-2018)** Manuel Wierda, *Nuclear parton distributions from advanced Machine Learning techniques,* Master project, UvA/VU Physics and Astronomy MSc program.

5. **(2016)** Daniel Shipley, *Searches for New Physics beyond the Standard Model at the LHC using ratios of cross-sections,* MPhys Final Project, University of Oxford.

4. **(2016)** Miriam Kuenzel, *New Physics searches at the LHC with Higgs pair production,* Oxford MMathPhys Dissertation, University of Oxford.

3. **(2011)** Carmen Gigliotti, *The impact of new theory into a global PDF analysis using bayesian inference,* Master Thesis, Università di Milano.

2. **(2011)** Giulia Calzolaio, *The impact of high energy resummation on Parton Distributions and LHC phenomenology,* Master Thesis, Università di Milano.

1. **(2009)** Marco Zaro, *kt factorization in inclusive jet production,* Master Thesis, Università di Milano.

Bachelor Theses

16. **(2024)** Roan van Brussel, *Fingerprinting New Physics at the FCC-ee with the SMEFT,* BSc project, UvA/VU Physics and Astronomy BSc program.

15. **(2024)** Thomas Spreen, *Event generators for LHC neutrino experiments,* BSc project, UvA/VU Physics and Astronomy BSc program.

14. **(2024)** Wouter Prommel, *Neutrino Scattering Cross-sections at High-Energies,* BSc project, UvA/VU Physics and Astronomy BSc program.

13. **(2023)** Anezka Bos, *A determination of polarised proton structure from machine learning,* BSc project, Artificial Intelligence BSc program and UvA/VU Physics and Astronomy MSc pre-program .

12. **(2023)** Wolf Gautier, *Optimal observables for Effective Field Theory interpretations,* BSc project, UvA/VU Physics and Astronomy BSc program.

11. **(2022)** Nusch Mortazavi, *Machine learning determination of the neutrino-nucleus cross-sections,* BSc project, UvA/VU Physics and Astronomy BSc program.

10. **(2021)** Jochem Bakker, *SMEFT constraints from Vector-Boson-Fusion processes,* BSc project, UvA/VU Physics and Astronomy BSc program.

9. **(2021)** Duncan Pelan, *Heavy Majorana neutrino mass constraints from an Effective Field Theory on the Type I see-saw mechanism,* UvA/VU Physics and Astronomy BSc program, link thesis.

8. **(2018)** Marco Bout, *A three-dimensional imaging of the proton with Artificial Neural Networks,* UvA/VU Physics and Astronomy BSc program, link thesis.

7. **(2018)** Sanne Vergouwen, *Constraining the Standard Model Effective Field Theory with top quark measurements,* UvA/VU Physics and Astronomy BSc program, thesis link.

6. **(2018)** Paul Gorris, *Z boson production in Pb-p collisions at 5.02 TeV,* UvA/VU Physics and Astronomy BSc program, thesis link.

5. **(2017)** Emanuel Hoogeveen, *Higgs pair production at a 100 TeV hadron collider,* UvA/VU Physics and Astronomy BSc program.

4. **(2011)** Luca Rottoli, *PDF systematic uncertainties for the determination of forward–backward asymmetry at the Large Hadron Collider,* Degree Thesis, Università di Milano.

3. **(2010)** Simone Lionetti, *Dataset dependence of alphas determinations in global PDF analysis,* Degree Thesis, Università di Milano.

2. **(2009)** Alice Donati, *Statistical aspects of the NNPDF determination of parton distributions,* Degree Thesis, Università di Milano

1. **(2009)** Elisa Mariani, *Determination of the QCD strong coupling constant in the NNPDF approach,* Degree Thesis, Università di Milano.

Summer internships

4. **(2016)** Daniel Shipley, *Searches for New Physics beyond the Standard Model at the LHC using ratios of cross-sections,* Oxford Theoretical Physics internship, July 2016.

3. **(2016)** Hannah Tillim, *Probing the Higgs quartic coupling at at 100 TeV hadron collider,* Oxford Theoretical Physics internship, June 2016 to Sept 2016.

2. **(2015)** Theodor Bjorkmo, *Constraining the photon PDF from W pair production at the LHC,* Oxford Theoretical Physics internship, June 2015 to Aug 2015.

1. **(2012)** Xin Fang, *Four jet resonance searches with subjet algorithms in the boosted and unboosted regimes,* CMS summer research internship, CERN.

Teaching and Educational Activities

Overview

I am an enthusiastic teacher with extensive experience at all levels from bachelor and master to advanced graduate courses. I have taught and coordinate several bachelor courses in Amsterdam, such as *Quantum Mechanics 2* and *Machine Learning* in the Amsterdam UvA/VU Physics and Astronomy joint BSc program and *From Quantum to Molecule* in the Medical Natural Sciences (MNW) BSc program at the VU. I have also taught several MSc courses, first in Oxford and then in Amsterdam, such as *Standard Model*, *Quantum Field Theory*, and *Quantum Chromodynamics*, as well as advanced courses and specialised lectures for graduate schools in topics from machine learning and effective theories to future colliders. I also served as Bachelor Coordinator and Internship Coordinator of the MNW program (2018-2022), and in 2019 I obtained my Senior Teaching Qualification (SKO) certification. Between 2022 and 2024 I held the Education and Management Portfolio within the Department of Physics and Astronomy of the VU.

Teaching Resources

My teaching philosophy is based on always preparing myself detailed teaching materials, from self-contained lecture notes to `python` notebooks, to facilitate student learning. All the teaching materials that I have developed for my courses are made publicly available via my personal website. A representative subset of teaching materials that I have prepared for my courses in previous years are:

- Lecture Notes 2021, *Quantum Mechanics 2*, Physics and Astronomy (UvA/VU joint degree) BSc program.
- Lecture Notes 2020, *From Quantum to Molecule*, Medical Natural Science (VU) BSc program.
- Lecture Slides and Jupyter Notebooks 2020, *Machine Learning for Physics and Astronomy*, Physics and Astronomy (UvA/VU joint degree) BSc program, Honors Track.
- Lecture Notes 2020, *The Standard Model as an Effective Field Theory*, DRSTP Graduate School on Theoretical High Energy Physics.
- Lecture Notes 2016, *The Standard Model and LHC phenomenology* course, part of the Oxford Master course in Mathematical Physics and the Particle (MMathPhys) and of the Particle Theory Graduate School of the University of Oxford.

Teaching Qualifications

- **(2019)** Senior Teaching Qualification (STQ) / Senior Kwalificatie Onderwijs (SKO), VU Amsterdam. Qualification certificate of advanced didactic competence, including coordination, degree design, and management skills, for University professors in the higher-education system of the Netherlands. The focus of my SKO project was the development of a revised, updated curriculum for the MNW bachelor program, paying special attention for the interconnection of the learning goals of each course with the end terms of the program and the synergies between the different learning pathways that compose it.
- **(2018)** Supervising PhD students training course, VU Amsterdam. Required course for Associate Professors (Universitaire Hoofddocenten) to act as promotor in Ph. D. theses at the VU Amsterdam.
- **(2017)** University Teaching Qualification (UTQ) / Basiskwalificatie Onderwijs (BKO), VU Amsterdam. Qualification certificate of didactic competence for University professors in the higher-education system of the Netherlands.

Education-related Management Tasks

- **(2022-2025)** Chair of the Nikhef Education Committee and the National Graduate School of Subatomic Physics (OSAF), in charge of overseeing Nikhef's educational activities such as monitoring the progress of PhD students, the curriculum, topical lectures, and schools. Around 150 PhD candidates belong to the OSAF graduate school at any given moment of time
- **(2021-2022)** Member of the Updated Curriculum of the MSc Physics and Astronomy JD programme Working Group. In charge of reviewing and critically assessing the current VU/UvA joint degree MSc programme in Physics and Astronomy, improving the ordering and contents of (groups of) individual courses, and evaluating our current teaching practices and overall educational strategy in general.

- **(2020-present)** VU Amsterdam representative in the Governing Board of the DRSTP Graduate School of Theoretical Physics.
  In charge of the organisation of scientific and educational activities such as DRSTP conferences, workshops, and seminar series.

- **(2019-2021)** Member of the Nikhef Education Committee, in charge of overseeing Nikhef's educational activities such as monitoring the progress of PhD students, the curriculum, topical lectures, and schools.

- **(2019)** Member of the VU Faculty of Sciences Portfolio analysis, representing the Physics and Astronomy (joint degree) and MNW programs in this education portfolio analysis. The goal is to evaluates and provide suggestions for improved coordination for the education programs within the Faculty of Sciences of the VU Amsterdam.

- **(2019)** Member of the Amsterdam Joint Degree Natuur- en Sterrenkunde Curriculum Committee.
  Responsible to assess, determine, and implemented modifications and improvement in the content of the various courses and in the courses themselves.

- (**2018-2022)** Coordinator of final projects and internships in the Medical Natural Sciences (MNW) bachelor program at the VU Amsterdam.
  In charge of monitoring, approving, and supporting the final bachelor projects and internships that all students of the MNW bachelor should follow in the third year of the program.

- (**2018)** VU representative at the VU/UvA Joint Degree committee, in charge of reviewing the implementation of the joint BSc and MSc Physics and Astronomy program between the VU and the UvA, including the different possibilities concerning the teaching locations.
  One of the main outcomes of this committee was the agreement to have 20% of the BSc program teaching based at the Zuidas campus.

- (**2018-2020)** VU representative in the Educational Board of the DRSTP Graduate School in Theoretical Physics, in charge of the organisation of educational activities such as graduate schools and related events.

- **(2018-2022)** Member of the Management Team of the Medische Natuurwetenschappen (MNW, Medical Natural Sciences) education program.

- (**2018-2022)** Coordinator of the Medical Natural Sciences (MNW) Bachelor program, VU Amsterdam.

- **(2015-2016)** Physics MPhys project Examiner, Rudolf Peierls Center for Theoretical Physics, University of Oxford. Expert assessor in the evaluation and marking of MPhys projects in Theoretical Physics.

- **(2015-2016)** Physics Summer Research Projects Tutor, Rudolf Peierls Center for Theoretical Physics, University of Oxford. Tutor of Year 3 Summer Research Projects in Theoretical Physics.

- **(2015-2016)** Physics MPhys project Tutor, Rudolf Peierls Center for Theoretical Physics, University of Oxford. Tutor of Year 4 MPhys projects in Theoretical Physics.

- **(2015)** Physics MPhys project Examiner, Rudolf Peierls Center for Theoretical Physics, University of Oxford. Expert assessor in the evaluation and marking of MPhys projects in Theoretical Physics.

- **(2014-2016)** Coordinator of the Graduate School Admissions at the Particle Theory group of the Department of Physics at the University of Oxford.
  In charge of reviewing the $\mathcal{O}(200)$ applications received every academic year from prospective Ph. D. students in the Particle Theory group, short-listing, interviewing, and then selecting the best candidates.

- **(2014-2016)** Physics undergraduate admissions at Balliol College, University of Oxford. Member of the panel for the admissions of new Physics and Physics and Philosophy undergraduate students at Balliol College.
  In charge of reviewing the applications from $\mathcal{O}(100)$ prospective students each academic year, short-listing and interviewing them, and deciding which students will be accepted at Balliol for the forthcoming academic year.

Teaching Experience

27. **(2025-2026)** Particle Physics II, UvA/VU MSc Program in Physics and Astronomy, 6EC course in the 1st year of the P&A joint degree MSc program, GRAPPA Track. Responsible of the lectures in Quantum Chromodynamics, with Mara Senghi-Soares as co-teacher.

26. **(2023)** The Standard Model as an Effective Field Theory. Graduate lectures in the context of the Nikhef Topical Lectures on Effective Field Theories, Groningen, April 2023.

25. **(2022-2025)** Effective Field Theories. 3 EC course in the Physics and Astronomy Master program (UvA/VU Joint Degree), Theoretical Physics and GRAPPA tracks. Shared with Wouter Waalewijn, Eric Laenen, and Jordy de Vries.

24. **(2022)** Nikhef Topical Lectures on Machine Learning. Graduate lecture course for Ph. D. students from Nikhef. Course title: *Machine Learning: from basics to applications in HEP and GWs*. Course materials, including Jupyter notebooks for the hands-on tutorials, available from this Indico page.

23. **(2021)** Aplicaciones de la Inteligencia Artificial en Ciencias (Applications of Artificial Intelligence in Sciences, in Spanish), Graduate school course at the Universidad Complutense of Madrid, program available here.

22. **(2020-2023)** Machine Learning for Physics and Astronomy, UvA/VU Bachelor Program in Physics and Astronomy, 3EC honours course in the 3nd year of the P&A joint degree program.

21. **(2020-2026)** Quantum Mechanics II, UvA/VU Bachelor Program in Physics and Astronomy, 6EC course in the 2nd year of the P&A joint degree program. Recordings of the Zoom lectures for the 2020-2021 course available here.

20. **(2020)** DRSTP School on Theoretical High Energy Physics, *The Standard Model as an Effective Field Theory* course, Lectures to Ph. D. students part of the DRSTP Graduate School, 8h lectures and 4h tutorials. Lecture notes of the course available here.

19. **(2019)** Machine Learning and applications to Physics workshop. Lectures on *Introduction to Machine Learning for Physics and Astronomy*. Universidad Computense de Madrid (UCM), December 2019. The course consists of 6h of lectures of which 2h are hands-on tutorials, and is aimed to Ph. D. students and postdocs.

18. **(2019)** Delta ITP Advanced Topics in Theoretical Physics*Machine Learning: a new Toolbox for Theoretical Physics,* 3EC course for 2nd year MSc and early-stage PhD students from the three Delta-ITP institutes: Amsterdam, Leiden, and Utrecht. A GitHub repository containing the course materials (lecture notes, examples for the tutorial sessions) is available here.

17. **(2019)** Nikhef Topical Lectures on Flavour Physics. Graduate lecture course for Ph. D. students from Nikhef. Course title: *An introduction to the Standard Model Effective Field Theory*, lecture notes available here, complete program in here.

16. **(2019)** Introduction to Particle Physics, Amsterdam Physics and Astronomy bachelor program (join degree). Guest lecturer on the topic of *Feynman diagrams in particle physics*, video recording of the lecture available here.

15. **(2018)** Nikhef Topical Lectures on Machine Learning and Artificial Intelligence, graduate lecture course for Ph. D. students from Nikhef, course title: *An introduction to Machine Learning in High Energy Physics*, course slides.

14. **(2018)** Nikhef Topical Lectures on the Physics of Future Colliders, Graduate lecture course for Ph. D. students from Nikhef, course title: *The physics potential of future high-energy colliders*, course slides.

13. **(2018-2019)** Introduction to Elementary Particle Physics, 1st year Bachelor course in Applied Physics at TU Delft. 6ECs, course given in the quality of "Guest Professor" at TU Delft. On average around 150 students followed this course each year. Public recordings of all the Theory lectures are publicly available in Collegerama. Dedicated lecture notes were prepared and provided to the students.

12. **(2017)** Nikhef Topical Lectures on Symmetry, graduate lecture course for Ph. D. students from Nikhef. Course title: *Symmetries (and their breaking) in the Standard Model*.

11. **(2017-2020)** Quantum Field Theory (extension), UvA/VU Master Program in Physics and Astronomy (joint degree), Theory Track. 3 ECs, course syllabus can be found in this link. Updated lecture notes were prepared and provided to the students.

10. **(2017)** Subatomic Physics Workshop, Joint UvA/VU Amsterdam bachelor degree in Physics and Astronomy, 4 weeks in January 2017.

9. **(2016-2022)** From Quantum to Molecules, Medical Natural Sciences (MNW) BSc program, VU Amsterdam. Course coordinator and main instructor, 6ECs in period 4 of the second year.

8. **(2014-2016)** Lecturer in Physics, Balliol College, University of Oxford. Tutor and lecturer in Physics at Balliol College, charged with small-group tutorial teaching of the following subjects:

   - first and second year Electromagnetism.
   - first and second year Optics.
   - first year Special Relativity and Classical Mechanics.
   - second year Thermal Physics and Statistical Mechanics.
   - third year Subatomic Physics and Quantum, Atomic and Molecular Physics.

   The teaching load was around 10 hours per week during term on average.

7. **(2015-2016)** *The Standard Model of Particle Physics,* Master course part of the Mathematical Physics (MMathPhys) program and the graduate School of the Theoretical Physics group, Physics Department, University of Oxford. Trinity Term, 16 lectures, prepared dedicated lecture notes to facilitate student learning.

6. **(2014)** *The Strong Interaction and LHC Phenomenology,* graduate course at the Theoretical Physics group of the Physics Department, University of Oxford. Trinity Term, 16 lectures.

5. **(2010)** *Lectures on Parton Distribution Functions,* Aspects of perturbative quantum Chromodynamics, Spring Course of the International Graduate School, Bielefeld - Paris - Helsinki, GRK 881 PACO, "Quantum Fields and Strongly Interacting Matter" Paris, March 2010.

4. **(2009-2011)** Computational Methods in Physics, 3EC BSc course at the Physics Faculty of the Università degli Studi di Milano, Milano, Italy.

3. **(2004-2006)** Calculus II, teaching assistant at the BSc course at the Physics Faculty of the Universitat de BarcelonaBarcelona, Spain.

2. **(2005)** High Energy Physics, teaching assistant at the BSc course at the Physics Faculty of the Universitat de Barcelona, Barcelona, Spain.

1. **(2004)** Advanced Quantum Mechanics, teaching assistant at the BSc course at the Physics Faculty of the Universitat de Barcelona, Barcelona, Spain.

Academic Management

Overview

I believe that good academic citizenship involves helping your colleagues and community by serving in management committees and other activities that promote scientific and academic progress. Between September 2021 and December 2024 I was part of the Management Team of the Department of Physics and Astronomy at the VU of holder of the Education and Management portfolio, and since January 2025 I serve as Head of Department. Representative examples of my academic management activities include the membership of Nikhef's Scientific Advisory Council and of the NWO Veni, Vidi, and OC-Klein grant assessment committees, serving in several faculty recruitment committees (BAC), and organizing national and international scientific conferences and workshops such as Fysica2019 and DIS2021 (virtual conference with 700 participants). I also frequently referee for some of the most important journals of my field, as well as for national and international funding agencies such as NWO, the European Research Council, or the German Research Foundation.

Management and Leadership Training

- **(2025-2026) Opleiding Leiderschap Next Level voor strategisch leidinggevenden**. 75 hour advanced leadership program designed for VU senior line managers (heads of department, research/education portofolio holders, service heads) with large management responsibilities and contributing to the VU organizational strategy. The course focuses on strategic decision-making, leading through complexity, team dynamics, and personal leadership development. It Includes interactive sessions, peer intervision, practical assignments, and the application of specific leadership models in the workplace.
- **(2022)** *Diversity, Equity, and Inclusion workshop* focused on how to avoid unconcious bias to ensure a diverse, safe, and inclusive research team. VU Amsterdam, 1 day course lead by trainer Esther Mollema.
- **(2020-2021)** Completed the **Leadership and Management Skills** program, aimed to develop leadership and management skills for VU staff with senior management responsibilities. This program, fully carried out in Dutch, had a total workload of around 100 hours.
- **(2017)** Completed the programme *Introduction Management VU*, introductory leadership and management program for VU staff members, with a duration of 1 day.

Management and Service

- **(2026-2031)** Member of the permanent CERN committee in The Netherlands, in charge of the coordination of NL national activities in high-energy physics, in particular through the Dutch representatives at the CERN Council, and of communication/interactions with CERN's management.
- **(2025-now)** Head of Department, in charge of managing a department with 150 FTEs (including PhDs and postdocs) and with an annual turnover of around € 17M.
- **(2024-2025)** External consultant of the ATLAS+CMS report for the European Committee for Future Accelerators (ECFA), in charge of the external review of the ATLAS and CMS contribution to the European Strategy of Particle Physics Update 2026.
- **(2024-2026)** Member of the NWO VENI selection panel, ENW Domain, in charge of evaluating NWO VENI applications (Exact Sciences and Mathematics domain), interviewing the candidates and assessing the overall proposals.
- **(2024-now)** Member of the selection panel of the Ikerbasque (Science Foundation of the Basque Country) Senior Fellowships scheme. Tenure-track like scheme for junior researchers aiming to join the Basque academic science ecosystem.
- **(2024-current)** Member of the Steering Committee of the Forward Physics Facility (FPF). Representing the FPF in discussions with CERN management, with funding bodies, and with other stakeholders and take strategic decisions concerning the general management of the FPF initiative.
- **(2023)** Member of the selection panel of the ATRAE program (Attraction of Consolidated Talent Working Abroad) of of the Spanish National Research Agency. This ATRAE program is targeted to outstanding consolidated group leaders working outside Spain and would support their integration into a Spanish research institution. The financial contribution in this program is 1M EUR per PI.

- **(2023-now)** Member of the Coordination Panel of the Forward Physics Facility, mandated to organize the coordination between the FPF experiments as well as with the Theory working groups.
- **(2023-now)** Member of the Ramon y Cajal selection panel of the Spanish Research Agency. The Ramon y Cajal program is the Spanish national tenure-track program and in charge of selecting the future leaders of particle and nuclear physics working in the research institutions of Spain.
- **(2023-2024)** Member of Faculty of Science financial allocation model Working Group, upon proposal of the Beta Faculty Board. In charge of reviewing the funding allocation model used at the Faculty of Science of the VU since 2019 and to propose improvements for the next iteration of the allocation model to start in 2024.
- **(2022-current)** Member of the Physics Beyond Colliders (PBC) PBC ECN3 neutrino panel at CERN, in charge of assessing and evaluating proposals for future experiments to be installed in the North Experimental Area of the CERN accelerator infrastructure, and to produce recommendations for the CERN management.
- **(2022-2024)** Member of the Coordination Team for the Mechanical Engineering UT/VU Bachelor program, in charge of coordinating and managing the joint University of Twente & VU Amsterdam Bachelor Degree in Mechanical Engineering.
- **(2022)** Participation in the VU Amsterdam working group in charge of implementing the "Erkennen en Waaderen" principles in our academic careers and pathways. Member of the Career Track workgroup whose goal is to provide recommendations for efficient, flexible and transparent agreements to guide vertical and horizontal promotions of VU Amsterdam academic staff.
- **(2022)** Member of the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG) evaluation panel in charge of the scientific evaluation of Research Units (large-scale consortia applications) in particle physics.
- **(2022-2023)** Member of the Faculty of Science working group evaluating the faculty-wide Tenure Track policies, in charge of evaluating the implementation of the new TT policy formulated in 2018 and proposing improvements in particular at the light of the "Erkennen en Waaderen" philosophy and the Collective Labor Agreement of the Dutch universities.
- **(2021-2024)** Member of the Management Team, Department of Physics and Astronomy, Faculty of Science, VU Amsterdam. In charge of the Education and Management Activities Portfolio.
- **(2021-2025)** Chair of the National Research School on Subatomic Physics (OSAF). OSAF is the graduate school of the Nikhef collaboration. As its chair, I oversee and coordinate the research, training, and educational activities of the PhD candidates within the Nikhef national collaboration in (around 150 of them at any given time, spread among the NWO institute and the partner universities in NL).
- **(2021-current)** Core member of the QCD Working Group of the Physics Beyond Colliders initiative, aimed to exploiting the full scientific potential of CERN's accelerator complex and technical infrastructure. Representative of the Forward Physics Facility.
- **(2021-2022)** Project leader of the new Departmental Website task-force, in charge of coordinating the design, implementation, and update of the new website of the Physics and Astronomy department at the VU Amsterdam.
- **(2021)** Editor of the Scientific Advisory Committee recommendations for Nikhef's Vista25 update, in charge of writing up recommendations concerning future strategic directions of Nikhef with the 2025 medium-term perspective.
- **(2020-2023)** Member of the Nikhef Computing Committee, as Theory Group representative, in charge of coordinating access and usage to the Nikhef computing and data storage resources.
- **(2020)** Member of the NWO ENW Open Competition KLEIN program, in charge of evaluating NWO KLEIN applications (Exact Sciences and Mathematics domain), lead assessor for the Physics proposals.
- **(2020)** Member of the NWO VIDI selection panel, ENW Domain, in charge of evaluating NWO VIDI applications (Exact Sciences and Mathematics domain), interviewing the candidates and assessing the overall proposals.
- **(2019)** Representative of the VU Physics and Astronomy Department at the Platform Academische Natuurkunde (PAN) meetings.

- **(2019-2022)** Member of the Nikhef's Wetenschappelijke Advies Raad (WAR), the Scientific Advisory Council, a committee charged with formally advising Nikhef's Director and Management Team on scientific issues and strategic matters.
- **(2019)** Member of the Toekomstig Online Landschaap (TOLL) working group, a program of the Communication and Marketing department of the VU Amsterdam that aims to strengthen and better profile the online presence of the VU and its education and research activities.
- **(2018)** Participant in assembling the Dutch contribution to European Strategy for Particle Physics Update process.
- **(2017)** Member of the Theory group team for the Nikhef evaluation, participating in the NWO evaluation of Nikhef for the period 2011-2016.
- **(2017-2022)** Member of the Management Committee for the Netherlands of the COST Network *Unraveling new physics at the LHC through the precision frontier*.
- **(2017-current)** Physics Coordinator of the NNPDF Collaboration, in charge of coordinating the scientific activities of the NNPDF collaboration, supervising a group of between 20 and 25 researchers with weekly work meetings and regular in-person collaboration meetings.
- **(2016-2021)** Coordinator of the Amsterdam Physics and Astronomy Visiting Professorship Program, in charge of coordinating the visits of high-profile professors who contribute to strengthen the teaching and research profile of the three participating institutes: the Department of Physics and Astronomy at the VU and the Institute of Physics (IoP) and the Anton Pannekoek Institute (API) at the UvA.

Participation in Faculty Search Committees

9. **(2025-2026)** Member of the BAC (search committee) for 2 new staff positions at ARCNL and at the Faculty of Science of the VU Amsterdam.
8. **(2023)** Member of the BAC (search committee) for 4 new Assistant Professor positions at the Faculty of Science of the VU Amsterdam, in the context of the Mechanical Engineering BSc program together with the University of Twente, responsible of writing the vacancy text and interviewing a subset of the short-listed candidates.
7. **(2023)** Member of the BAC (search committee) for a new position of Staff Scientist in the Nikhef Ultra-High-Energy Cosmic Rays program, responsible of short-listing applicants, interviewing them, and proposing the successful applicant(s) to the Management Team of Nikhef.
6. **(2021)** Member of the search committee for the new Physics and Astronomy MSc GRAPPA Track Coordinator, in charge of examining the candidates for the new GRAPPA MSc Track Coordinator and providing recommendations to the IoP/VU management teams.
5. **(2021)** Member of the BAC (search committee) for a new position of Staff Scientist in the Nikhef Theory group, responsible of short-listing applicants, interviewing them, and proposing the successful applicant(s) to the Management Team of Nikhef.
4. **(2019-2020)** Member of the recruitment committee (BAC) for the hiring of a tenure-track assistant professor at the Institute of Physics (IoP) at the UvA in the context of the Physics Sector-Plan initiative.
3. **(2019)** Member of the BAC (search committee) for an Assistant Professor in Gravitational Waves at the VU and Nikhef, funded by the Sector Plan.
2. **(2019)** Member of the BAC (search committee) for a new position of Full Professor in Gravitational Waves at the VU and Nikhef, responsible of short-listing applicants, interviewing them, and proposing the successful applicant to the board of the Faculty of Sciences at the VU.
1. **(2018)** Member of faculty position search committee at the Department de Fisica Quantica i Astrofisica, Universitat de Barcelona, Spain.

Organisation of Conferences and Workshops

34. **(2025)** Member of the Scientific Program Committee of the FCC Week 2025, in charge of defining the parallel program of the Physics and Detectors working groups, Vienna, May 2025. https://indico.cern.ch/event/1408515/.

33. **(2025)** Co-organiser of the 8th Forward Physics Facility Workshop, CERN, January 2025, https://indico.cern.ch/event/1473651/.

32. **(2025)** Co-organizer of the Belgium-Netherlands-Germany (BND) 2025 Graduate School (Nijmegen, September 2025). The BND Graduate School is the main summer school attended by PhD candidates part of the Nikhef Graduate School (OSAF). https://indico.imapp.ru.nl/event/261/

31. **(2024)** Discussion Leader at the UvA-VU work conference "AI in Research", in charge of the "Potential Problems caused by in Research", organized by the Boards of the UvA and the VU, Amsterdam, November 2024. The outcome of this workshop is used to write an official UvA+VU whitepaper with recommendations for the usage of AI in research.

30. **(2024)** Co-organizer of the Belgium-Netherlands-Germany (BND) 2024 Graduate School (Ghent, September 2024). The BND Graduate School is the main summer school attended by PhD candidates part of the Nikhef Graduate School (OSAF). Program and material: https://indico.ugent.be/event/32/.

29. **(2023)** Co-organizer of the Forward Physics Facility Theory Workshop, CERN, September 2023, https://indico.cern.ch/event/1296658.

28. **(2023)** Co-Organizer of the Belgium-Netherlands-Germany (BND) 2023 Graduate School (Wuppertal, August 2023). The BND Graduate School is the main summer school attended by PhD candidates part of the Nikhef Graduate School (OSAF).

27. **(2023)** Co-organizer of the *Advanced Artificial Intelligence for precision High Energy Physics* graduate school, aimed to advanced PhD students and postdocs working at the interface between AI techniques and particle physics, Lake Como Schools, Spring 2023, http://lakecomoschool.org.

26. **(2021-2022)** Organizer of the Forward Physics Facility (FPF) 4th Workshop, aimed to prepare the FPF Snowmass Community White Paper.

25. **(2022)** Organizer of a Focus Session at Physics at Veldhoven 2022, yearly gathering of the Dutch Physics community, with title *Anomaly! Unravelling the Next Standard Model from the Bottom-up*.

24. **(2021)** Organiser of the *Deep Inelastic Scattering 2021* Workshop, Amsterdam/Stony Brook, in April 2021. DIS is one of the largest yearly conferences in the field of high-energy and nuclear physics, and the virtual 2021 edition gathered around 700 participants.

23. **(2020-2021)** Convener of the QCD session in the SM@LHC2020/2021 Conference.

22. **(2019)** Organizer of FYSICA 2019, the annual conference of the Netherlands' Physical Society, hosted in 2019 at the Amsterdam Science Park jointly by the VU Physics and Astronomy Department and by the IoP at the UvA.

21. **(2019)** Organizer of the "LatorreFest" symposium, a scientific symposium to celebrate the 60th birthday of Prof Jose Ignacio Latorre. Barcelona (Spain), May 2019.

20. **(2019)** Organizer of the DRSTP *Trends in Theory* conference, the bi-annual gathering of the Dutch community of Theoretical Physics. Trends in Theory 2019 took place in 2019 in Dalfsen with more than 130 participants.

19. **(2018)** Convenor of the *Partonic and Gluonic Distributions in Nucleons and Nuclei* session at CIPANP18, The 13th Conference on the Intersections of Particle and Nuclear Physics.

18. **(2018-2020)** Organizer of the National Seminar for Theoretical High Energy Physics (THEP), hosted by Nikhef and taking place in March and November every year. The schedule of the THEP seminar speakers can be found here.

17. **(2018)** Organizer and speaker of a Focus Session at Physics@Veldhoven2018, *The Neutrino Universe,* January 2018.

16. **(2017)** Organizer of the PDF-related activities of the *Standard Model working group* of the HL-HE-LHC workshop, aiming to improve our understanding of the physics potential of the HL-LHC and HE-LHC, in the context of the update of the European Strategy for Particle Physics.

15. **(2017)** Organizer of the conference *Big data tools for physics and astronomy*, Amsterdam, the Netherlands, June 2017. Conference schedule.

14. **(2017)** Organizer of the workshop *Parton Distributions and Lattice Calculations in the LHC Era*, University of Oxford, UK, March 2017. Conference schedule.

13. **(2017)** Member of the Local Organizing Committee of the Deep Inelastic Scattering 2017 workshop, Birmimgham, UK, April 2017.

12. **(2016)** Convenor of the Parton Distributions parallel session of the QCD@LHC2016 ConferenceZurich, Switzerland, August 2015.

11. **(2015)** Convenor of the QCD parallel session of the EPS-HEP 2015 Conference, Vienna, Austria, July 2015. The European Physical Society Conference on High Energy Physics (EPS-HEP) 2015, program available here.

10. **(2015)** Member of the Program Committee of the LHCP-2015 Conference, St Petersburg, Russia, September 2015. The 3rd Conference on Large Hadron Collider Physics (LHCP 2015), program available here.

9. **(2015)** Organizer of the "Parton Distributions for the LHC Run II" Workshop, Benasque Center for Science, February 2015. Conference schedule.

8. **(2014)** Theory convener of the LHCb-Theory Workshop, Convenor of the "Forward Electroweak Physics, including pA" session of the "Implications of LHCb measurements and future prospects", CERN, October 2014.

7. **(2014)** Organizer of the workshop *Topical workshop on top quark differential distributions*, Cannes, France, September 2013. Website of the conference. Write-up with the summary of the workshop available here.

6. **(2013)** Convenor of the *Parton Distributions* session, Fermilab, November 2013. Workshop on QCD Tools for LHC Physics: From 8 to 14 TeV, "What's needed and why?".

5. **(2013)** Discussion Leader at the 2013 Hadron Collider Physics Summer school, CERN, September 2013. The school is targeted at early stage postdocs and advanced graduates students in experimental particle physics and phenomenology.

4. **(2012-2014)** CMS PDF Workshop, CERN. Convener of the CMS PDF Forum (as Affiliate Theorist), that organizes and coordinate PDF related activities among the various Physics Analysis Groups of the CMS experiment.

3. **(2010)** *Taller de Altas Energias* 2010, Universitat de Barcelona, September 2010. The Taller de Altas Energias is a joint graduate school for high energy students from all Spanish research institutions. Lectures and information are available from the TAE10 website.

2. **(2007-2008)** LPTHE seminars, coordinator of the LPTHE (Universite Paris VI and Paris VII) weekly common seminar in theoretical particle physics.

1. **(2005-2006)** Phenomenology Journal Club, Departament d'Estructura i Constituents de la Materia, Universitat de Barcelona, coordinator of the weekly particle physics journal club.

Membership of LHC Working Groups

- (**2008-current)** Member of the Parton Distribution Functions Working Group of the LHC (PDF4LHC).
- (**2009-current)** Member of the Higgs Cross-Section Working Group of the LHC (HXSWG).
- (**2012-current)** Member of the Top Quark Working Group of the LHC (LHCTopWG).
- (**2013-current)** Member of the Electroweak Working Group of the LHC (LHCEWWG).
- (**2013-current)** Member of the Effective Field Theory Working Group of the LHC (LHCEFTWG).

Planning of Future HEP facilities

- Member of the leadership core team of the Forward Physics Facility (FPF) study group, in charge of the QCD activities. Lead editor of the FPF Snowmass White Paper. The FPF is a proposed fixed-target experiment to study neutrinos, QCD, and BSM physics at the Large Hadron Collider.
- Member of the Institutional Board of the Electron Ion Collider User Group (EICUG), as representative of the Nikhef Institute.
- Member of the High-Luminosity LHC Physics Working Group, Author of the ECFA Report on the Physics Goals and Performance Reach of the HL-LHC.
- Member of Future Circular Colliders (FCC) Working Group, convener of the PDF group, within Standard Model working group.
- Member of the TLEP/FCC-ee Working Group, and author of the first overview of the TLEP/FCC-ee physics potential.
- Member of the Snowmass Community Planning Study Group, and author of the QCD and Electroweak Working Group reports.
- Member of the Large Hadron Electron Collider (LHeC) Study Group, and author of the LHeC Conceptual Design Report.

Refereeing Activities for Funding Agencies

I have refereed scientific projects and grant applications (both for personal grants and for consortia) for the following national and international funding agencies:

- Doctoral INPhINIT Fellowships Evaluator, La Caixa Foundation. Reviewer of PhD and Postdoc fellowships funded by La Caixa to carry out research in Spanish institutions.
- National Science Centre Poland, PI grant reviewer.
- STFC Ernest Rutherford Fellowships, reviewer of applications for ER Fellowships (five-year personal fellowships at UK institutions).
- European Research Council (ERC), project reviewer for the ERC in charge of Starting, Consolidator, and Advanced Grant applications.
- Netherlands Organisation for Scientific Research (NWO), project reviewer for NWO, the Dutch research council.
- German Academic Exchange Service, reviewer of the Postdoctoral Researchers International Mobility Experience program.
- Italian Ministry of Education, Universities and Research (MIUR), reviewer of research projects and postdoc applications.
- Swiss National Science Foundation (SNSF), reviewer of SNSF Starting Grant applications.
- Agence Nationelle de la Recherche (ANR, French National Research Agency), reviewer of ANR grant proposals.
- Fonds de la Recherche Scientifique (FNRS), national science foundation of Wallonia, Belgium. Reviewer of PhD projects.
- German Research Foundation (Deutsche Forschungsgemeinschaft DFG), panel member in charge of the scientific evaluation of Research Units (large-scale consortia applications).
- Deutsche Forschungsgemeinschaft (DFG, German Research Foundation), reviewer of DFG grant proposals.
- The Office of Nuclear Physics (NP), Department of Energy (DoE), USA, reviewer for grant proposals.
- Israel Science Foundation, scientific research projects reviewer.
- Agencia Nacional de Evaluación y Prospectiva (ANEP), scientific projects reviewer of the ANEP, Spanish Ministry of Economy and Competitivity.

- Centro Nacional de Fisica de Particulas, Astroparticulas y Nuclear (CPAN) of Spain, referee for CPAN postdoctoral fellowships.
- Fons voor Wetenschappelijk Onderzoek (FWO), reviewer for projects of the FWO, the Flemish organisation for scientific research (Belgium).
- National Science Foundation (NSF) of South Africa, scientific projects reviewer.
- CINECA, Italian Consortium for High-Performance Scientific Computing, referee of grant applications to CINECA, such as the PRIN 2020 call.
- Cambridge University Press, reviewer of proposals of new books to be published by CUP.
- Romanian National Science Foundation, scientific projects reviewer.

Refereeing Activities for Scientific Publications

I frequently referee for some of the most important journals of my field, including Journal of High Energy Physics, Physical Review Letters, and European Journal of Physics C. In the following, I list the scientific publications for which I have refereed.

- SciPost
- Physics Letters B
- Physical Review Letters
- Journal of High Energy Physics
- Nuclear Physics B
- Nuclear Physics A
- European Journal of Physics C
- European Journal of Physics A
- Machine Learning for Science and Technology
- Physical Review C
- Physical Review D
- International Journal of Modern Physics A
- IOP Journal of Physics G
- Technological Forecasting and Social Change
- Oxford University Press (Dictionary of Physics)
- Progress on Theoretical and Experimental Physics
- IoP Reports on Progress in Physics
- The Journal of Visualized Experiments

Talks, Seminars, and Colloquia

Overview

I am frequently invited to give talks, seminars, and colloquia at national and international conferences, workshops, universities, and research institutions, e.g. I have given a large number of keynote lectures at international conferences, and invited to give seminars at institutions such as CERN, ETH Zurich, EPFL Lausanne, and Paris-Sorbonne in Europe and Harvard, MIT, UC Berkeley and UC Los Angeles in the US. In this section I provide representative examples of keynote and invited talks at conferences, invited colloquia, and selected seminars at research institutions.

Keynote and Invited Talks at Conferences

Here I list representative keynote and invited talks at national and international conferences and workshops.

- **(2024)** *Effective Field Theories at the LHC*, invited plenary talk at the Large Hadron Collider 2024 Conference (LHCP2024), Boston, June 2024.
- **(2024)** *Neutrino Physics at a Muon Collider*, invited plenary talk at the annual meeting of the International Muon Collider Collaboration (IMCC), CERN, March 2024.
- **(2024)** *QCD, Neutrino, and BSM Physics at Far-Forward Experiments: from the LHC to the FCC-pp*, invited talk at the FCC Physics Workshop 2024, Annecy, February 2024.
- **(2024)** *Proton Structure from the LHC to Future Colliders*, invited talk at the Zurich Phenomenology Workshop 2024, ETH Zurich, January 2024.
- **(2023)** *Neutrino Facilities at CERN*, review talk at NuPhys2023: Prospects in Neutrino Physics, University College London, December 2023.
- **(2023)** *Theoretical uncertainties (and how to tame them) at the LHC*, talk at "The LHC Precision Program" workshop, Benasque Center for Science, Benasque, October 2023.
- **(2023)** *Parton Distributions in the SMEFT: the top quark case*, invited talk at the LHC Top Quark Working Group general meeting, CERN, June 2023.
- **(2023)** *Differential measurements for global SMEFT analyses*, invited vision talk at the CMS Physics Days: the Effective Field Theory program, Zoom, May 2023.
- **(2022)** *Evidence and implications of intrinsic charm in the proton*, Oxford Particle Theory seminar, Oxford, November 2022.
- **(2022)** *An Effective (Field Theory) Pathway to the New Standard Model*, plenary invited talk at the Annual Meeting of the Subatomic Physics section of the Dutch Physics Association (NVV), Lunteren, November 2022.
- **(2022)** *Precision QCD at Colliders*, invited plenary talk at the Deep Inelastic Scattering 2022 Conference, Santiago de Compostela, May 2022.
- **(2022)** *LHCb as a QCD discovery experiment*, invited talk at the Plenary Meeting of the LHC Collaboration, Zoom, April 2022.
- **(2021)** *Probing QCD and hadron structure at the Forward Physics Facility of the LHC*, invited review talk at the General Meeting of the LHC Forward Physics Working Group, Zoom, December 2021. Slides
- **(2022)** *Nucleon PDFs: what we know and what is missing*, invited review talk at the 14th European Research Conference on Electromagnetic Interactions with Nucleons and Nuclei, Zoom, November 2021. Slides.
- **(2021)** *Parton Distributions at the LHC Run III and beyond*, invited talk at the ATLAS Collaboration Week plenary meeting, CERN, October 2021. Slides.
- **(2021)** *The quest towards high-precision global parton distributions*, review talk at the 50th International Symposium of Multiparticle Dynamics (ISMD2021), Zoom, July 2021. Slides.

- **(2020)** *Parton Distributions: Towards Snowmass 2021*, invited review talk at the *Energy Frontier* working group on Hadronic Structure and Forward QCD (EF06) of Snowmass, Zoom, July 2020. Slides.
- **(2019)** *The structure of the proton and precision LHC phenomenology*, invited review talk at the Standard Model at the LHC 2019 workshop, Zurich, Switzerland, April 2019. Slides.
- **(2019)** *Parton Distributions and Deep-Inelastic Scattering,* opening keynote talk at the Deep-Inelastic Scattering 2019 conference, Torino, Italy, April 2019. Slides.
- **(2017)** *Precision QCD Processes at the LHC,* invited plenary review talk, ICFA seminar on *Future Perspectives in High Energy Physics*, Ottawa, Canada, November 2017. Slides.
- **(2017)** *Neural networks and machine learning in high energy physics,* invited plenary talk, Symposium Trends in Theory 2017, Dutch Research School of Theoretical Physics, Delfsen, The Netherlands, May 2017. Slides.
- **(2017)** *Review of Recent Progress in PDFs,* invited plenary talk, Large Hadron Collider Physics Conference 2017 (LHCP2017), Shanghai, China, May 2017. Slides.
- **(2016)** *Neural Network Fits of Parton Distributions*, invited review talk at the 4th Workshop on the QCD Structure of the Nucleon (QCD-N'16), Guetxo, Spain, July 2016. Slides.
- **(2015)** *Parton Distributions at the LHC Run II,* invited review talk, ATLAS Standard Model Workshop, LAPP, Annecy, France, February 2015. Slides.
- **(2014)** *QCD at the LHC: recent progress and open problems,* invited plenary talk, Les Recontres de Physique de la Vallee d'Aoste 2014, La Thuile, Italy, Feb 2014. Slides.
- **(2014)** *Parton Distributions at the LHC,* invited plenary talk, SM@LHC Conference, CIEMAT, Madrid, Spain, April 2014. Slides.
- **(2013)** *Status and future of PDFs from a theoretical perspective,* opening talk of the conference, Deep-Inelastic Scattering Workshop 2013, Marseille, France, April 2013. Slides.

Invited Seminars and Colloquia

Here I list representative (recent) invited colloquia and important talks given at important national and international research institutions. As mentioned above, the complete list of recent talks is available from my personal website.

- **(2024)** *Quantum Information and Quantum Algorithms in High-Energy Physics*, vision talk at the AQA + CERN + QTI workshop on quantum algorithms for HEP, Leiden University, February 2024.
- **(2023)** *Physics with TeV neutrinos from the LHC*, CERN Theory Division Colloquium, CERN, November 2023.
- **(2023)** *Do protons really contain charm quarks?* KIT Particle Physics Colloquium, Karlsruhe Institute of Technology, Karlsruhe, January 2023.
- **(2023)** *Physics with TeV neutrinos at the LHC*, Particle Physics seminar, University of California at Irvine, UCI, August 2023.
- **(2022)** *Intrinsic Charm in the Proton*, Nikhef Colloquium, Amsterdam, May 2022. Slides.
- **(2022)** *A global combination of particle physics data in the Standard Model Effective Field Theory*, IFAE Theory Seminar, Barcelona, March 2022. Slides.
- **(2021)** *The path to proton structure at one-percent accuracy*, invited DFG-RTG Colloquium at RWTH Aachen University, Zoom, November 2021. Slides
- **(2021)** *An Effective Pathway to the New Standard Model*, talk at the Focus Session FM02: *Journeys through the Zeptouniverse: particle physics and the quest for a new standard model* at the Physics@Veldhoven 2021 conference, Zoom, January 2021. Slides and video recording.
- **(2020)** *What hides inside a proton? From heavy quarks and photons to leptons and Higgs bosons*, colloquium at the High Energy Physics Graduate School seminar series, Albert-Ludwigs-Universitat Freiburg, November 2020 Zoom. Slides: part A and part B. Recordings: part A1, part A2, part B.

- **(2020)** *The structure of the proton: QCD at work from the LHC to IceCube*, the Nico van Kampen Colloquium in Theoretical Physics, University of Utrecht, March 2019. Slides.
- **(2019)** *Towards a combined top and Higgs global analysis in the Standard Model EFT*, seminars at the Institut de Ciences del Cosmos (ICC) of the University of Barcelona and at Institut de Fisica Corpuscular (IFIC) in Valencia, October 2019. Slides.
- **(2019)** *Towards a global analysis of the Standard Model Effective Field Theory*, seminars at the University of Portland in Eugene and at the University of California in San Diego (UCSD), USA, August 2019. Slides.
- **(2019)** *The structure of the proton: QCD at work from the LHC to IceCube*, Nuclear Physics seminar at the University of California in Los Angeles (UCLA), August 2019. Slides.
- **(2018)** *Novel probes of small-x QCD from HERA, the LHC, and beyond*, invited talk at the Nuclear Theory / RIKEN Seminar series, Brookhaven National Laboratory (BNL), New York, USA. Slides.
- **(2017)** *Discovering "new physics" within QCD: evidence for BFKL dynamics in HERA data*, invited talk at the National Seminar Theoretical High Energy Physics Nikhef, Amsterdam, November 2017. Slides.
- **(2017)** *Parton Distributions from High-Precision Collider Data*, invited colloquium at the High Energy Physics Seminar of the Vrije Universiteit Brussels, Brussels, November 2017. Slides.
- **(2016)** *The structure of the proton and precision LHC phenomenology*, Nuclear and Particle Physics Seminar series, Center for Theoretical Physics (CPT), MIT, Boston, USA. slides.
- **(2016)** *Probing electroweak symmetry breaking with Higgs pair production at the LHC*, invited talk at the Particle Theory Seminar series of High Energy Physics Group, Center for the Fundamental Laws of Nature, Harvard University, USA, November 2016. Slides.
- **(2015)** *The structure of the proton in the Higgs Boson era,* invited talk at the Berkely/LBNL Theory seminar series, Berkeley Center for Theoretical Phycis, Berkeley, USA, April 2015.
- **(2015)** *The structure of the proton in the Higgs Boson era,* invited talk at the SLAC experimental seminar series, SLAC National Laboratory, Stanford University, USA, April 2015. Slides.
- **(2015)** *Parton distributions for the LHC and for future colliders,* invited talk at Theoretical Particle Physics and Cosmology seminar series, King's College, London, UK, September 2015. Slides.

Complete List of Publications of Prof. Dr. Juan Rojo

The following list contains the complete information corresponding to my scientific publications, both peer-reviewed and non peer-reviewed, obtained from the InspireHep database profile as of June 22, 2026:

`https://inspirehep.net/authors/1019897?ui-citation-summary=true`

Each entry contains also the DOI identified, arxiv number, and citation counts. Additional information, such as complete author list and hyperlinks to the references, can be obtained online from the InspireHEP database. Recall that in high-energy physics it is customary to compose the author list always in alphabetical order.

274. FASER Collaboration, "Electromagnetic Shower Reconstruction and Identification in FASER's Emulsion Detector for LHC Forward Neutrino Measurements," [arXiv:2606.18517 [hep-ex]].

273. Bart van der Wielen, Jeroen J. M. Sangers, Samuel Mañas-Valero, Juan Rojo, and Sonia Conesa-Boj, "Uncertainty-aware machine learning for core-loss background subtraction in EELS", NPJ Computational Materials in press, `https://www.nature.com/articles/s41524-026-02145-3` (2026)

272. T. Armadillo, E. Celada, J. ter Hoeve, F. Maltoni, L. Mantani *et al.*, "New Physics Reach through Precision at Future Colliders: a Multi-Pronged Approach," [arXiv:2604.16596 [hep-ph]]. 5 citations.

271. R. Barrué, L. Benato, A. K. Güven, E. Hammou, J. ter Hoeve *et al.*, "Proton Structure from Neural Simulation-Based Inference at the LHC," [arXiv:2604.13157 [hep-ph]].

270. R. D. Ball *et al.* [NNPDF Collaboration], "Parton distribution functions and theory parameters: an NNPDF perspective," [arXiv:2602.24005 [hep-ph]].

269. FASER Collaboration, "Momentum Measurement of Charged Particles in FASER's Emulsion Detector at the LHC," [arXiv:2602.17575 [hep-ex]]. 3 citations.

268. R. Stegeman, S. Forte, and J. Rojo, "Extractions of the strong coupling from collider data without PDF refitting are biased," PoS EPS-HEP2025 (2026) 225 [arXiv:2511.22561 [hep-ph]]. 6 citations.

267. MuCoL Collaboration, "MuCol Milestone Report No. 7: Consolidated Parameters," [arXiv:2510.27437 [physics.acc-ph]]. 9 citations.

266. FPF Collaboration, L. A. Anchordoqui *et al.*, "The forward physics facility: Physics opportunities and conceptual design," Nucl. Phys. B **1026** (2026) 117398 [arXiv:2510.26260 [hep-ex]]. 14 citations.

265. FASER Collaboration, "Latest neutrino results from the FASER experiment and their implications for forward hadron production," PoS ICRC2025 (2025) 349 [arXiv:2507.23552 [hep-ex]]. 1 citation.

264. J. John, F. Kling, J. Koorn, P. Krack, and J. Rojo, "A first determination of the LHC neutrino fluxes from FASER data," JHEP **11** (2025) 106 [arXiv:2507.06022 [hep-ph]]. 6 citations.

263. ECFA Collaboration, "ECFA Higgs, electroweak, and top Factory Study," CERN Yellow Rep. Monogr. 5 (2025) [arXiv:2506.15390 [hep-ex]]. 58 citations.

262. R. Francener, V. P. Goncalves, F. Kling, P. Krack, and J. Rojo, "Deep-inelastic scattering at TeV energies with LHC muons," Eur. Phys. J. C **85** (2025) 1098 [arXiv:2506.13889 [hep-ph]]. 10 citations.

261. R. D. Ball *et al.* [NNPDF Collaboration], "A determination of $\alpha_s(m_Z)$ at $\mathrm{aN^3LO_{QCD}} \otimes \mathrm{NLO_{QED}}$ accuracy from a global PDF analysis," Eur. Phys. J. C **85** (2025) 1001 [arXiv:2506.13871 [hep-ph]]. 16 citations.

260. PBC Collaboration, R. Alemany Fernández *et al.*, "Summary Report of the Physics Beyond Colliders Study at CERN," [arXiv:2505.00947 [hep-ex]]. 21 citations.

259. International Muon Collider Collaboration, "The Muon Collider," [arXiv:2504.21417 [physics.acc-ph]]. 86 citations.

258. FCC Collaboration, M. Benedikt *et al.*, "Future Circular Collider Feasibility Study Report: Volume 1, Physics, Experiments, Detectors," Eur. Phys. J. C **85** (2025) 1468 [arXiv:2505.00272 [hep-ex]]. 215 citations.

257. FCC Collaboration, M. Benedikt *et al.*, "Future Circular Collider Feasibility Study Report: Volume 2, Accelerators, Technical Infrastructure and Safety," Eur. Phys. J. ST **234** (2025) 5713–6197 [arXiv:2505.00274 [physics.acc-ph]]. 142 citations.

256. FCC Collaboration, M. Benedikt *et al.*, "Future Circular Collider Feasibility Study Report: Volume 3, Civil Engineering, Implementation and Sustainability," Eur. Phys. J. ST **234** (2025) 5113–5383 [arXiv:2505.00273 [physics.acc-ph]]. 57 citations.

255. FASER Collaboration, "Reconstruction and performance evaluation of FASER's emulsion detector at the LHC," JINST **20** (2025) P12018 [arXiv:2504.13008 [physics.ins-det]]. 14 citations.

254. J. ter Hoeve, L. Mantani, J. Rojo, A. N. Rossia, and E. Vryonidou, "Higgs trilinear coupling in the standard model effective field theory at the high luminosity LHC and the FCC-ee," Phys. Rev. D **112** (2025) 013008 [arXiv:2504.05974 [hep-ph]]. 16 citations.

253. ATLAS and CMS Collaborations, "Highlights of the HL-LHC physics projections by ATLAS and CMS," [arXiv:2504.00672 [hep-ex]]. 100 citations.

252. A. Abada *et al.*, "Neutrino Theory in the Precision Era," [arXiv:2504.00014 [hep-ph]]. 3 citations.

251. Linear Collider Collaboration, "The Linear Collider Facility (LCF) at CERN," [arXiv:2503.24049 [hep-ex]]. 48 citations.

250. FASER Collaboration, "Prospects and Opportunities with an upgraded FASER Neutrino Detector during the HL-LHC era: Input to the EPPSU," [arXiv:2503.19775 [hep-ex]]. 15 citations.

249. Linear Collider Vision Collaboration, "A linear collider vision for the future of particle physics," Eur. Phys. J. ST **235** (2026) 1641–1796 [arXiv:2503.19983 [hep-ex]]. 97 citations.

248. FPF Working Groups, "The Forward Physics Facility at the Large Hadron Collider," [arXiv:2503.19010 [hep-ex]]. 16 citations.

247. A. Caldwell *et al.*, "Future Opportunities with Lepton-Hadron Collisions," [arXiv:2503.18208 [hep-ex]]. 1 citation.

246. F. Ahmadova *et al.*, "The Large Hadron electron Collider as a bridge project for CERN," [arXiv:2503.17727 [hep-ex]]. 14 citations.

245. J. Cruz-Martinez, T. Hasenack, F. Hekhorn, G. Magni, E. R. Nocera *et al.*, "NNPDFpol2.0: a global determination of polarised PDFs and their uncertainties at next-to-next-to-leading order," JHEP **07** (2025) 168 [arXiv:2503.11814 [hep-ph]]. 28 citations.

244. J. ter Hoeve, L. Mantani, J. Rojo, A. N. Rossia, and E. Vryonidou, "Connecting scales: RGE effects in the SMEFT at the LHC and future colliders," JHEP **06** (2025) 125 [arXiv:2502.20453 [hep-ph]]. 40 citations.

243. A. Chiefa, M. N. Costantini, J. Cruz-Martinez, E. R. Nocera, T. R. Rabemananjara, J. Rojo, T. Sharma, and M. Ubiali, "Parton distributions confront LHC Run II data: a quantitative appraisal," JHEP **07** (2025) 067 [arXiv:2501.10359 [hep-ph]]. 15 citations.

242. J. Cruz-Martinez, A. Jansen, G. van Oord, T. R. Rabemananjara, C. M. R. Rocha, J. Rojo, and R. Stegeman, "Hyperparameter optimisation in deep learning from ensemble methods: applications to proton structure," Mach. Learn. Sci. Tech. **6** (2025) 025027 [arXiv:2410.16248 [hep-ph]]. 7 citations.

241. M. van Beekveld, S. Ferrario Ravasio, E. Groenendijk, P. Krack, J. Rojo *et al.*, "A phenomenological analysis of LHC neutrino scattering at NLO accuracy matched to parton showers," Eur. Phys. J. C **84** (2024) 1175 [arXiv:2407.09611 [hep-ph]]. 16 citations.

240. R. Mammen Abraham, J. Adhikary, J. L. Feng, M. Fieg, F. Kling *et al.*, "FPF@FCC: neutrino, QCD, and BSM physics opportunities with far-forward experiments at a 100 TeV Proton Collider," JHEP **01** (2025) 094 [arXiv:2409.02163 [hep-ph]]. 33 citations.

239. E. Celada, T. Giani, J. ter Hoeve, L. Mantani, J. Rojo, A. N. Rossia, M. Thomas, and E. Vryonidou, "Mapping the SMEFT at high-energy colliders: from LEP and the (HL-)LHC to the FCC-ee," JHEP **09** (2024) 091 [arXiv:2404.12809 [hep-ph]]. 118 citations.

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