

## CURRICULUM VITAE ABREVIADO (CVA)

### Part A. PERSONAL INFORMATION

CV date

03/05/2024

First name	Miguel		
Family name	García Echevarría		
Gender (*)	Male	Birth date (dd/mm/yyyy)	05/02/1985
Social Security, Passport, ID number	78910329C		
e-mail	miguel.garciae@ehu.eus	URL Web	
Open Researcher and Contributor ID (ORCID) (*)		0000-0003-2888-8526	

(\*) Mandatory

### A.1. Current position

Current position			
Position	Associate professor ( <i>profesor agregado</i> )		
Initial date	29/08/2023		
Institution	University of the Basque Country UPV/EHU		
Department/Center	Physics		
Country	Spain	Teleph. number	0034 94601 2596
Key words	Theoretical Physics, Collider Phenomenology, QCD, Effective Field Theories, Hadron Structure		

### A.2. Previous positions (research activity interruptions, art. 13.2.b))

Period	Position/Institution/Country/Interruption cause
10/2021-08/2023	Assistant professor ( <i>profesor adjunto</i> ) UPV/EHU
01/2021-10/2021	<i>Beatriz Galindo</i> distinguished researcher, Universidad de Alcalá
09/2019-12/2020	Assistant professor ( <i>prof. ayudante doctor</i> ), Universidad de Alcalá
09/2018-08/2019	<i>Marie Curie</i> postdoctoral researcher, INFN, Pavia, Italy
09/2017-08/2018	Postdoctoral researcher, INFN, Pavia, Italy
12/2015-08/2017	<i>Juan de la Cierva</i> postdoctoral researcher, Universitat de Barcelona
11/2013-10/2015	Postdoctoral researcher, NIKHEF, Amsterdam, Netherlands

### A.3. Education

PhD, Licensed, Graduate	University/Country	Year
PhD in Physics	Universidad Complutense de Madrid	2013
Master in Theoretical Physics	Universidad Autónoma de Madrid	2010
Degree in Physics ( <i>Licenciado</i> )	Universidad del País Vasco	2008

### Part B. CV SUMMARY (max. 5000 characters, including spaces)

#### General indicators of quality of scientific production

According to INSPIRE database (<https://inspirehep.net/authors/1078290>):

- 65 works (including articles, proceedings, etc), among which 35 publications in high-impact international peer-reviewed journals
- h-index = 27
- Citations: more than 3800
- "Profesor contratado doctor" habilitation (2016)
- "Certificado i3" of excellence in research (2021)

#### Mentorship

Postdocs:

- Raj Kishore (UPV/EHU, 02/2024-present)

PhD students:

- Alessia Bongallino (UPV/EHU, graduation expected 2027)

- Samuel Fernández Romera (UPV/EHU, graduation expected 2026)
- Patricia Gutiérrez García (U. Complutense Madrid, graduation expected 2026)
- Rafael Fernández del Castillo (UCM, graduation expected 2024)

Master students:

- Ángel Felipe (UPV/EHU, expected 2024)
- Miguel Ángel Villegas Salazar (UCM, 2022)
- Samuel Fernández Romera (UCM, 2022)
- Luis Fernández Martínez (UCM, 2021)

Bachelor students:

- Beñat Albizbeaskoetxea (UPV/EHU, expected June 2024)
- Sara Laca (UPV/EHU, expected June 2024)
- Ángel Felipe (UPV/EHU, 2023)
- Alejandro Díaz Cuesta (University of Alcalá, 2021)
- Joan Estévez Estudis (University of Barcelona, 2017)

## Summary

My research has mainly focused on the theoretical and phenomenological study of the multi-dimensional structure of hadrons, using effective field theories of QCD, with the aim of better understanding QCD and how the properties of hadrons emerge from the dynamics of their constituent quarks and gluons. The precise knowledge of hadron structure is also essential to be able to extract any sensible information from hadron collider data.

I have made several seminal contributions. On the theory side, the proper definition in field theory of transverse momentum distributions (TMDs) and Wigner distributions (generalized TMDs) of quarks and gluons, the obtention of their properties up to a high perturbative accuracy (evolution, matching, etc), which is essential in phenomenological studies, and the development of new formalisms to probe nucleon structure in multi-scale processes, such as quarkonia and jet production. On the phenomenological side, I have performed several data analyses which are a reference in the field, like for the Sivers spin asymmetry.

My research has had and remains to have a great impact on current experiments at CERN, DESY, JLab, BNL and KEK, among others, and is helping to sharpen the scientific goals of future facilities like the Electron-Ion Collider at BNL (US) and a potential fixed-target experiment at the LHC at CERN. In fact, I belong to the international collaborations EICUG (Electron-Ion Collider User Group) and AFTER@LHC (a fixed-target experiment at the LHC), and I became a reference in the community for spin and TMD physics (see e.g. my role as editor in two recent big community reviews and my role as chair of three international conferences of reference in the field).

## Organization of conferences

- Chair of 3 international conferences: Resummation, Evolution, Factorization 2019 (REF2019); QCD Structure of the Nucleon (QCD-N) 2021 and 2025.
- Organizer of the XIV CPAN Days 2022 (annual meeting of the Spanish Particle, Astroparticle and Nuclear Physics community)
- Parallel-session convener and co-organizer of Quarkonia as Tools international workshop editions of 2019, 2020, 2021.
- Parallel session convener of Particles and Nuclei International Conference 2021 (PANIC2021).
- Member of the scientific committee of *Resummation, Evolution, Factorization (REF)* international annual workshop series since 2016.
- Member of the scientific committee of *QCD Structure of the Nucleon (QCD-N)* international 4-annual workshop series since 2021.

## Part C. RELEVANT MERITS (sorted by typology)

### C.1. Publications (see instructions)

According to INSPIRE database (<https://inspirehep.net/authors/1078290>):

- 65 works (including articles, proceedings, etc), among which 35 publications in high-impact international peer-reviewed journals and 2 community reviews for which I was section editor.

### A selection of 10 publications:

*It is customary in our discipline to arrange the authors alphabetically.*

#### - Gluon TMD fragmentation functions into quarkonium

M.G. Echevarria, S.F. Romera, I. Scimemi. *JHEP* 12 (2023) 181 [4 cit.]

#### - Quantum Simulation of Light-Front Parton Correlators

M.G. Echevarria, I.L. Egusquiza, E. Rico, G. Schnell. *Phys.Rev.D* 104 (2021) 1 [24 cit.]

#### - Global analysis of the Sivers functions at NLO+NNLL in QCD

M.G. Echevarria, Z. Kang, J. Terry. *JHEP* 01 (2021) 126 [55 cit.]

#### - TMD factorization for dijet and heavy-meson pair in DIS

F. del Castillo, M.G. Echevarria, Y. Makris, I. Scimemi. *JHEP* 01 (2021) 088 [29 cit.]

#### - Proper TMD factorization for quarkonia production: $pp \rightarrow \eta_{c,b}$ as a study case

M.G. Echevarria, *JHEP* 1910 (2019) 144 [51 cit.]

#### - Unpolarized Transverse Momentum Dependent Parton Distribution and Fragmentation Functions at next-to-next-to-leading order

M.G. Echevarria, I. Scimemi, A. Vladimirov. *JHEP* 09 (2016) 004 [180 cit.]

#### - Single spin asymmetries from a single Wilson loop

D. Boer, M.G. Echevarria, P. Mulders, J. Zhou. *Phys.Rev.Lett.* 116 (2016) 12, 122001 [64 cit.]

#### - QCD evolution of (un)polarized gluon TMDPDFs and the Higgs $qT$ -distribution

M.G. Echevarria, T. Kasemets, P. Mulders, C. Pisano. *JHEP* 07 (2015) 158 [123 cit.]

#### - QCD Evolution of the Sivers Asymmetry

M.G. Echevarria, A. Idilbi, Z. Kang, I. Vitev. *Phys.Rev.D* 89 (2014) 074013 [211 cit.]

#### - Factorization Theorem For Drell-Yan At Low $qT$ And Transverse Momentum Distributions On-The-Light-Cone

M.G. Echevarria, A. Idilbi, I. Scimemi. *JHEP* 07 (2012) 002 [394 cit.]

### C.2. Conferences and seminars

17 invited seminars at different institutions world-wide.

50+ contributions to international conferences. **The 10 most relevant ones:**

- Transversity 2022 (Pavia, Italy, 23-27 May 2022)

Invited talk: Quarkonium production to probe TMDs

- Quarkonium QWG 2021 (online, 15-19 Mar 2021)

Invited talk: Quarkonium TMD Fragmentation Functions in NRQCD

- Probing Nucleons and Nuclei in High Energy Collisions INT 18-3 (Seattle, US, 8-12/10/2018)

Invited talk: QED corrections to evolution of TMDs

- SPIN 2016 (UIUC, Champaign, US, 25-30 Sep 2016)

Invited talk: TMDs: entering the precision era

- QCD-N 2016 (UPV-EHU, Bilbao, Spain, 11-15 Jul 2016)

Invited review talk: TMD factorization and evolution

- QCD Evolution 2016 (Nikhef, Amsterdam, Netherlands, 30 May-5 Jun 2016)

Invited talk: Definition and evolution of GTMDs

- REF 2014 (Antwerp, Belgium, 8-11 Nov 2014)

Invited talk: Gluon TMDPDFs and the Higgs boson transverse momentum distribution

- Transversity 2014 (Chia, Cagliari, Italy, 9-13 Jun 2014)

Invited talk: Scale Evolution of Gluon TMDs

- QCD Evolution 2014 (Santa Fe, US, 12-16 May 2014)

Invited talk: QCD Evolution of the Sivers Asymmetry

- QCD Evolution 2013 (JLab, Newport News, US, 6-10 May 2013)

Invited talk: Evolution of (Un)Polarized TMDs at NNLL

### C.3. Research projects (last 5 years)

MultiDNuS: Multidimensional Nucleon Structure (ID: CNS2022-135186. Funding agency: MICINN, 198.104€)

PI: Miguel G. Echevarría; Duration: 1/9/2023-31/8/2025

QCDHaSForm: QCD in high-energy collisions: hadron structure and formation (ID: PID2022-136510NB-C33. Funding agency: MICINN, 46.500€)

PI: Miguel G. Echevarría; Duration: 1/9/2023-31/8/2026

Gravitation, Cosmology and Fundamental Physics (ID: IT1628-22, Funding Agency: Gobierno Vasco, 534.030€)

Role: research team; PI: Jon Urrestilla; Duration: 2022 - 2025

T-NiSQ: Tensor Networks in Simulation of Quantum Matter (QuantERA program, ID: PID2019-106080G, Funding agency: European Commission, 210.000€)

Role: research team; PI: Enrique Rico, Gunar Schnell; Duration: 01/01/2022 - 31/12/2024.

The strong interaction at the frontier of knowledge: fundamental research and applications (ID: Strong-2020. Funding agency: European Commission, 10M€)

Role: research team; PI: Barbara Erazmus; Duration: 01/06/2019 - 31/07/2024

MultiNuS: Multidimensional Nucleon Structure (ID: CM/BG/2021-002. Funding agency: Comunidad de Madrid, 160.000€)

Duration: 22/3/2021 - 21/9/224 (stopped 17/10/2021 due to institution change).

PI: Miguel G. Echevarría

Física Hadrónica y Cromodinámica Cuántica: desde las bajas energías hasta el LHC (ID: PID2019-106080GB-C21. Funding agency: MICINN, 129.470€)

Role: research team; PI: Ignazio Scimemi, José R. Peláez Sagredo; 1/1/2020-30/9/2023

GLUECORE: Mapping the 3-dimensional gluon structure of the proton (MarieCurie fellowship, Funding agency: European Commission, 180.000€)

PI: Miguel G. Echevarría, Duration: 01/09/2018 - 31/08/2020

#### **C.4. Community service**

- Referee for PRL, JHEP, PRD, EPJC, PLB, NPA.
- Evaluator for the EU HORIZON-MSCA-PF calls since 2022 and for the US DOE Nuclear Physics Office calls since 2023.
- Co-promoter and member of the core writing group of the Community document "Community Support for A Fixed-Target Programme for the LHC", submitted to the European Strategy of Particle Physics 2020 Update Committee
- Member of the core writing group of the Community document "A Fixed-Target Programme at the LHC: Physics Case and Projected Performances for Heavy-Ion, Hadron, Spin and Astroparticle Studies", submitted to Physics Reports, arXiv:1807.00603
- Member of the writing group of the Community document "Transverse Momentum Dependent (TMD) parton distribution functions: status and prospects", Acta Phys. Polon. B46 (2015) 12, 2501. arXiv:1507.05267
- Member of AFTER@LHC, promoting a fixed-target experiment at the LHC (2015-Present)
- Member of the Electron-Ion Collider User Group (2017-Present) and "Theory Alliance"
- PI of UPV/EHU CPAN node (since 2023)

#### **C.5. Outreach**

- President of the Science group at Loyola residence hall (2007-2010): organizer of dozens of outreach activities for the general public with leading Spanish scientists of different fields, as well as three consecutive annual outreach workshops supported by UCM
- Dozen of talks in high schools for 17-18 year-olds since 2008 (Madrid, Barcelona, Bilbao)
- Mentor of the Inspira STEAM program to foster STEAMs among school kids (2022-present)