Umberto Biccari

Curriculum Vitae (June 2022)

Avda Universidades 24
48007 Bilbao, Spain
+34 630 835 277
+34 944 139 003 Ext.: 3282
umberto.biccari@deusto.es
cmc.deusto.eus/umberto-biccari

Personal data

Name and Surname: Umberto Biccari
Date of birth: September 29th, 1988
Place of birth: Florence, Italy
Job address: Fundación Deusto, Avda Universidades 24, 48007 Bilbao, Basque Country, Spain
Telephone: +34 944 139 003 Ext.: 3282
Mobile: +34 630 835 277
Email: umberto.biccari@deusto.es, u.biccari@gmail.com
Web: **Personal page**
Linkedin: **Linkedin account**
SCOPUS: ResearcherID J-9847-2017
ORCID: **ORCID account**
Google Scholar: **Google Scholar account**
ResearchGate: **ResearchGate account**

Education

Sep. 2013 - Dec. 2016 **Ph.D. in Mathematics**, *University of the Basque Country and BCAM - Basque Center for Applied Mathematics*, Bilbao, Basque Country, Spain.

Title of the thesis On the controllability of partial differential equations involving non-local terms and singular potentials

Advisor Prof. Enrique Zuazua

Qualification Summa Cum Laude (with Honors), International Ph.D.

Link **Download PDF**

Mar. - Aug. 2013 **Internship**, *BCAM - Basque Center for Applied Mathematics*, Bilbao, Basque Country, Spain.

2010 - 2012 **Master degree in Mathematics**, *University of Florence*, Italy.

2007 - 2010 **Bachelor's Degree in Mathematics**, *University of Florence*, Italy.

Work experience

Actual position

From Mar. 2021 **Associated researcher**, *Chair of Computational Mathematics, Fundación Deusto*, Bilbao, Basque Country, Spain.

Previous positions

Sep. 2019 - Feb. 2022 **Lecturer**, *Faculty of engineering, University of Deusto*, Bilbao, Basque Country, Spain.

Mar. 2017 - Feb. 2021 **Postdoctoral researcher**, *Chair of Computational Mathematics, Fundación Deusto*, Bilbao, Basque Country, Spain.

Jan. - Feb. 2017 **Postdoctoral researcher**, *BCAM - Basque Center for Applied Mathematics*, Bilbao, Basque Country, Spain.

Personal description

International Ph.D. Summa Cum Laude in mathematics from the University of Basque Country, in the field of control theory for dynamical systems. Associated researcher at Fundación Deusto in Bilbao, within the Chair of Computational Mathematics. Certified research experience covering a diversified spectrum of fields in the applied and computational mathematics, including but not limited to:

- Control theory, optimal control and optimization.
- Mathematical aspects of machine learning.
- Numerical approximation of Partial Differential Equations.
- Mathematical and computational tools for the model, stability, and control of power systems.

Experienced in computational software for optimization and scientific computing, as well as programming languages typically employed in applied mathematics. Good communication skills developed through a working experience in different projects and with different responsibilities, in multidisciplinary teams with members of several nationalities. Italian mother-tongue, proficiency in English and Spanish, with a good understanding of French.

Personal skills

Languages

Italian **Mother tongue**

English **Level C1, certificate of *Cambridge Assessment English* (2018)**

Spanish **Level C1, certificate of *Escuela oficial de idiomas de Bilbao* (2016)**

French **Level B2, certificate of *Institut Français de Florence* (2006)**

	Written comprehension	Writing	Listening	Speaking
Italian	Mother tongue	Mother tongue	Mother tongue	Mother tongue
English	Professional	Professional	Professional	Professional
Spanish	Professional	Professional	Professional	Professional
French	High level	Medium level	Medium level	Medium level

Computer skills

Operating systems **Ubuntu, Windows**.

Computational software `IpOpt, CasADi, FreeFEM`.

Programming languages **Matlab, Python (beginner)**.

Text editing **LaTeX, Microsoft Office**.

Job-related skills

Scientific research and writing of scientific articles.

Design of optimization algorithms.
Use of computational software for optimization and scientific computing.
Research projects proposals' preparation.
Experience in targeted work.

Driving license: B

Participation in research projects

Local PI **ELKARTEK 2020 - CONVADP - Nuevas tecnologías para aumentar la densidad de potencia en convertidores electrónicos**, *Funded by the Basque Government*, Duration: 2 years (2020 - 2021), Funding: 87.184,80€.

Researcher **PID2020-112617GB-C22 KILEARN - Kinetic equations and learning control**, *Funded by MINECO*, Duration: 3 years (2021 - 2023), Funding: 37.026€.

Researcher **ELKARTEK 2018 - Road2DC- Nuevas herramientas para el diseño y control de redes de distribución híbridas ac/dc**, *Funded by the Basque Government*, Duration: 2 years (2018 - 2019), Funding: 109.272,75€.

Researcher **MTM2017-92996-C2-1-R - COSNET - Control y estabilidad de redes híbridas AC/DC: Ecuaciones Diferenciales y Ecuaciones en Derivadas Parciales para el análisis de estabilidad de redes**, *Funded by MINECO*, Duration: 4 years (2018 - 2021), Funding: 41.745€.

Researcher **ERC Grant 694126 DYCON - Dynamic Control**, *Funded by the European Research Council*, Duration: 6 years (2016 - 2021), Funding: 2.065.125€.

Researcher **EOARD-AFOSR grant FA9550-18-1-0242. Nonlocal PDEs: Analysis, Control and Beyond**, *Funded by the Air Force Office of Scientific Research (U.S.)*, Duration: 4 years (2018 - 2021), Funding: 456.494$.

Researcher **EOARD-AFOSR grant FA9550-14-1-0214. Dynamics, Control and Numerics for Fractional Partial Differential Equations**, *Funded by the Air Force Office of Scientific Research (U.S.)*, Duration: 4 years (2014 - 2017), Funding: 450.438$.

Researcher **MTM2014-52347 - Methods for platforms of numerical simulations and control of environmental fluxes**, *Funded by MICINN*, Duration: 3 years (2014 - 2016), Funding: 71.269€.

Ph. D. student **ERC Grant FP7-246775 NUMERIWAVES**, *Funded by the European Research Council*, Duration: 3 years (2013 - 2015), Funding: 1.663.000€.

Ph. D. student **MTM2011-29306 - Partial Differential Equations: Analysis, Control, Numerics and Applications**, *Funded by MICINN*, Duration: 1 year (2013), Funding: 308.308€.

Visiting research appointments

Jun. 2022 **Friedrich-Alexander Universität**, *Erlangen*, Germany.

Jun. 2019 **University of Napoli**, *Napoli*, Italy.

Mar. 2019 **Friedrich-Alexander Universität**, *Erlangen*, Germany.

Nov. - Dec. 2018 **University of Puerto Rico**, *San Juan*, Puerto Rico, U.S.

Jul. 2018 **University of Craiova**, *Craiova*, Rumania.

Mar. 2017 **Universidad Autónoma de Madrid**, *Madrid*, Spain.

Feb. - Mar. 2016 **University of Puerto Rico**, *San Juan*, Puerto Rico, U.S.

May 2014 **CIMI - Centre International de Mathématiques et d'Informatique**, *University Paul Sabatier*, Toulouse, France.

Mar. 2014 **CIMI - Centre International de Mathématiques et d'Informatique**, *University Paul Sabatier*, Toulouse, France.

Publications

Papers published or accepted in indexed journals

1. U. B., V. Hernández-Santamaría and J. Vancostenoble, **Existence and cost of boundary controls for a degenerate/singular parabolic equation**, Math. Control Relat. F., Vol. 12.2 (2022), pp. 495-530 (**link**).
2. U. B., **Internal control for a non-local Schrödinger equation involving the fractional Laplace operator**, Evol. Eq. Control. Theo., Vol. 11.1 (2022), pp. 301-324 (**link**).
3. U. B., A. Marica and E. Zuazua, **Propagation of one and two-dimensional discrete waves under finite difference approximation**, Found. Comput. Math., Vol. 20 (2020), pp. 1401-1438 (**link**).
4. U. B. and E. Zuazua, **A stochastic approach to the synchronization of coupled oscillators**, Front. Energy Res., Vol. 8.115 (2020) (**link**).
5. U. B., M. Warma and E. Zuazua, **Controllability of the one-dimensional fractional heat equation under positivity constraints**, Commun. Pure Appl. Anal., Vol. 19.4 (2020), pp. 1949-1978 (**link**).
6. U. B. and M. Warma, **Null-controllability properties of a fractional wave equation with a memory term**, Evol. Eq. Control The., Vol. 9.2 (2020), pp. 399-430 (**link**).
7. U. B. and V. Hernández-Santamaría, **Controllability of a one-dimensional fractional heat equation: theoretical and numerical aspects**, IMA J. Math. Control Inf., Vol. 36.4 (2019), pp. 1199-1235 (**link**).
8. U. B. and V. Hernández-Santamaría, **Null Controllability of linear and semilinear nonlocal heat equations with an additive integral kernel**, SIAM J. Control Optim., Vol. 57.4 (2019), pp. 2924-2938 (**link**).
9. U. B. and S. Micu, **Null-controllability properties of the wave equation with a second order memory term**, J. Differential Equations, Vol. 267.2 (2019), pp. 1376-1422 (**link**).
10. U. B., D. Ko and E. Zuazua, **Dynamics and control for multi-agent networked systems: a finite difference approach**, Math. Models Methods Appl. Sci., Vol. 29.4 (2019), pp. 755-790 (**link**).
11. U. B., **Boundary controllability for a one-dimensional heat equation with a singular inverse-square potential**, Math. Control Relat. F., Vol. 9.1 (2019), pp. 191-219 (**link**).
12. U. B. and V. Hernández-Santamaría, **The Poisson equation from non-local to local**, Electron. J. Differential Equations, Vol. 2018.145 (2018), pp. 1-13 (**link**).
13. U. B., M. Warma and E. Zuazua, **Local elliptic regularity for the Dirichlet fractional Laplacian**, Adv. Nonlinear Stud., Vol. 17.2 (2017), pp. 387-409 (**link**).
14. U. B., M. Warma and E. Zuazua, **Addendum: Local elliptic regularity for the Dirichlet fractional Laplacian**, Adv. Nonlinear Stud., Vol. 17.4 (2017), pp. 837 - 839 (**link**).

15. U. B. and E. Zuazua, **Null controllability for a heat equation with a singular inverse-square potential involving the distance to the boundary function**, J. Differential Equations, Vol. 261.5 (2016), pp. 2809 - 2853 (**link**).

Papers published in conferences

16. U. B. and E. Zuazua, **Multilevel Selective Harmonic Modulation by duality**, 18th IFAC workshop on Control Applications of Optimization, Gif-sur-Yvette, France, July 18-22, 2022 (**link**).

Book chapters

17. U. B, M. Warma and E. Zuazua, **Control and numerical approximation of fractional diffusion equations**. Handbook of Numerical Analysis, Vol. 23 (2022), pp. 1-58 (**link**).
18. U. B., M. Warma and E. Zuazua, **Local regularity for fractional heat equations**. In *Recent Advances in PDEs: Analysis, Numerics and Control*. SEMA SIMAI Springer Series, Volume 17 (2018), Springer International Publishing (**link**).

Papers submitted

19. U. B., Y. Song, X. Yuan and E. Zuazua, **A two-stage numerical approach for the sparse initial source identification of a diffusion-advection equation** (**link**).
20. U. B. and E. Zuazua, **Multilevel control by duality** (**link**).
21. D. J. Oroya-Villalta, C. Esteve-Yagüe and U. B., **Multilevel Selective Harmonic Modulation via Optimal Control** (**link**).
22. U. B., V. Hernández-Santamaría, L. Louison and A. Omrane, **Optimal control of linear non-local parabolic problems with an integral kernel** (**link**).
23. U. B., **Blow-up results for a logarithmic pseudo-parabolic $p(.)$-Laplacian type equation** (**link**).
24. A. Rahmoune and U. B., **Multiplicity of solutions for fractional $q(.)$-Laplacian equations** (**link**).
25. U. B., A. Navarro-Quiles and E. Zuazua, **Stochastic optimization methods for the simultaneous control of parameter-dependent systems** (**link**).
26. H. Antil, U. B., R. Ponce, M. Warma and S. Zamorano, **Controllability properties from the exterior under positivity constraints for a 1-D fractional heat equation** (**link**).
27. U. B., N. Sakamoto, E. Unamuno, D. Madariaga, E. Zuazua and J. A. Barrena, **Model reduction of converter-dominated power systems by Singular Perturbation Theory** (**link**).
28. U. B., **WKB expansion for a fractional Schrödinger equation with applications to controllability** (**link**).

Citation scores

SCOPUS **h-index 8**, *149 citations*.

Google Scholar **h-index 10**, *316 citations*.

ResearchGate **h-index 11, RG Score 15.31**, *337 citations*.

Certificates

IKERTRAMOS call 2019 Positive evaluation of **UNIBASQ - Agencia de Calidad del Sistema Universitario Vasco** for the research activity carried out in the 6 years period 2013-2018.

Contributions to conferences and workshops

Jul. 18 - 22, 2022 **Invited speaker**, *workshop on ANALYSIS, CONTROL & INVERSE PROBLEMS FOR DIFFUSIVE SYSTEMS WITH APPLICATIONS TO NATURAL AND SOCIAL SCIENCES*, Bari, Italy.

Jul. 18 - 22, 2022 **Invited speaker**, *BIENNIAL CONFERENCE OF THE SPANISH SOCIETY OF APPLIED MATHEMATICS*, Zaragoza, Spain.

Jul. 18 - 22, 2022 **Speaker**, *18th IFAC WORKSHOP ON CONTROL APPLICATIONS OF OPTIMIZATION*, Gif-sur-Yvette, France.

May 23 - 27, 2022 **Invited speaker**, *conference on INVERSE PROBLEMS MODELING AND SIMULATION*, Malta.

Jul. 1-7, 2021 **Invited speaker**, *conference ANALYSIS AND NUMERICS OF DESIGN, CONTROL AND INVERSE PROBLEMS*, Rome, Italy.

Jan. 27 - 31, 2020 **Invited speaker**, *CONFERENCE OF YOUNG RESEARCHERS OF THE SPANISH ROYAL MATHEMATICAL SOCIETY*, Castellón, Spain.

Dec. 11, 2019 **Speaker**, *JORNADA SOBRE REDES ELÉCTRICAS DEL FUTURO: RETOS Y SOLUCIONES*, Mondragon Unibertsitatea - Campus de Orona, Orona, Spain.

Aug. 18 - 30, 2019 **Speaker and organizer**, *conference PARTIAL DIFFERENTIAL EQUATIONS, OPTIMAL DESIGN AND NUMERICS*, Centro de Ciencia Pedro Pascual, Benasque, Spain.

May 20 - 24, 2019 **Organizer**, *INTERNATIONAL CONFERENCE ON ELLIPTIC AND PARABOLIC PROBLEMS*, Gaeta, Italy.

Dec. 5 - 7, 2018 **Invited speaker**, *conference DYNAMICS, CONTROL AND NUMERICS FOR FRACTIONAL PDE's*, San Juan, Puerto Rico, U.S.

Aug. 26 - 31, 2018 **Speaker**, *FRENCH-ROMANIAN CONFERENCE IN APPLIED MATHEMATICS*, University of Bordeaux, France.

Feb. 26 - Mar. 2, 2018 **Invited speaker**, *conference MINAKE 2018 - MICROLOCAL AND NUMERICAL ANALYSIS, KINETIC EQUATIONS AND CONTROL*, Real Academia de Ciencias, Madrid, Spain.

Aug. 20 - Sep 1, 2017 **Plenary speaker**, *conference PARTIAL DIFFERENTIAL EQUATIONS, OPTIMAL DESIGN AND NUMERICS*, Centro de Ciencia Pedro Pascual, Benasque, Spain.

Nov. 1 - 7, 2015 **Invited speaker**, *conference RECENT DEVELOPMENTS ON APPROXIMATION METHODS FOR CONTROLLED EVOLUTION EQUATIONS*, Mathematisches Forschunginstitut of Oberwolfach, Germany.

Aug. 24 - Sep 4, 2015 **Speaker**, *conference PARTIAL DIFFERENTIAL EQUATIONS, OPTIMAL DESIGN AND NUMERICS*, Centro de Ciencia Pedro Pascual, Benasque, Spain.

Nov. 13 - 14, 2014 **Speaker**, *conference FRACTIONAL CALCULUS, PROBABILITY AND NON-LOCAL OPERATORS: APPLICATIONS AND RECENT DEVELOPMENTS*, BCAM - Basque Center for Applied Mathematics, Bilbao, Spain.

Nov. 6 - 8, 2013 **Speaker**, *conference FRACTIONAL CALCULUS, PROBABILITY AND NON-LOCAL OPERATORS: APPLICATIONS AND RECENT DEVELOPMENTS*, BCAM - Basque Center for Applied Mathematics, Bilbao, Spain.

Teaching

Academic courses

Sep. 2021 - Feb. 2022 **Algebra**, *Bachelor degree in Computer Engineering, University of Deusto, Bilbao campus, Spain*, 6 ECTS.

Sep. 2020 - Feb. 2021 **Mathematics**, *Bachelor degree in Business Administration, University of Deusto, San Sebastián campus, Spain*, 6 ECTS.

Sep. 2019 - Feb. 2020 **Mathematics**, *Bachelor degree in Business Administration, University of Deusto, San Sebastián campus, Spain*, 6 ECTS.

Non-academic courses

Jun. 24 - 28, 2019 **Control problems for non-local PDE**, *University of Naples, Italy*.

Description Intensive course of 10 hours held within the semester on *Shape optimization, control and inverse problems for partial differential equations*, organized by the University of Naples, Italy, with the collaboration of INdAM. The course was addressed to Ph.D. students in applied mathematics.

Sep. 2018 - Apr. 2019
Sep. 2017 - Apr. 2018 **Mathematical methods for control theory**, *Fundación Deusto, Bilbao, Basque Country, Spain*.

Description The scope of the course was to provide the mathematical and computational fundamentals for control theory. The course was addressed to master and Ph.D. students in applied mathematics and engineering, with a total duration of 57 hours per academic year.

Certificates

Profesor de universidad privada Positive evaluation of **ANECA - Agencia Nacional de Evaluación de la Calidad y Acreditación** for the role of professor of private university.

Contratado doctor Positive evaluation of **ANECA - Agencia Nacional de Evaluación de la Calidad y Acreditación** for the role of associate professor.

Ayudante doctor Positive evaluation of **ANECA - Agencia Nacional de Evaluación de la Calidad y Acreditación** for the role of assistant professor.

Other merits and contributions

Reviewer for JCR indexed journals

IEEE Transactions on automatic control.
Systems and Control Letters.
SIAM Journal on Control and Optimization.
Applied Mathematics and Optimization.
Mathematical Methods in the Applied Sciences.
Journal de Mathématiques Pures et Appliquées.
ESAIM: Control, Optimization and Calculus of Variations.

Mathematical Control and Related Fields.
Advances in Difference Equations.

Dissemination activity

Models involving memory terms and hybrid PDE/ODE systems. Dissemination video on my research activity in the field of control theory for differential equations with memory effects (**link**).

Attended courses and schools

Jan. 14-15, 2019 **Control of PDEs under uncertainty**, *Intensive course held by Prof. Jesús Martínez-Frutos and Francisco Periago (Polytechnic University of Cartagena, Spain)*, Bilbao,Basque Country, Spain.

Jan. 10-15, 2016 **Geometric PDEs and their approximation**, *Winter school*, Texas A&M University, College Station, U.S.

Oct. 2014-Jun. 2015 **Topics on PDEs, control and numerics**, *Advanced course held by Prof. Enrique Zuazua*, Bilbao, Basque Country, Spain.

Jun. 24-28, 2013 **Nonlinear water waves**, *2013 C.I.M.E. summer school*, Cetraro (CS), Italy.

May 27-31, 2013 **An introduction to finite elements methods**, *BCAM advanced course held by Prof. Sergey Korotov (BCAM)*, Bilbao, Basque Country, Spain.

May 6-10, 2013 **An introduction to viscosity solutions for fully non-linear PDEs and applications to calculus of variations in L^∞**, *BCAM advanced course held by Prof. Nikolaos Katzourakis (University of Reading)*, Bilbao, Spain.

Apr. 29-May 3, 2013 **Numerical methods for SPDE**, *BCAM advanced course held by Prof. Max. Gunzburger (Florida State University)*, Bilbao, Basque Country, Spain.

Apr. 8-12, 2013 **An introduction to domain decomposition methods for PDEs**, *BCAM advanced course held by Dr. Luca Gerardo-Giorda (BCAM)*, Bilbao, Basque Country, Spain.

Jun. 11-15, 2012 **6$^{\text{th}}$ edition of the MODELLING WEEK**, *Universidad Complutense de Madrid - Faculty of Mathematics*, Madrid, Spain.