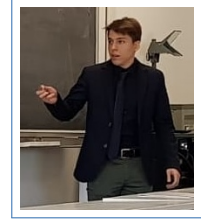


Bruno Degli Esposti

*Postdoctoral researcher
in mathematics*

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CV compatible with European format. Last updated on 8th of October, 2025.

Professional Profile

Junior postdoctoral researcher (*assegnista di ricerca*) in numerical analysis at the Department of Mathematics and Computer Science *Ulisse Dini* of the University of Florence, under the supervision of Prof. Alessandra Sestini. My main research interests are Isogeometric Analysis combined with the Boundary Element Method (IgA-BEM), high-order quadrature formulas on scattered nodes, meshless domain discretization of 3D CAD geometries, stable meshless schemes for advection-dominated PDEs, and high-performance computing (HPC).

Personal Details

Gender: Male.
Nationality: Italian.
Date of birth: 29th of July, 1996.
Place of birth: Prato (PO), Italy.

Education and Professional Experience

11/2024 – present Postdoctoral researcher (*assegnista di ricerca*) in numerical analysis at the Department of Mathematics and Computer Science *Ulisse Dini* of the University of Florence, under the supervision of Prof. Alessandra Sestini. Title of the research project: *Hierarchical matrix compression techniques and parallel fast implementations of efficient multi-patch IgA-BEM numerical solvers of some 3D differential problems*.

11/2021 – 10/2024 Doctoral degree *summa cum laude* in mathematics under the supervision of Prof. Alessandra Sestini (University of Florence) and Prof. Dr. Oleg Davydov (Justus-Liebig-Universität Giessen). Fourteen months spent in Giessen (Germany) for research purposes, as part of an official cotutelle agreement. Title of the thesis: *Domain discretization and moment-free quadrature for meshless methods*. Date of defense: 21/03/2025.

10/2018 – 10/2021 Master's degree in mathematics at the University of Florence. Weighted mean of grades: 29.8/30. Final grade: 110/110 with honors. Title of the thesis: *Numerical solution of the 2D compressible Euler equations using WENO reconstructions on polygonal meshes*. Supervisor: Prof. Alessandra Sestini.

10/2019 – 03/2020 Erasmus semester at FAU Erlangen-Nürnberg, Germany. Courses on advanced FEM and FVM, control and numerics of PDEs, optimization with PDEs, High Performance Computing (HPC), and inverse problems.

- 10/2015 – 10/2018 Bachelor's degree in mathematics at the University of Florence. Weighted mean of grades: 29.76/30. Final grade: 110/110 with honors. Title of the thesis: *Lattice-based cryptographic attacks*. Supervisor: Prof. Orazio Puglisi.
- 2011 – 2015 High school diploma from Liceo Scientifico Niccolò Copernico, Prato. Final grade: 100/100 with honors.

Scholarships and Awards

- 2018 – 2020 Two-year-long scholarship from INdAM (Italian national institute of higher mathematics) for young researchers.
- 2018 Graduation prize from the department of Mathematics and Computer Science *Ulisse Dini*, University of Florence, 1st place.
- 2018 Graduation prize from the University of Florence.
- 2015 – 2018 Three-year-long scholarship from INdAM (Italian national institute of higher mathematics).

Affiliations and Research Funding

- 2022 – present Member of the national group for scientific computing (GNCS) of the Italian national institute of higher mathematics F. Severi (INdAM).
- 2025 Funded member of the annual project GNCS 2025 *High-order BEM based numerical techniques for wave propagation problems*. Coordinator: Prof. Luca Desiderio, University of Messina.
- 2024 Member of Cineca class C ISCRA project *Efficient quadrature and matrix compression techniques for multi-patch IgA-BEM on 3D domains*, code HP10CEJK9J. Access to Galileo100 supercomputing cluster from 09/24 to 09/25. Principal investigator Prof. Alessandra Sestini.
- 2024 Funded member of the annual project GNCS 2024 *Tecniche numeriche efficienti per problemi differenziali avanzati: BEM e paradigma isogeometrico*. Coordinator: Prof. Maria Lucia Sampoli, University of Siena.
- 2022 Funded member of the annual project GNCS 2022 *Verso nuove frontiere dell'analisi isogeometrica*. Coordinator: Prof. Francesca Pelosi, University of Rome Tor Vergata.

Peer-Reviewed Publications

- ORCID <https://orcid.org/0000-0002-1017-3277>
- 2025 Davydov, O., & Degli Esposti, B. (2025). *Meshless moment-free quadrature formulas arising from numerical differentiation*. Computer Methods in Applied Mechanics and Engineering, 445, 118199.
- 2023 Degli Esposti, B., Falini, A., Kanduč, T., Sampoli, M. L., & Sestini, A. (2023). *IgA-BEM for 3D Helmholtz problems using conforming and non-conforming multi-patch discretizations and B-spline tailored numerical integration*. Computers & Mathematics with Applications, 147, 164-184.

Editorial and Reviewing Service

- 2025 - present Reviewer for Computers & Mathematics with Applications (CAMWA).

Event Organization Activities

24/09/2025 Organizer of the mini-symposium *Advances in approximation theory and its applications* at the fifth edition of the Young Applied Mathematicians Conference (YAMC25), Padova, Italy. Five contributed talks on the efficient solution of reaction-diffusion PDEs, data modelling using adaptive kernel-based methods, stability in polynomial histopulation, multiresolution graph signal analysis, and optimal preconditioners for quaternion Toeplitz systems.

Conference Presentations and Posters

02/10/2025 Contributed talk at the SMART conference 2025, Reggio Calabria, Italy. Title of the talk: *A decoupled meshless Nyström scheme for 2D Fredholm integral equations of the 2nd kind with smooth kernels*.

23/09/2025 Contributed talk at the fifth edition of the Young Applied Mathematicians Conference (YAMC25), Padova, Italy. Title of the talk: *Bayesian estimation of convergence rates in numerical methods*.

09/09/2025 Contributed talk at the Dolomites Research Week on Approximation and Applications 2025, Alba di Canazei, Italy. Title of the talk: *Moment-free approximation of linear functionals*.

02/09/2025 Contributed talk at the 2025 edition of the biennial congress of the Italian Society of Applied and Industrial Mathematics (SIMAI), Trieste, Italy. Title of the talk: *A decoupled meshless Nyström scheme for 2D Fredholm integral equations of the second kind with smooth kernels*.

23/05/2025 Contributed poster presentation at the ICSC observatory event Supercomputing, Data Science and AI: from Innovation to Technological Transfer, Firenze, Italy. Title of the poster: *Advances in the efficiency of high-order schemes for integral equations in 2D and 3D*.

07/02/2025 Contributed talk at the workshop Software for Approximation SA2025, Turin, Italy. Title of the talk: *A meshless Nyström scheme for Fredholm integral equations of the second kind with smooth kernels*.

18/09/2024 Contributed long talk at the fourth edition of the Young Applied Mathematicians Conference (YAMC24), Rome, Italy. Title of the talk: *Point cloud generation algorithm for 3D domains in B-Rep format*.

10/09/2024 Contributed talk at the 6th Dolomites Workshop on Constructive Approximation and Applications (DWCAA24), Alba di Canazei, Italy. Title of the talk: *Meshless quadrature formulas for regular and singular integrals*.

26/06/2024 Contributed talk at the 10th International Conference on Mathematical Methods for Curves and Surfaces, Oslo, Norway. Title of the talk: *Meshless quadrature formulas arising from numerical differentiation*.

26/09/2023 Contributed poster presentation at the Two-day Workshop on Approximation Theory 2023, Giessen, Germany. Title of the poster: *Meshless quadrature formulas arising from numerical differentiation formulas*.

22/09/2023 Contributed talk at the third edition of the Young Applied Mathematicians Conference (YAMC23), Siena, Italy. Title of the talk: *Meshless quadrature formulas arising from numerical differentiation formulas*.

18/09/2023	Contributed talk at the Dolomites Research Week on Approximation and Applications 2023, San Vito di Cadore, Italy. Title of the talk: <i>Meshless quadrature formulas arising from numerical differentiation formulas</i> .
21/06/2023	Contributed talk at the 11th International Conference on IsoGeometric Analysis, Lyon, France. Title of the talk: <i>Improvements to the flexibility of a 3D multi-patch IgA-BEM approach</i> .
13/03/2023	Contributed talk at the International Conference on Multivariate Approximation 2023, Schloss Rauischholzhausen, Germany. Title of the talk: <i>Improvements to the flexibility of a 3D multi-patch IgA-BEM approach</i> .
23/09/2022	Contributed talk at the SMART conference 2022, Rimini, Italy. Title of the talk: <i>3D IgA-BEM with nonconformal C^0 multipatch spline spaces</i> .

Other Conferences, Workshops, and Courses Attended

November 2024	Participant at one-day workshop <i>Introduction to MATLAB on HPC systems at Cineca</i> organized by the national supercomputing centre for scientific research Cineca, Casalecchio di Reno, Italy.
June 2024	Participant at 2nd CINI Summer School on High-Performance Computing and Emerging Technologies, University of Trento.
December 2022	Participant at Workshop on Polytopal Element Methods in Mathematics and Engineering (POEMS 2022), Politecnico di Milano.
February 2022	Enrollment in PhD-level course Methods for Parallel Programming (6 ECTS), lecturer Osvaldo Gervasi, University of Perugia. Final project is a parallel conjugate gradient solver in NumPy and MPI4py for the solution of a 1D elliptic problem, with tests on a domestic MPI cluster.
December 2021	Participant at Numerical Aspects of Hyperbolic Balance Laws and Related Problems – Young Researchers Conference, event organized by the University of Verona, online attendance.
July 2021	Participant at Industrial Problem Solving with Physics 2021, a one-week event aimed at boosting the connection between university and industry. Work done on novel solutions to technological problems proposed by the automotive company AnteMotion.
June 2019	Participant at the XIII Modeling Week at Universidad Complutense of Madrid, Spain. Problem 4: <i>Steel heat treating: industrial process, mathematical modeling, free software implementation and numerical simulation</i> under the supervision of Prof. Francisco Ortégón Gallego.

Supervision of Students

01/2022 – 12/2022	Co-advisor of a master's thesis in physics at the university of Florence. Candidate: Mauro Giliberti. Advisors: Prof. Aldo Lorenzo Cotrone, Dr. Francesco Bigazzi. Title of the thesis: <i>Numerical solution of bubble dynamics in holographic vacuum decay</i> .
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Language Skills

<i>Italian:</i>	Native speaker.
<i>English:</i>	C2 Level, CAE University of Cambridge, Grade A.
<i>Spanish:</i>	B1 Level, University Language Centre (CLA) University of Florence.

Chinese: A1 Level, HSK Chinese Proficiency Test, 200/200.

Software Projects and Digital Skills

GitHub profile: <https://github.com/BrunoDegliEsposti>

NodeGenLib: NodeGenLib is a header-only C++ library and a collection of MATLAB MEX functions to generate scattered nodes on complex 2D and 3D domains using an advancing front method. Its aim is to make it easier to run numerical simulations and solve practical problems using meshless/meshfree methods on challenging geometries. CAD models in STEP file format are natively supported. Available under version 3 of the LGPL license at <https://github.com/BrunoDegliEsposti/NodeGenLib>

Basic proficiency: Fortran 90/95, Javascript, Bash, Web development.

Intermediate: Python, NumPy, MPI, OpenMP, CUDA, Linux server administration (Debian), Version control software (Git), Build systems (CMake).

Advanced: C, C++, MATLAB, MEX API, BLAS, LAPACK, L^AT_EX.