Curriculum Vitae

Personal Information

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Positions and cursus

Since 1 June 2020 I am Full Professor (Professore Ordinario) at Università di Pisa (Italy).

2019 – 2020. I was Associate Professor (Professore Associato) at
Università degli Studi di Napoli Federico II (Naples, Italy).

2014 – 2019. I was Assistant Professor (Maître de Conférences) at
Laboratoire Jean Kuntzmann - Université Grenoble Alpes (Grenoble, France).

2014 – 2014. I spent six months as Post-doc in Shape Optimization at Università di Pisa .

2010 – 2013. PhD at Scuola Normale Superiore and, since 2012, also at Université de Savoie with advisors Giuseppe Buttazzo and Dorin Bucur; discussion: 8 Nov 2013 in Pisa; mention: 70/70 cum Laude.

2005 – 2010. I was *Student in Mathematics* at SNS and I graduated with 70/70 cum Laude in 2010; as every SNS student, I was also a student at the University of Pisa:

- 2008 – 2010. Master in Mathematics - Università di Pisa (110/110 cum Laude);
- 2005 – 2008. Bachelor in Mathematics - Università di Pisa (110/110 cum Laude).

Honors and awards

2025. ERC Consolidator Grant
2024. Fubini Prize 2024.
2020. Book Prize UMI for my book *"Regularity of the one-phase free boundaries"* (Springer, 2023).
2019. ERC Starting Grant.
2013. My PhD Thesis *"Existence and Regularity Result for Some Shape Optimization Problems"* was selected for publication in Edizioni della Normale (Springer, 2015).

PhD students

Nuno Carneiro (since 2025; Università di Pisa, FCT);
Maria Antonietta Palladino (since 2024; Scuola Normale Superiore);
Federico Lai (since 2024; Università di Pisa);
Filippo Paiano (since 2023; Università di Pisa);
Matteo Carducci (since 2023; Scuola Normale Superiore);
Lorenzo Ferreri (since 2022; Scuola Normale Superiore);
François Générau (2017-2020; Université Grenoble Alpes); co-supervised with Edouard Oudet;
Baptiste Trey (2016-2020; Université Grenoble Alpes); co-supervised with Emmanuel Russ.

Post-docs

Giulia Bevilacqua (1 Sept 2022 – 31 Jan 2026);
Carlo Gasparetto (1 April 2023 – 30 April 2025);
Luca Benatti (1 Feb 2023 – 31 Jan 2024; co-supervised with Alessandra Pluda);
Roberto Ognibene (1 Feb 2022 – 31 March 2025);
Joseph Feneuil (1 Sept 2021 – 9 July 2022);
Giorgio Tortone (1 March 2021 – 28 Feb 2025).

Selected results

Logarithmic epiperimetric inequalities for the obstacle and the thin-obstacle problems

[CSV1] M. Colombo, L. Spolaor, B. Velichkov. *A logarithmic epiperimetric inequality for the obstacle problem.* **Geom. Funct. Anal.** 28 (4) (2018), 1029–1061.

[CSV2] M. Colombo, L. Spolaor, B. Velichkov. *Direct epiperimetric inequalities for the thin obstacle problem and applications.* **Comm. Pure. Appl. Math.** 73 (2) (2020), 384–420.

Regularity theory for one-phase free boundary problems

[FTV] L. Ferreri, G. Tortone, B. Velichkov. *A capillarity one-phase Bernoulli free boundary problem.* Preprint ArXiv (2023).

[FV] L. Ferreri, B. Velichkov. *Regularity for one-phase Bernoulli problems with discontinuous weights and applications.* **Trans. Amer. Math. Soc.** (2024), to appear.

[ESV] M. Engelstein, L. Spolaor, B. Velichkov. *Uniqueness of the blow-up at isolated singularities for the Alt-Caffarelli functional.* **Duke Math. J.** 169 (8) (2020), 1541–1601.

Regularity theory for two-phase free boundary problems

[SV] L. Spolaor, B. Velichkov. *An epiperimetric inequality for the regularity of some free boundary problems: the* 2*-dimensional case.* **Comm. Pure. Appl. Math.** 72 (2) (2018), 375–421.

[DSV1] G. De Philippis, L. Spolaor, B. Velichkov. *Regularity of the free boundary for the two-phase Bernoulli problem.* **Invent. Math.** 225 (2021), 347–394.

[DSV2] G. De Philippis, L. Spolaor, B. Velichkov. *(Quasi-)conformal methods in two-dimensional free boundary problems.* **J. Eur. Math. Soc.** (2024), doi: 10.4171/JEMS/1435

Regularity theory for vectorial Bernoulli problems and free boundary systems

[MTV1] D. Mazzoleni, S. Terracini, B. Velichkov. *Regularity of the optimal sets for some spectral functionals.* **Geom. Funct. Anal.** 27 (2017), 373–426.

[MTV2] D. Mazzoleni, S. Terracini, B. Velichkov. *Regularity of the free boundary for the vectorial Bernoulli problem.* **Anal. PDE** 13 (3) (2020), 741–764.

[MTV3] F. Maiale, G. Tortone, B. Velichkov. *Epsilon-regularity for the solutions of a free boundary system.* **Rev. Mat. Iberoam.** 39 (5) (2023), 1947–1972.

Regularity of optimal shapes

[BMMTV] G.Buttazzo, F. Maiale, D. Mazzoleni, G. Tortone, B. Velichkov. *Regularity of the optimal sets for a class of integral shape functionals.* **Arch. Rat. Mech. Anal.** (2024), to appear.

[MTV4] D. Mazzoleni, B. Trey, B. Velichkov. *Regularity of the optimal sets for the second Dirichlet eigenvalue.* **Ann. Inst. H. Poincaré Anal. Non Linéaire** 39 (3) (2022), 529–573.

[RTV] E. Russ, B. Trey, B. Velichkov. *Existence and regularity of optimal shapes for elliptic operators with drift.* **Calc. Var. PDE** 58 (2019).

[BMPV] D. Bucur, D. Mazzoleni, A. Pratelli, B. Velichkov. *Lipschitz regularity of the eigenfunctions on optimal domains.* **Arch. Rat. Mech. Anal.** 216 (2015), 117–151.

Regularity theory for optimal partition problems

[OV2] R. Ognibene, B. Velichkov. Structure of the free interfaces near triple junction singularities in harmonic maps and optimal partition problems. Preprint ArXiv (2024).

[OV1] R. Ognibene, B. Velichkov. Boundary regularity of the free interface in spectral optimal partition problems. Preprint ArXiv (2024).

Free boundary minimal surfaces

[BSV] G. Bevilacqua, S. Stuvard, B. Velichkov. Classical solutions to the soap film capillarity problem for plane boundaries. **Math. Ann.** 392 (2025), 4607–4659.

Mini courses

- "Free boundary regularity for the one-phase Bernoulli problem" (6 hours).
  Summer school "Free boundary problems and related topics" (ETH Zürich, 2022).
- "Regularity of the one-phase free boundaries" (6 hours).
  Summer school "Shape optimization, control and inverse problems for PDEs" (Naples, 2019).

Selected talks

- "Regularity up to the boundary for optimal partition problems"
  Workshop Calculus of Variations (Oberwolfach, 2024).
- "On the fine structure of the two-phase free boundaries"
  Workshop Partial Differentials Equations (Oberwolfach, 2023).
- "Free boundary clusters with two phases" MSRI Workshop "Regularity Theory for Minimal Surfaces and Mean Curvature Flow" - online (22/3/2022).
- "An epsilon-regularity theorem for the solutions of a vectorial free boundary system"
  Workshop Partial Differentials Equations (Oberwolfach, 2021).
- "Vectorial free boundary problems and regularity of the optimal sets for the eigenvalues of the Dirichlet Laplacian". One world PDE Seminar - online (2/3/2021).
- "Regularity of the two-phase free boundaries."
  Workshop Calculus of Variations (Oberwolfach, 2020).
- "Regularity of the two-phase free boundaries."
  XXX Convegno Nazionale di Calcolo delle Variazioni (Levico Terme, 2020).
- "On the logarithmic epiperimetric inequality."
  Partial Differentials Equations (Oberwolfach, 2019).
- "On the logarithmic epiperimetric inequality."
  XXIX Convegno Nazionale di Calcolo delle Variazioni (Levico Terme, 2019).
- Approche variationnelle à la régularité des frontières libres singulières.
  Laboratoire Jacques-Louis Lions (05/02/2018).
- "Variational approach to the regularity of the singular free boundaries."
  Seminar at ETH Zürich, 13/03/2018.
- "Recent results on the regularity of the free boundary of the obstacle problem."
  Calculus of Variations at Paris-Diderot (Paris, 2018).
- "Regularity of the free boundaries around isolated singularities."
  Seminar at Université Paris Sud - Orsay, 26/01/2018.
- "Regularity of the optimal sets for spectral functionals."
  Seminar at Max Planck Institut Leipzig, 13/05/2016.
- "Regularity of the optimal sets for spectral functionals."
  Seminar at Universität Zürich, 13/04/2016.Séminaire Parisien d'Optimisation, 6/10/2014.

Organization of workshops and conferences

Regularity Theory for Free Boundary and Geometric Variational Problems – one week conferences; 21 speakers per event; 5 editions: 2021 (Levico), 2022 (Pisa), 2023 (Levico), 2024 (Levico), 2025 (Cervia); jointly organized with Giulia Bevilacqua, Roberto Ognibene, Luca Spolaor.

Calculus of Variations and Free Boundary Problems – one day workshops; two in 2025 (Pisa); three in 2024 (Pisa); two in 2023 (Pisa); one in 2022 (Pisa), 2019 (Napoli), 2018 (Grenoble), 2017 (Grenoble); a complete list can be found here: http://www.velichkov.it/events.html

Projects

PI of an ERC Starting Grant project (2020-2025). PI of the project ERC Starting Grant "VAREG - Variational approach to the regularity of the free boundaries" (project number: 853404; duration: 66 months; volume 1,330 kE; starting date: 1 June 2020; host institution: Università di Pisa; web page: http://www.velichkov.it/vareg.html).

Local Coordinator of a national PRIN project (2023-2025). Local Coordinator (for Università di Pisa) of the project PRIN 2022 "NO^3 - Nodal Optimization, NOnlinear elliptic equations, NOnlocal geometric problems, with a focus on regularity" financed by MIUR (volume 200kE; duration: 24 months; PI: Nicola Soave).

PI of a project at University of Pisa (2022-2024). PI of the project PRA "GeoDom - Geometric evolution problems and PDEs on variable domains" financed by the University of Pisa (duration: 24 months; volume 50 kE; web page: http://www.velichkov.it/geodom.html).

Local Coordinator of a national ANR project (2018-2019). Local Coordinator (for Laboratoire Jean Kuntzmann – Université Grenoble Alpes) of the project ANR "ShapO - Shape Optimization" financed by the French National Research Agency - ANR (duration: 48 months; starting date: 10/2018; volume 300 kE; PI: Jimmy Lamboley).

PI of a project at Université Grenoble Alpes (2015-2016). PI of "VariForm - Méthodes Variationnelles en Optimisation de Formes" (Université Grenoble Alpes, 24 months, 15 kE).

Participation to other national projects. Member of the projects ANR "Geospec - Geometry and Spectral Optimization" (2016-2020) and ANR "CoMeDiC - Convergent Metrics for Digital Calculus" (2015-2020) financed by the French National Research Agency - ANR.

Selection committees and administration

PhD school in Mathematics (University of Pisa).

Since 11/2022 I am deputy coordinator of the PhD school in Mathematics at the Department of Mathematics, University of Pisa, appointed by the coordinator Roberto Frigerio.

In 2025 I was member (with Cecilia Pagliantini and Michele D'Adderio) of the selection committee for the entrance exam of the PhD school in Mathematics for the academic year 2025/2026.

In 2024 I was member (with Carlo Petronio and Cecilia Pagliantini) of the selection committee for the entrance exam of the PhD school in Mathematics for the academic year 2024/2025.

Selection committees at Scuola Normale Superiore.

In Sept 2020 and Sept 2022 I was member of the evaluation committees for the entrance exams (for the 1st and 4th years) at Scuola Normale Superiore respectively for the academic years 2020/2021 (chair: Franco Flandoli) and 2022/2023 (chair: Angelo Vistoli).

Referee of PhD thesis.

2024. Federico Franceschini (ETH Zürich; advisors: Alessio Figalli and Joaquim Serra);
2024. Clara Torres Latorre (Universitat de Barcelona; advisor: Xavier Ros-Oton);
2018. Harish Shrivastava (Università di Pisa; advisor: Giuseppe Buttazzo);

Selection committees for permanent positions.

2022. Call for Associate Professor (Professore Associato) at Università di Torino.

2021. Call for Full Professor (Professore Ordinario) at Università di Pisa.

2021. Call for a Tenure-Track (RTDB) position at Università di Torino.