

Personal Information

 <https://www.elisasovrano.it>
 <http://personale.unimore.it/Rubrica/dettaglio/elisasovrano>
 elisasovrano@gmail.com  elisa.sovrano@unimore.it
 <https://orcid.org/0000-0003-4085-9103>

Scientific production indicators

Scopus – documents: 22; total citations: 161; h-index: 7.

Google scholar – total citations: 215; h-index: 9.

Introduction

My research is driven in the area of nonlinear analysis concerning the theory of ordinary and partial differential equations and dynamical systems. I am interested in applications in the field of population dynamics and biology applications. I deal with dynamical systems theory, topological and variational methods, and bifurcation techniques to investigate:

- existence, multiplicity, and qualitative properties of solutions to semilinear and quasilinear elliptic boundary value problems;
- existence and regularity of solutions to nonlinear parabolic problems (e.g., reaction-diffusion equations associated with nonlinear diffusion);
- chaotic dynamics in discrete and continuous dynamical systems.

Academic career

2022/09/01–to date: Assistant professor (Researcher RTdB) at the Department of Sciences and Method for Engineering, Univ. Modena and Reggio Emilia (Italy).

2021/11/01–2022/08/31: Postdoc researcher at the Department of Sciences and Method for Engineering, Univ. Modena and Reggio Emilia (Italy). *Supervised by L. Malaguti.*

2019/11/01–2021/10/31: Postdoc researcher funded by FSMP (Fondation Sciences Mathématiques de Paris) at CNRS (Centre National de la Recherche Scientifique) – CAMS (Centre d'Analyse et de Mathématique Sociales) – EHESS (École des Hautes Études en Sciences Sociales), Paris (France). *Supervised by H. Berestycki.*

2019/01/01–2019/10/31: Postdoc researcher funded by INdAM (Istituto Nazionale di Alta Matematica) at the Department of Mathematics and Geosciences, Univ. Trieste (Italy). *Supervised by P. Omari.*

2018/07/01–2018/12/31: Postdoc researcher at CMUP (Centre for Mathematics of Univ. Porto), Porto (Portugal). *Supervised by I.S. Labouriau.*

2018/03/07–2018/04/11: Visiting researcher at CMAF-CIO (Center for Mathematics, Fundamental Applications and Operations Research), Univ. Lisbon (Portugal).

2018/02/26: PhD (cum laude) in Computer Science, Mathematics and Physics, Univ. Udine (Italy). Mention Doctor Europaeus. Title of the thesis: Nonlinear differential equations having non-sign-definite weights. *Supervised by F. Zanolin.*

2014/03/19: MSc (cum laude) in Mathematics, Univ. Udine (Italy). Title of the thesis: Snap-back repellers. *Supervised by F. Zanolin.*

Scientific qualification

2020/11/09–2029/11/09: Italy National Scientific Habilitation as Associate Professor – **ASN 2018-2020**
“Settore Concorsuale 01/A3 - II Fascia” (certificate: <http://bit.ly/ASN-ES>).

Papers

- [25] E. Muñoz-Hernández, V. Sovrano, V. Taddei. Coupled reaction-diffusion equations with degenerate diffusivity: wavefront analysis. **To appear in Nonlinearity**, 2025.
- [24] F. Colasuonno, B. Noris, E. Sovrano. Continuous dependence for p -Laplace equations with varying operators. **Discrete Contin. Dyn. Syst. Ser. S**, 2024.
- [23] A. Corli, L. Malaguti, E. Sovrano, Wavefronts for Generalized Perona-Malik Equations. **Hyperbolic problems: theory, numerics, applications**, Vol I, HYP2022, 2024
- [22] M. Garrione, E. Sovrano. Stationary fronts and pulses for multistable equations with saturating diffusion. **NoDEA Nonlinear Differential Equations Appl.**, 30(2), 31, 2023.
- [21] E. Liz, E. Sovrano. Stability, bifurcations and hydra effects in a stage-structured population model with threshold harvesting. **Commun. Nonlinear Sci. Numer. Simul.**, 109(106280), 15 pp., 2022.
- [20] A. Corli, L. Malaguti, E. Sovrano. Wavefront solutions to reaction-convection equations with Perona-Malik diffusion. **J. Differential Equations**, 308, 474–506, 2022.
- [19] G. Feltrin, E. Sovrano, A. Tellini. On the number of positive solutions to an indefinite parameter-dependent Neumann problem. **Discrete Contin. Dyn. Syst.**, 42(1), 21–71, 2022.
- [18] I. Coelho, C. Rebelo, E. Sovrano, Extinction or coexistence in periodic Kolmogorov systems of competitive type. **Discrete Contin. Dyn. Syst.**, 41(12), 5743–5764, 2021.
- [17] P. Omari, E. Sovrano. Positive solutions of superlinear indefinite prescribed mean curvature problems. **Commun. Contemp. Math.**, 23:03, 2050017, 2021.
- [16] E. Sovrano. How to Construct Complex Dynamics? A Note on a Topological Approach. **Internat. J. Bifur. Chaos Appl. Sci. Engrg.**, 30(2):2050034, 7, 2020.
- [15] P. Omari, E. Sovrano. Positive solutions of indefinite logistic growth models with flux-saturated diffusion. **Nonlinear Anal.**, 201:111949, 26, 2020.
- [14] I. S. Labouriau, E. Sovrano. Chaos in periodically forced reversible vector fields. **J. Singul.**, 22:227–240, 2020.
- [13] A. Boscaggin, G. Feltrin, E. Sovrano. High Multiplicity and Chaos for an Indefinite Problem Arising from Genetic Models. **Adv. Nonlinear Stud.**, page 000010151520202094, 2020.
- [12] G. Feltrin, E. Sovrano, F. Zanolin. Periodic solutions to parameter-dependent equations with a ϕ -Laplacian type operator. **NoDEA Nonlinear Differential Equations Appl.**, 5(5):Paper No. 38, 27, 2019.
- [11] E. Sovrano, F. Zanolin. Ambrosetti-Prodi periodic problem under local coercivity conditions. **Adv. Nonlinear Stud.**, 18(1):169–182, 2018.
- [10] E. Sovrano. A negative answer to a conjecture arising in the study of selection-migration models in population genetics. **J. Math. Biol.**, 76(7):1655–1672, 2018.
- [9] E. Sovrano. Ambrosetti-Prodi type result to a Neumann problem via a topological approach. **Discrete Contin. Dyn. Syst. Ser. S**, 11(2):345–355, 2018.
- [8] G. Feltrin, E. Sovrano. Three positive solutions to an indefinite Neumann problem: a shooting method. **Nonlinear Anal.**, 166:87–101, 2018.
- [7] G. Feltrin, E. Sovrano. An indefinite nonlinear problem in population dynamics: High multiplicity of positive solutions. **Nonlinearity**, 31(9):4137–4161, 2018.
- [6] E. Sovrano, F. Zanolin. A periodic problem for first order differential equations with locally coercive nonlinearities. **Rend. Istit. Mat. Univ. Trieste**, 49:335–355, 2017.
- [5] E. Sovrano, F. Zanolin. Indefinite weight nonlinear problems with Neumann boundary conditions.

J. Math. Anal. Appl., 452(1):126–147, 2017.

- [4] E. Sovrano, F. Zanolin. The Ambrosetti-Prodi periodic problem: Different routes to complex dynamics. **Dynam. Systems Appl.**, 26:589–626, 2017.
- [3] E. Sovrano. About Chaotic Dynamics in the Twisted Horseshoe Map. **Internat. J. Bifur. Chaos Appl. Sci. Engrg.**, 26(6):1650092, 10, 2016.
- [2] E. Sovrano, F. Zanolin. Remarks on dirichlet problems with sublinear growth at infinity. **Rend. Istit. Mat. Univ. Trieste**, 47:267–305, 2015.
- [1] E. Sovrano, F. Zanolin. Dolcher fixed point theorem and its connections with recent developments on compressive/expansive maps. **Rend. Istit. Mat. Univ. Trieste**, 46:101–121, 2014.

Preprints

- [4] A. Corli, M. Garrione, E. Sovrano. Traveling waves for a triangular system of convection-diffusion equations.
- [3] A. Makki, E. Sovrano. Wavefronts for equations with Perona-Malik type diffusions and bistable reactions.
- [2] L. Malaguti, E. Sovrano. Wavefronts in coupled degenerate reaction-diffusion equations for bacterial growth models.
- [1] H. Berestycki, E. Sovrano. Reaction-diffusion equations with transmission conditions.

Peer reviewing

Certified reviews on Publons for international journals: Advances in Difference Equations; Boundary Value Problems; Mathematische Nachrichten; Open Mathematics; Rocky Mountain Journal of Mathematics; Discrete Continuous Dyn. Syst. Ser. S

Conferences & Seminars

Communications (IT: invited talk; CT: contributed talk; P: poster)

2024	<p>VIII Symposium on Nonlinear Analysis, (Toruń, Poland, 2024/06/17–21). IT: <i>Wavefront for reaction-diffusion systems with degenerate diffusivity</i>.</p> <p>Workshop Modeling, Control and Games through Partial Differential Equations, (Brescia, Italy, 2024/04/17–18). IT: <i>Wavefront for systems of reactive-diffusive equations with degenerate diffusivity</i>.</p>
2023	<p>Differential equations and dynamics in Alba (in honor of the career of Fabio Zanolin), (Alba, Italy, 2023/09/11–13). IT: <i>A journey on Ambrosetti-Prodi problems and chaotic dynamics</i>.</p> <p>Workshop Nonlinear Partial Differential Equations and Dynamical Systems, (Madrid, Spain, 2023/06/12–14). IT: <i>Flux-saturated diffusion's influence on stationary fronts and pulses in multistable reaction-diffusion equations</i>.</p> <p>13th AIMS Conference on Dynamical Systems Differential Equations and Applications, (Wilmington, NC USA, 2023/05/31–06/04). ITs: <i>Impact of threshold harvesting on the dynamics of age-structured populations; Wavefront analysis for reactive-convective Perona-Malik equations</i>.</p>
2022	<p>Equadiff15, (Brno, Czech Republic, 2022/07/11–15). IT: <i>Reactive-convective Perona-Malik equations: regular vs. nonregular wavefronts</i>.</p> <p>Non-linear elliptic PDE in Hauts-de-France, (Valenciennes, France, 2022/06/27–30). IT: <i>Positive solutions to logistic indefinite problems driven by the mean curvature operator</i>.</p> <p>Second mini-workshop on Differential Equations and Dynamical Systems - Working on some recent trends, (Foz do Arelho, Portugal, 2022/04/20–22). IT: <i>Reaction-convection equations with non-monotone diffusion: what are the consequences of this diffusion on wavefronts?</i>.</p>
2021	<p>Two Days Workshop in Nonlinear Analysis 2021, (Zoom, 2021/09/02–03). IT: <i>Wavefronts for the reactive-convective Perona-Malik equation</i>.</p> <p>Nonlinear Phenomena: between ODEs and PDEs (INdAM Workshop), (Zoom, 2021/06/07–09). IT: <i>Wavefronts for the reactive-convective Perona-Malik equation</i>.</p>
2019	<p>International Workshop on Differential Equations (Lisbon, Portugal, 2019/09/05–06) CT: <i>Positive solutions of a superlinear indefinite prescribed mean curvature problem</i>.</p>

	International Conference on Differential & Difference Equations and Applications (Lisbon, Portugal, 2019/07/01–05/07). IT: <i>An indefinite nonlinear problem in population genetics: high multiplicity and chaos.</i>
2018	<p>ReaDi meeting: Reaction-diffusion equations, Modelling and Social sciences (Paris, France, 2018/12/06–07). IT: <i>Multiplicity of positive solutions for indefinite nonlinear problems in population genetics.</i></p> <p>Giornate di Equazioni Differenziali Ordinarie: metodi e prospettive (Ancona, Italy, 2018/09/27–29). IT: <i>About indefinite Neumann problems with oscillating nonlinear potentials: multiplicity of positive solution.</i></p> <p>International Conference on Nonlinear Analysis and Boundary Value Problems (Santiago, Spain, 2018/09/04–07). IT: <i>Chaos in a family of difference equations: a topological proof.</i></p> <p>11th European Conference on Mathematical and Theoretical Biology (Lisbon, Portugal, 2018/07/23–27). Poster: <i>High multiplicity of positive solutions to indefinite problems arising in population genetics.</i></p> <p>12th AIMS Conference on Dynamical Systems Differential Equations and Applications (Taipei, Taiwan, 2018/07/05–09). ITs: <i>Ambrosetti-Prodi type result under local coercivity conditions; Existence and multiplicity of periodic solutions to local coercive equations with a ϕ-Laplacian type operator.</i></p> <p>Mini-workshop on ExtraOrdinary Differential Equations (Lisbon, Portugal, 2018/03/28–30). IT: <i>Multiplicity of positive solutions for some indefinite problems.</i></p> <p>9th Workshop DSABNS (Torino, Italy, 2018/02/07–09). CT: <i>Indefinite nonlinear weight problems in population genetics.</i></p>
2017	<p>Intensive week of PDEs at Spa (Spa, Belgium, 2017/12/11–15). IT: <i>Indefinite nonlinear problems in population genetics: multiplicity of positive solutions.</i></p> <p>Equadiff 2017 (Bratislava, Slovakia, 2017/07/24–28). Poster: <i>Ambrosetti-Prodi boundary value problems: multiplicity of solutions and chaotic dynamics.</i> IT: <i>Multiplicity of positive solutions for indefinite weight problems motivated by population genetics.</i></p> <p>International Conference on Differential & Difference Equations and Applications (Amadora, Portugal, 2017/06/05–09). CT: <i>Multiplicity of positive solutions for indefinite Neumann problems with an oscillating nonlinear potential.</i></p>
2016	<p>Nonlinear Meeting in Udine 2017 on the occasion of Pierpaolo Omari's 60th birthday (Udine, Italy, 2016/01/23–26). CT: <i>Neumann problems with indefinite weight: modelling population genetics.</i></p> <p>ODEs Under Christmas Trees (Udine, Italy, 2016/12/22). IT: <i>Neumann problems with indefinite weight: modelling population genetics.</i></p> <p>11th AIMS Conference on Dynamical Systems Differential Equations and Applications (Orlando, Florida, 2016/07/01–04). ITs: <i>Chaotic Dynamics in the Twisted Horseshoe Map Via a Topological Approach; Remarks on the Ambrosetti-Prodi Periodic Problem.</i></p> <p>Boundary Value problems in FVG (SISSA, Trieste, Italy, 2016/02/04). IT: <i>Positive solutions of Dirichlet problems with an indefinite weight.</i></p>
2015	VII Symposium on Nonlinear Analysis SNA 2015 , (Toruń, Poland, 2015/09/14–18). CT: <i>Positive solutions of Dirichlet problems with an indefinite weight.</i>

Invited seminars

- 2024/07/01** Univ. Modena and Reggio Emilia, Italy (*Wavefront for reaction-diffusion systems with degenerate diffusivity*)
- 2021/11/30** Politecnico Milano, Italy (*Sign-indefinite logistic growth models with flux-saturated diffusion*)
- 2021/05/13** Univ. Ferrara, Italy (*The effects of flux-saturated diffusion on indefinite logistic-growth models*)
- 2019/12/09** Univ. Picardy Jules Verne, France (*Multiplicity of positive solutions for indefinite nonlinear problems in population genetics*)
- 2018/11/14** Univ. Chicago, Illinois (*Multiplicity of clines for indefinite nonlinear problems in population genetics*)
- 2018/09/21** Univ. Porto, Portugal (*A topological route to detect chaos in two families of dynamical systems*)
- 2017/03/31** Univ. Vigo, Spain (*Neumann problems with an indefinite weight applied to population genetics*)
- 2016/07/14** Univ. Lisbon, Portugal (*Remarks on the Ambrosetti-Prodi periodic problem*)

Organization of scientific events

Conferences (co-organizer)

- **INdAM Workshop 2025** *Planned* (Rome, Italy, 2025/06/9–13), 16 speakers, ~40 participants
- **Special Session @ 11th AIMS Conference on Dynamical Systems Differential Equations and Applications** (Nyu Abu Dhabi, United Arab Emirates, 2024/12/16–20) “Evolutionary equations systems”, 21 speakers
- **Nonlinear Meeting 2024** (Reggio Emilia, Italy, 2024/09/12–13), 6 speakers, ~30 participants
- **Minisymposium @ 9th European Congress of Mathematics** (Seville, Spain, 2024/07/15–19) “Dynamical aspects of nonlinear problems in reaction-diffusion equations, Hamiltonian systems, and ODEs”, 12 speakers
- **Minisymposium @ Equadiff15** (Brno, Czech Republic, 2022/07/11–15) “Advances for problems with nonlinear differential operators”, 5 speakers
- **Christmas Meeting 2020** (Zoom, 2021/12/22), 3 speakers, ~25 participants
- **Nonlinear Meeting 2021** (Zoom, 2021/03/22–23), 6 speakers, ~90 participants
- **Christmas Meeting 2020** (Zoom, 2020/12/17), 3 speakers, ~40 participants
- **Nonlinear Meeting 2017** (Udine, Italy, 2016/01/23–26), 13 speakers, ~40 participants

Series of seminars (co-organizer)

2020/09/01–to date @DEG1 research group, ~2 seminars per month

2021/02/01–2021/10/31 @CAMS’ PhD students and postdocs, 1 seminar per month

Visits & International collaborations

- 2023** Univ. Lisbon (Portugal), hosted by C. Rebelo
- 2021** Politecnico Milano (Italy), hosted by M. Garrione
- 2019** Univ. Ferrara (Italy), hosted by A. Corli
Univ. Porto (Portugal), hosted by I. S. Labouriau.
- 2018** Univ. Chicago (Illinois), hosted by T. Dupont and T. Nagylaki
Univ. Vienna (Austria), hosted by R. Bürger
Univ. Lisbon (Portugal), hosted by C. Rebelo
Univ. Torino (Italy), hosted by A. Boscaggin.
- 2017** Univ. Lisbon (Portugal), hosted by C. Rebelo
Univ. Vigo (Spain), hosted by E. Liz.
- 2016** Univ. Lisbon (Portugal), hosted by C. Rebelo.

Research projects

Individual projects

- 2019/11/01–2021/10/31** – *PI of the project*: “Reaction-Diffusion Equations in Population Genetics: a study of the influence of geographical barriers on traveling waves and non-constant stationary solutions”
Postdoc fellowship from FSMP (Science Mathematics Foundation of Paris), France.
- 2019/01/01–2019/10/31** – *PI of the project*: “Problems in Population Dynamics: from Linear to Nonlinear Diffusion”, Postdoc fellowship from INdAM, Italy.

Group projects

- 2025–2026** – *Member of the INdAM-GNAMPA project*: “Existence and symmetry breaking via nonsmooth critical point theory” PI: F. Colasuonno (Univ. Turin)
- 2023–2025** – *Member of the PRIN project*: “Modeling, Control and Games through Partial Differential Equations” PI: R. Colombo (Univ. Brescia)

2023–2024 – *Member of the INdAM-GNAMPA project*: “Analisi qualitativa di problemi differenziali non lineari” PI: G. Feltrin (Univ. Udine)

2020–2021 – *Member of the INdAM-GNAMPA project*: “Problemi ai limiti per l’equazione della curvatura media prescritta” PI: A. Boscaggin (Univ. Turin)

2017–2018 – *Member of the INdAM-GNAMPA project*: “Problemi differenziali con peso indefinito: tra metodi topologici e aspetti dinamici” PI: A. Sfecci (Univ. Trieste)

2016–2017 – *Member of the INdAM-GNAMPA project*: “Problemi differenziali non lineari: esistenza, molteplicità e proprietà qualitative delle soluzioni” PI: M. Garrione (Politecnico di Milano)

2015–2016 – *Member of the INdAM-GNAMPA project*: “Problemi al contorno associati ad alcune classi di equazioni differenziali non lineari” PI: F. Obersnel (Univ. Trieste)

Awards

PhD Thesis Award (2019) in the field of Computer science, Mathematics and Physics, Univ. Udine.

Academic activities

Teaching

- A.Y. 2024/25** *Teaching classes of Mathematical Analysis*, BSc Management Engineering, Univ. Modena and Reggio Emilia (68 h); *Teaching classes of Mathematical Models and Methods for Engineering*, BSc Management Engineering, Univ. Modena and Reggio Emilia (18 h)
- A.Y. 2023/24** *Teaching classes of Mathematical Analysis*, BSc Management Engineering, Univ. Modena and Reggio Emilia (108 h); *Teaching classes of Mathematical Models and Methods for Engineering*, BSc Management Engineering, Univ. Modena and Reggio Emilia (18 h); *Teaching classes of Mathematical Analysis II*, BSc Strategic Science, Univ. Modena and Reggio Emilia (30 h)
- A.Y. 2022/23** *Teaching classes of Mathematical Analysis*, BSc Management Engineering, Univ. Modena and Reggio Emilia (108 h); *Teaching classes of Mathematical Analysis II*, BSc Strategic Science, Univ. Modena and Reggio Emilia (30 h)
- A.Y. 2021/22** *Exercise classes of Mathematical Analysis*, BSc Engineering, Univ. Udine (31 h)
- A.Y. 2017/18** *Exercise classes of Mathematical Analysis*, BSc Engineering, Univ. Udine (32 h); *Exercise lessons of Mathematical Analysis*, BSc Mathematics, Univ. Udine (20 h); *Exercise lessons of Advanced Geometry*, BSc Mathematics, Univ. Udine (20 h); *Teaching classes of Precalculus*, BSc Engineering, Univ. Udine (20 h)
- A.Y. 2015/16** *Exercise lessons of Mathematical Analysis*, BSc Mathematics, Univ. Udine (24 h); *Teaching classes of Precalculus*, BSc Engineering, Univ. Udine (20 h)

Supervision & tutoring

Scientific supervisor

- Supervisor of the research fellowship “Qualitative properties of nonlinear diffusive processes” at Univ. of Modena and Reggio Emilia (Italy) – Research fellow: A. Makki (2024/04/16–2025/04/16)

Internship and thesis supervisor

- Tutor of A. Foralli, BSc in Management Engineering (A.Y. 2024/25)

Institutional responsibilities

PhD academic board member

- Program in Mathematics of Univ. of Ferrara – Univ. of Modena and Reggio Emilia – Univ. of Parma: 39th Cycle (2023/24); 40th Cycle (2024/25)

PhD committee member

- PhD in Mathematics, Department of Applied Mathematics and Mathematical Analysis, Complutense Univ. of Madrid (Spain) – Candidate: E. Muñoz Hernández (A.Y. 2022/23)

- PhD in Mathematics, Department of Applied Mathematics, Univ. of Granada (Spain) – Candidate: M. Garzón (A.Y. 2021/22)
- PhD in Mathematics, Department of Applied Mathematics and Mathematical Analysis, Complutense Univ. of Madrid (Spain) – Candidate: S. Fernández-Rincón (A.Y. 2020/21)

Master committee member

- Master in Epidemiology, Univ. Torino (Italy) – Candidate: N. Destefanis (A.Y. 2024/25)

Administrative appointments

- Member of the *Incoming Assessment Committee* at the Department of Sciences and Method for Engineering (Univ. of Modena and Reggio Emilia) – from 2023/02 to 2025/02.
- Member of the *Incoming Student Orientation Committee* at the Department of Sciences and Method for Engineering (Univ. of Modena and Reggio Emilia) – from 2023/12 to 2025/02
- Member of the *Quality Assurance Management Group for MSc in Managment Engineering* at the Department of Sciences and Method for Engineering (Univ. of Modena and Reggio Emilia) – from 2023/11 to date