Sara Sottile

PhD in Mathematics

Academic Positions

July 2025 -Present **Research Fellow**, *University of Bologna*, Department of Medical and Surgical Sciences.
Research project: "Data manager and analyst - waterpipe use and cancer"
Supervisor: Prof. Paolo Boffetta.

Mar 2024-Mar 2025 **Research Fellow**, *University of Bologna*, Department of Medical and Surgical Sciences.
Research project: "Data management and analysis for WP5 of Orchestra project"
Supervisor: Prof. Paolo Boffetta.

Feb 2023-Mar 2024 **Research Fellow**, *University of Trento*, Department of Mathematics.
Research project: "Analysis of epidemic models"
Supervisor: Prof. Andrea Pugliese.

Other Research Experience

Apr 2024-Present **Research Collaboration**, *European Network on Optimising Treatment with Therapeutic Antibodies in chronic inflammatory diseases (ENOTTA)*.
Collaboration within the project "A mechanistic mathematical model to describe the effect of methotrexate in reducing immunogenicity of adalimumab in axial spondyloarthritis".

Oct-Nov 2024 **Research Collaboration**, *VIHTALI-Value in Health Technology and Academy for Leadership and Innovation*.
Collaboration within the project "Health Technology Assessment of the adjuvanted quadrivalent influenza vaccine Fluad Tetra: update".

Jan-Jul 2022 **Research Collaboration**, *Evidera*.
Collaboration within the project "Preparation of HTA for new influenza vaccine in Spain".

Apr-Sep 2021 **Research Collaboration**, *VIHTALI-Value in Health Technology and Academy for Leadership and Innovation*.
Collaboration within the project "Economic evaluation of the introduction of the live attenuated influenza vaccine (Fluenz Tetra®) in the Italian pediatric population (2-6 years)".

Education

Nov 2019-Jan 2023 **Ph.D. in Mathematics**, *University of Trento*, Trento, Italy.
Research project: "mathematical models for epidemics".
Thesis: "Different approaches to epidemic modelling: from theoretical analysis to real data", Supervisor: Prof. Andrea Pugliese

Oct 2017-Jul 2019 **M.Sc. in Mathematics (Modelling Curriculum)**, *University of Turin*, Turin, Italy.
Thesis: "Epidemic Models: a Switch Control for Networks", Supervisor: Prof. Lorenzo Fatibene, Co-supervisor: Prof. Xinzhi Liu, Grade: 110/110 cum Laude

Jan 2019-Apr 2019 **Exchange program**, *University of Waterloo*, Waterloo, Ontario, Canada.

Sep 2014-Oct 2017 **B.Sc. in Mathematics**, *University of Bari "A. Moro"*, Bari, Italy.
Thesis: "On the constitutive equations in Thermodynamics", Supervisor: Prof. Arcangelo Labianca, Grade: 107/110

Experience in Educational Contributions

May 2025-Present **Author Collaboration**, *Claudio Maggioli - Editore ConcorsiPubblici.com*.
Preparation of general knowledge book - STEM subjects

Mar 2024-Present **Author Collaboration**, *Zanichelli editore S.p.A*.
Preparation of exercises for High School

Dec 2022-Present **Author and Reviewer**, *"Qui si Risolve"*.
Preparation of educational material for High School and University.

Teaching

1st semester A.Y. 2023-24 — **Teaching Assistant for the course "Geometry I"**, *BSc in Physics*, University of Trento.

1st semester A.Y. 2023-24 — **Teaching Assistant for the course "Calculus I"**, *BSc in Computer Science and BSc in Computer, Communication and Electronic Engineering, Department of Information Engineering and Computer Science*, University of Trento.
Taught in English.

Sept 2023 — **Teaching Assistant for the Mathematics pre-course**, *Department of Economics and Management*, University of Trento.
Taught in English.

2nd semester A.Y. 2022-23 — **Teaching Assistant for the course "Calculus II"**, *BSc in Computer Science and BSc in Computer, Communication and Electronic Engineering, Department of Information Engineering and Computer Science*, University of Trento.
Taught in English.

1st semester A.Y. 2022-23 — **Teaching Assistant for the course "Calculus I"**, *BSc in Computer Science and BSc in Computer, Communication and Electronic Engineering, Department of Information Engineering and Computer Science*, University of Trento.
Taught in English.

1st semester A.Y. 2022-23 — **Teaching Assistant for the course "Mathematical Analysis III"**, *BSc in Physics, Department of Physics*, Trento, Italy.

1st semester A.Y. 2022-23 — **Teaching Assistant for the course"Mathematical Modeling and Simulation"**, *MSc in Quantitative and Computational Biology*, University of Trento.
Taught in English.

Jan 2021-Mar 2022 — **Exam Supervision**, *Department of Economics and Management*, Trento, Italy.

1st semester A.Y. 2021-22 — **Teaching Assistant for the course "Calculus I"**, *BSc in Computer Science and BSc in Computer, Communication and Electronic Engineering, Department of Information Engineering and Computer Science*, University of Trento.
Taught in English.

1st semester A.Y. 2020-21 — **Teaching Assistant for the course "Mathematical Modeling/Mathematical Biology"**, *MSc in Quantitative and Computational Biology and MSc in Mathematics*, University of Trento.
Taught in English.

Mentoring

Michela D'Amario — *Parameters estimations for modelling the COVID-19 pandemic in Italy*, MSc Thesis, University of Trento. Defense: May 2021.

Claudio Meggio — *A stochastic SEIR household model for COVID-19 epidemic including lockdown effects*, MSc Thesis, University of Turin. Defense: June 2021.

Visiting

Sep 2024 — **Short-Term Scientific Mission**, *Institute of Mathematics and Informatics Bulgarian Academy of Sciences*, Sofia, Bulgaria.

Jan-Apr 2019 — **Exchange program MSc**, *University of Waterloo*, Waterloo, Ontario, Canada.

Communications

27-29 May 2025 Istanbul (TR) — **Invited speaker**, *Working Group ENOTTA meeting*.

20-24 Jan 2025 Napoli (IT) — **Invited speaker**, *16th Conference on Dynamical Systems Applied to Biology and Natural Sciences-DSABNS*, Part of the minisymposium Minisymposium "Dynamical Systems applied on Biology and Natural Sciences".

11-13 Dec 2024 Paphos (CY) **Invited speaker**, *Working Group ENOTTA meeting*.

10-12 July 2024 Napoli (IT) **Invited speaker**, *GIMC SIMAI YOUNG 2024*.
Title: "(Mis)-information spreading: a geometric analysis of a SIRS epidemic model"
Part of the minisymposium "MS01: Mathematical Models for Socio-Epidemiological Dynamics"

6-9 Feb 2024 Caparica (PT) **Organizer and speaker (MiniSymposium) and poster presentation**, *15th Conference on Dynamical Systems Applied to Biology and Natural Sciences-DSABNS*.
Title of MiniSymposium: "Slow-fast systems in biology: geometric singular perturbation theory applications and new perspectives"
Title of Poster: "A geometric analysis of the impact of large but finite switching rates on vaccination evolutionary games"

29-31 Jan 2024 Trento (IT) **Organizer and speaker**, *WORKSHOP-Integrated Mathematical approaches to Socio-Epidemiological Dynamics*.
Title: "A geometric analysis of the SIRS compartmental model with fast information and misinformation spreading"

28 Aug-1 Sep 2023 Matera (IT) **Invited speaker**, *Bi-annual congress of the Italian Society of Applied and Industrial Mathematics (SIMAI)*.
Title: "A geometric analysis of the SIRS model with secondary infections"
Part of the minisymposium "MS03: Recent Advances on the mathematical and numerical modeling of epidemics"

19-21 June 2023 Girona (ES) **Poster presentation**, *Workshop on epidemic modelling: current challenges*.
Title: "A geometric analysis of the impact of large but finite switching rates on vaccination evolutionary games"

18-19 May 2023 Napoli (IT) **Invited speaker**, *Workshop Modellistica Socio-Epidemiologica*.
Title: "A geometric analysis of the impact of large but finite switching rates on vaccination evolutionary games"

19-23 Sep 2022 Heidelberg (DE) **Poster presentation:**, *12th European Conference on Mathematical and Theoretical Biology-ECMTB 2022*.
Title: "Global stability of SAIRS epidemic models"

26-29 July 2022 Wien (A) **Contributed speaker**, *10th Vienna International Conference on Mathematical Modelling-MATHMOD 2022*.
Title: "Global analysis of SAIRS-type epidemic models"

7-8 Apr 2022 Pavia (IT) **Invited speaker**, *Kick-off Meeting PRIN2020*.
Title: "Global stability of SAIRS epidemic models"

8-11 Feb 2022 online **Contributed speaker**, *13th Conference on Dynamical Systems Applied to Biology and Natural Sciences-DSABNS*.
Title: "Global stability of SAIRS epidemic models"

7 Feb 2022 online **Oganizer and speaker**, *Ph.D. Opening Day 2022 at University of Trento*.
Title: "Global stability of SAIRS epidemic models"

10 June 2021 online **Invited speaker**, *Ph.D. Seminars at University of Groningen*.
Title: "Time-varying epidemic transmission in heterogeneous networks"

4-7 Feb 2020 Trento (IT) **Poster presentation**, *11th Conference on Dynamical Systems Applied to Biology and Natural Sciences-DSABNS*.
Title: "Time-varying epidemic transmission in heterogeneous networks"

Attended conferences, workshops and schools

29-31 Jan 2024 Trento (IT) **WORKSHOP-Integrated Mathematical approaches to Socio-Epidemiological Dynamics**.

20-25 Nov 2023 Udine (IT) **Advanced School on "Delays and structures in dynamical systems: modeling, analysis and numerical methods"**, *CISM (Internationl Centre for mechanical sciences*, Udine, Italy.

9-13 May 2022 Bonn (DE) **Summer School "Stochastic modelling in the life sciences"**, *Hausdorff Research Institute for Mathematics*, Bonn, Germany.

29 Nov-1 Dec 2021 online **Karlstad Autumn School "Interacting Particles meet Homogenization and Measure Theory"**, *Karlstad University*, Karlstad, Sweden.

30 Aug-3 Sep 2021 Trento (IT) **High-Performance Computing summer school 2021, Project M&S: Modelling and Simulation**, *University of Trento*, Trento, Italy.

5-10 July 2021 online **Networks 2021: A Joint Sunbelt and NetSci Conference**.

2-5 Feb 2021 online **12th Conference on Dynamical Systems Applied to Biology and Natural Sciences-DSABNS**.

7-11 Dec 2020 online **Conference on Complex Systems 2020-CSS2020**.

18-20 May 2020 online **Workshop Modeling the propagation of Covid-19**.

17-18 Feb 2020 Turin (IT) **ISI Workshop on Learning, Algorithms and Networks**.

Responsibilities

2023 **Scientific committee**, *Complex Networks 2023, Menton Riviera, France*.

Nov 2021-Dec 2022 **Member of the Committee for the Open Science**, *University of Trento*.

Dec 2020-Dec 2022 **Member of the Committee of PhD students and grant holders**, *University of Trento*.

Dec 2020-Dec 2022 **Elected representative for PhD students of the Dept. of Mathematics**, *University of Trento*.

Organization

6-9 Feb 2024 Caparica (PT) **Minisymposium: "Slow-fast systems in biology: geometric singular perturbation theory applications and new perspectives"**, *15th Conference on Dynamical Systems Applied to Biology and Natural Sciences-DSABNS*.

29-31 Jan 2024 Trento (IT) **WORKSHOP-Integrated Mathematical approaches to Socio-Epidemiological Dynamics**.

Sep 2020-Dec 2022 Trento (IT) **Doc in Progress**, *Periodic seminars at the Dept. of Mathematics, University of Trento*.

7 Feb 2022 Trento (IT) **PhD Opening Day 2022**, *Dept. of Mathematics, University of Trento*.

11 Mar 2021 Trento (IT) **PhD Opening Day 2021**, *Dept. of Mathematics, University of Trento*.

Reviewing

2024 Journal of Mathematical Biology, Mathematics and Computers in Simulation

2023 Waves in Random and Complex Media, TWMS Journal of Applied and Engineering Mathematics, Mathematics and Computers in Simulation, Applied Mathematical Modelling, Physica D: Nonlinear Phenomena, Applied Mathematica

2022 Journal of Mathematical Biology, Rendiconti del Circolo Matematico di Palermo Series 2, Nonlinear Analysis: Real World Applications

2021 Journal of Biological Dynamics, Rendiconti del Circolo Matematico di Palermo Series 2

Awards and Research funding

Feb 2024 **Research Fellowship within the project AIRC**, *University of Bologna*, Bologna, Italy.

Apr 2024 **Research grant - Short-Term Scientific Mission for COST Action CA21147 "European Network on Optimising Treatment with Therapeutic Antibodies in chronic inflammatory diseases" (ENOTTA)**, *COST Action*.

Feb 2024 **Research Fellowship within the project Progetto H2020-ORCHESTRA**, *University of Bologna*, Bologna, Italy.

Feb 2023 **Research Fellowship within the project Grant PRIN-MIUR No. 2020JLWP23 (CUP:E15F21005420006)**, *University of Trento*, Trento, Italy.

July 2022 **Travel Support for ECMTB 2022**, *European Society for Mathematical and Theoretical Biology*.

June 2022 **Full Grant for the school "Mathematical modeling for epidemiology: analysis, simulation and forecasting"**, *Fondazione CIME*.

Apr 2022 **Travel support for the school "Stochastic modelling in the life sciences"**, *Hausdorff Research Institute for Mathematics*.

Dec 2020 **Scholarships for Events on Complex Systems (SECS)**, *Young Researchers of the Complex Systems Society*.

Nov 2019 **3 years PhD Research Fellowship MUR-funded Department of Excellence**, *University of Trento*, Trento, Italy.

Dec 2019 **Financial support for the Extra-Erasmus mobility**, *University of Turin*, Turin, Italy.
Exchange program at University of Waterloo (CA)

Membership

Apr 2024-Present **ENOTTA WP2**, *COST Action CA21147 "European Network on Optimising Treatment with Therapeutic Antibodies in chronic inflammatory diseases"*.

Mar 2024-Present **MSE - UMI**, *Modellistica Socio-Epidemiologica (Social-Epidemiological Modelling) of the Unione Matematica Italiana*.

Mar 2024-Present **EWM**, *European Women in Mathematics*.

Jan 2022-Present **"GNAMPA" Indam**, *Gruppo Nazionale per l'Analisi Matematica, la Probabilità e le loro Applicazioni*.

June 2022-Present **ESMTB**, *European Society for Mathematical and Theoretical Biology*.

Dec 2020-Dec 2021 **Complex Systems Society**.

IT skills

I have advanced skills in statistical software (R, STATA), online survey and database management (REDCap), and proficient use of Windows and Microsoft Office (Word, Excel, PowerPoint). I am highly skilled in LaTeX, advanced MATLAB programming, good proficiency in Python, and have strong knowledge Linux, Bash, and HTML.

Languages

Italian (Mother tongue), English (B2), Spanish (A2)

Publications

1. **Seyedi, S., Sottile, S., Abedini, M., Boffetta, P., Violante, F.S., Lodi, V., De Palma, G., Sala, E., Mauro, M., Rui, F., et al.**, *Antibody Kinetics of Immunological Memory in SARS-CoV-2-Vaccinated Healthcare Workers—The ORCHESTRA Project*, Vaccines (2025), Vol. 13, Issue 6, pp. 611, `https://doi.org/10.3390/vaccines13060611`
2. **Calabrò, G.E. et al.**, *Health Technology Assessment del vaccino antinfluenzale quadrivalente adiuvato Fluad Tetra®: update*, Journal of Preventive Medicine and Hygiene (2025), Vol. 66, Issue 1 Suppl. 2, pp. E1-E56, `https://doi.org/10.15167/2421-4248/jpmh2025.66.1S2`. **Rizzo, C., Sottile, S., Di Serafino, F. and Pugliese, A.**, Chapter 5: "*Valutazione economica dell'introduzione del vaccino aQIV nella popolazione italiana di età superiore ai 60 anni*".
3. **Achterberg, M.A., Sensi, M. and Sottile, S.**, *A minimal model for multigroup adaptive SIS epidemics.*, Chaos: An Interdisciplinary Journal of Nonlinear Science, (2025), Vol.35, Issue 3, `https://doi.org/10.1063/5.0246228`
4. **Bulai, I. M., Sensi, M. and Sottile, S.**, *A geometric analysis of the SIRS compartmental model with fast information and misinformation spreading*, Chaos, Solitons and Fractals, (2024), Vol. 185, pp. 115104, `https://doi.org/10.1016/j.chaos.2024.115104`.

5. **Kaklamanos, P., Pugliese, A., Sensi, M. and Sottile, S.**, *A geometric analysis of the SIRS model with secondary infections*, SIAM Journal on Applied Mathematics (2024), Vol. 84, Issue 2, pp. 661 - 686, https://doi.org/10.1137/23m1565632.
6. **Della Marca, R., d'Onofrio, A., Sensi, M. and Sottile, S.**, *A geometric analysis of the impact of large but finite switching rates on vaccination evolutionary games*, Nonlinear Analysis: Real World Applications (2024), Vol. 75, 103986, https://doi.org/10.1016/j.nonrwa.2023.103986.
7. **Cangiotti, N., Capolli, M., Sensi, M. and Sottile, S.**, *A survey on Lyapunov functions for epidemic compartmental models*, Bollettino dell'Unione Matematica Italiana (2024), Vol. 17, pp. 241-257 https://doi.org/10.1007/s40574-023-00368-6.
8. **Ottaviano, S., Sensi, M. and Sottile, S.**, *Global stability of multi-group SAIRS epidemic models*, Mathematical Methods in the Applied Sciences (2023), Vol. 46, Issue 16, pp. 14045-14071 https://doi.org/10.1002/mma.9303.
9. **Calabrò, G.E. et al.**, *Health Technology Assessment: a value-based tool for the evaluation of healthcare technologies. Reassessment of the cell-culture-derived quadrivalent influenza vaccine: Flucelvax Tetra® 2.0*, Journal of Preventive Medicine and Hygiene (2022), Vol. 63, Issue 4 Suppl. 1, pp. E1-E138, https://doi.org/10.15167/2421-4248/jpmh2022.63.4S1.
   Rizzo, C., Saraceno, G., Sottile, S., Abreha, F.M. and Pugliese, A., Chapter 5: "*Valutazione economica dell'introduzione del nuovo vaccino antinfluenzale quadrivalente da coltura cellulare nel contesto di cura italiano (update da nuova indicazione)*".
10. **Fochesato, A., Sottile, S., Pugliese, A., Márquez-Peláez, S., Toro-Diaz, H., Gani, R., Alvarez, P. and Ruiz-Aragón, J.**, *An Economic Evaluation of the Adjuvanted Quadrivalent Influenza Vaccine Compared with Standard-Dose Quadrivalent Influenza Vaccine in the Spanish Older Adult Population*, Vaccines (2022), Vol. 10, pp. 1360, https://doi.org/10.3390/vaccines10081360.
11. **Sottile, S., Kahramanoğulları, O. and Sensi, M.**, *How network properties and epidemic parameters influence stochastic SIR dynamics on scale-free random networks*, Journal of Simulation (2022), Vol. 18, Issue 2, pp. 206–219 https://doi.org/10.1080/17477778.2022.2100724.
12. **Ottaviano, S., Sensi, M. and Sottile, S.**, *Global stability of SAIRS epidemic models*, Nonlinear Analysis: Real World Applications (2022), Vol. 26, pp. 103501, https://doi.org/10.1016/j.nonrwa.2021.103501.
13. **Boccalini, S. et al.**, *Health Technology Assessment (HTA) of the introduction of influenza vaccination for Italian children*, Journal of Preventive Medicine and Hygiene (2021), Vol. 62, Issue 2 Suppl. 1, pp. E1-E128, https://doi.org/10.15167/2421-4248/jpmh2021.62.2s1.
   Rizzo, C., Sottile, S. and Pugliese A., Chapter 6: "*Valutazione economica dell'introduzione del vaccino antinfluenzale vivo attenuato (Fluenz Tetra®) nella popolazione giovanile italiana (2-6 anni)*".
14. **Sottile, S. and Liu, X.**, *Time-varying epidemic transmission in heterogeneous networks and applications to measles*, Journal of Biological Systems (2020), Vol. 28, No. 4, pp. 1-26, https://doi.org/10.1142/S0218339020500217.