Davide Liessi

Scientific CV

Contact information

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Research interests

My research mainly concerns delay equations and the infinite-dimensional dynamical systems they generate.

I have been working on the stability of their periodic solutions in its analytic (principle of linearised stability and Floquet theory for renewal equations) and numerical aspects (pseudospectral collocation of the evolution operators of renewal equations, also coupled with delay differential equations).

I am interested in the study of stability for neutral delay equations, in the generalisation of pseudospectral methods in several directions (arbitrary families of nodes, Lyapunov exponents, partial differential equations) and in their integration with software for studying dynamical systems, in the study of analytic and numerical linearisation techniques, in the applications to population dynamics and epidemiology.

Positions

- November 2023 – November 2024 (current): Postdoctoral researcher, sector MAT/08, DMIF, U. Udine (I).
- May 2020 – May 2023: Research fellow (RTDa), sector MAT/08, DMIF, U. Udine (I).
- April 2018 – March 2019: Postdoctoral researcher, sector MAT/08, DMIF, U. Udine (I).
- December 2017 – current: Member of CDLab – Computational Dynamics Laboratory, DMIF, U. Udine (I).

Degrees

- 2014–2018: PhD in Computer Science, Mathematics and Physics, U. Udine (I), *cum laude*,
  thesis *Pseudospectral methods for the stability of periodic solutions of delay models*, supervisor Dimitri Breda.
- 2011–2014: MSc in Mathematics, U. Udine (I), *cum laude*,
  thesis *Un modello per la dinamica dell'impatto tra martelletto e corda nel pianoforte*,
  advisor Fabio Zanolin, co-advisors Dimitri Breda, Federico Fontana.
- 2007–2011: BSc in Mathematics, U. Udine (I), *cum laude*,
  thesis *Il gruppo degli automorfismi di un gruppo abeliano*, advisor Dikran Dikranjan.

Publications and software

Journal articles

10. D. Breda and D. Liessi, *A practical approach to computing Lyapunov exponents of delay differential and renewal equations*, submitted, arXiv: 2310.15400 [math.NA, math.DS].
9. D. Breda, D. Liessi, and S. M. Verduyn Lunel, *Spectra of evolution operators of a class of neutral renewal equations: theoretical and numerical aspects*, Appl. Numer. Math. (2023), doi: 10.1016/j.apnum.2023.06.018, pre-publised online.
8. A. Andò, S. De Reggi, D. Liessi, and F. Scarabel, *A pseudospectral method for investigating the stability of linear population models with two physiological structures*, Math. Biosci. Eng., 20 (2023), pp. 4493–4515, doi: 10.3934/mbe.2023208.
7. F. Blanchini, D. Breda, G. Giordano, and D. Liessi, *Michaelis–Menten networks are structurally stable*, Automatica, 147 (2023), 110683, doi: 10.1016/j.automatica.2022.110683.

6. D. Breda, D. Liessi, and R. Vermiglio, *Piecewise discretization of monodromy operators of delay equations on adaptive meshes*, J. Comput. Dyn., 9 (2022), pp. 103–121, DOI: 10.3934/jcd.2022004.
5. D. Breda and D. Liessi, *Floquet theory and stability of periodic solutions of renewal equations*, J. Dynam. Differential Equations, 33 (2021), pp. 677–714, DOI: 10.1007/s10884-020-09826-7.
4. D. Breda and D. Liessi, *Approximation of eigenvalues of evolution operators for linear coupled renewal and retarded functional differential equations*, Ric. Mat., 69 (2020), pp. 457–481, DOI: 10.1007/s11587-020-00513-9.
3. D. Breda and D. Liessi, *Approximation of eigenvalues of evolution operators for linear renewal equations*, SIAM J. Numer. Anal., 56 (2018), pp. 1456–1481, DOI: 10.1137/17M1140534.
2. V. Clamer, A. Pugliese, D. Liessi, and D. Breda, *Host coexistence in a model for two host–one parasitoid interactions*, J. Math. Biol., 75 (2017), pp. 419–441, DOI: 10.1007/s00285-016-1088-z.
1. D. Breda, O. Diekmann, D. Liessi, and F. Scarabel, *Numerical bifurcation analysis of a class of nonlinear renewal equations*, Electron. J. Qual. Theory Differ. Equ., 65 (2016), pp. 1–24, DOI: 10.14232/ejqtde.2016.1.65.

Book chapters

2. D. Breda, D. Liessi, and R. Vermiglio, *A practical guide to piecewise pseudospectral collocation for Floquet multipliers of delay equations in MATLAB*, submitted, arXiv: 2203.12734 [math.NA].
1. A. Andò, D. Breda, D. Liessi, S. Maset, F. Scarabel, and R. Vermiglio, *15 years or so of pseudospectral collocation methods for stability and bifurcation of delay equations*, in *Accounting for Constraints in Delay Systems*, G. Valmorbida, W. Michiels, and P. Pepe, eds., Adv. Delays Dyn. 12, Springer, Cham, 2022, pp. 127–149, DOI: 10.1007/978-3-030-89014-8_7.

Theses

- D. Liessi, *Pseudospectral methods for the stability of periodic solutions of delay models*, PhD thesis, University of Udine, 2018.

Software

The listed software is available at `http://cdlab.uniud.it/software`.

3. D. Liessi, `LE-RE`, MATLAB codes for approximating Lyapunov exponents for renewal, also coupled with delay differential equations.
2. D. Liessi, `eigTMNpw`, MATLAB/Octave program extending `eigTMNc` (see below) in a piecewise fashion.
1. D. Breda and D. Liessi, `eigTMNc`, MATLAB/Octave program for approximating the spectrum of evolution operators of coupled systems of renewal equations and retarded functional differential equations.

Visits

4. 28 June – 1 July 2023: Visit to Francesca Scarabel (U. Leeds, UK), collaboration with Hil Meijer (U. Twente, NL), topics: extension of MatCont for delay equations.
3. 10–20 February 2019: Stay at U. Utrecht (NL), collaboration with Odo Diekmann and Sjoerd M. Verduyn Lunel, topics: perturbation theory and stability of neutral delay equations.
2. 27 February – 26 May 2017: Stay at U. Utrecht (NL), collaboration with Odo Diekmann and Sjoerd M. Verduyn Lunel, topics: sun-star calculus and Floquet theory for retarded functional differential equations and renewal equations, perturbation theory for neutral delay equations, delayed models for population dynamics.
1. 16–19 May 2016: Visit to Odo Diekmann (U. Utrecht, NL), collaboration with Dimitri Breda (U. Udine, I), Mats Gyllenberg (U. Helsinki, FI), Hans Metz (U. Leiden, NL), Francesca Scarabel (U. Helsinki, FI) and Rossana Vermiglio (U. Udine, I), topics: retarded functional differential equations and renewal equations, delayed models for population dynamics.

Projects

12. *MONDI – Modellistica numerica e data-driven per l'innovazione sostenibile* (U. Udine, MUR DM 737, NextGeneration EU, CUP G25F21003390007), principal investigator Dimitri Breda (U. Udine, I), member.
11. *Modelización y análisis numérico en problemas de evolución con aplicaciones a biología, economía y mecánica de fluídos* (PID2020-113554GB-I00/AEI/10.13039/501100011033), Ministerio de Ciencia e Innovación (E) and European FEDER funds, 2023, member.
10. PRIN 2020: *Integrated mathematical approaches to socio-epidemiological dynamics* (n. 2020JLWP23, CUP E15F21005420006), principal investigator Andrea Tosin (U. Torino, I), member.
9. Finanziamento GNCS Giovani Ricercatori 2020–2021: *Approssimazione dello spettro di operatori di evoluzione per equazioni di rinnovo neutrali lineari tramite metodi pseudospettrali*, grant recipient.
8. GNCS 2020: *Analisi numerica di sistemi evolutivi complessi*, coord. Dimitri Breda (U. Udine, I), member.
7. Finanziamento GNCS Giovani Ricercatori 2018–2019: *Approssimazione degli autovalori di operatori di evoluzione per equazioni differenziali con ritardo neutrali lineari tramite metodi pseudospettrali*, grant recipient.
6. GNCS 2018: *Approssimazione numerica di problemi di evoluzione: aspetti deterministici e stocastici*, coord. Raffaele D'Ambrosio (U. L'Aquila, I), member.
5. PRID 2017: *Sistemi dinamici e applicazioni*, DMIF, U. Udine (I), coord. Fabio Zanolin (U. Udine, I), member.
4. GNCS 2017: *Analisi e sviluppo di metodologie numeriche per certi tipi non classici di sistemi dinamici*, coord. Stefano Maset (U. Trieste, I), member.
3. SPA-DISCO 2016: *Systèmes à paramètres distribués avec contraintes*, CNRS International Research Network, coord. Giorgio Valmorbida (L2S, CentraleSupélec, F), duration 5 years, member.
2. GNCS 2016: *Analisi numerica di certi tipi non classici di equazioni di evoluzione*, coord. Stefano Maset (U. Trieste, I), member.
1. GNCS 2015: *Analisi numerica di sistemi dinamici infinito-dimensionali e non regolari*, coord. Nicola Guglielmi (U. L'Aquila, I), member.

Organisation of conferences and conference sessions

2. 18th IFAC Workshop on Time Delay Systems, U. Udine (I), 24–27 September 2023, member of the International program committee and of the Local organising committee.
1. International Conference on Scientific Computation and Differential Equations – SciCADE 2022, U. Iceland, Reykjavík (IS), 25–29 July 2022, minisymposium "Numerical methods for population models in biology", co-organisers Tyler Cassidy, Francesca Scarabel.

Conference talks

22. Congresso UMI 2023, U. Pisa and Scuola Normale Superiore (I), 04–9 September 2023, sezione "S10 – Sistemi dinamici e metodi numerici per le equazioni differenziali", *Approssimazione degli esponenti di Lyapunov per equazioni di rinnovo*, invited.
21. Mathematical Modelling in Engineering & Human Behaviour 2023, Universitat Politécnica de València (E), 11–14 July 2023, session "Mathematical models in population dynamics: applications, modelling and numerical methods", *Numerical bifurcation analysis of delay equations: a user-friendly MatCont interface*, invited.
20. Workshop Software for Approximation – SA2023, U. Torino (I), 8–10 February 2023, *Numerical bifurcation analysis of delay equations: a user-friendly MatCont interface*.
19. 17th IFAC Workshop on Time Delay Systems, Montréal (CA), 27–30 September 2022, invited session "Software for time delay systems", *eigTMNpw: A tutorial on computing Floquet multipliers*, invited.
18. 17th IFAC Workshop on Time Delay Systems, Montréal (CA), 27–30 September 2022, invited session "Software for time delay systems", *Numerical bifurcation analysis of delay equations: a user-friendly MatCont interface*, invited.
17. Conference on Functional Analysis, Approximation Theory and Numerical Analysis – FAATNA20>22, U. Basilicata, Matera (I), 5–8 July 2022, session "Numerical advances in differential equations", *Investigating the stability of periodic neutral renewal equations via Floquet multipliers*, invited.

16. 16th IFAC Workshop on Time Delay Systems, Guangzhou (CHN), online, 29 September – 1 October 2021, invited session "Computational tools and software, II", *Stability of equilibria and periodic orbits of delay equations*, invited.
15. 6th ECCOMAS Young Investigators Conference, Universitat Politécnica de València (E), online, 7–9 July 2021, minisymposium "Recent advances in time numerical integration of evolutive problems", *Numerical stability analysis of linear periodic delay equations via pseudospectral methods*, invited.
14. International Conference on Advances in Differential Equations and Numerical Analysis – ADENA 2020, Indian Institute of Technology Guwahati (IND), online, 12–15 October 2020, minisymposium "Young researchers in numerics for evolutionary problems", *Numerical stability analysis of linear periodic delay equations via pseudospectral methods*, invited.
13. Online Delay Days, Hasselt (B) – Utrecht (NL) – Berlin (D), 1–2 October 2020, *Numerical stability analysis of linear periodic renewal equations via pseudospectral methods*, invited.
12. Convegno GNCS 2020, Montecatini Terme (I), 11–13 February 2020, *Approximation of the spectrum of evolution operators for linear neutral delay equations with pseudospectral methods*, invited.
11. Mini-symposium "Delay equations: theory and applications", U. Utrecht (NL), 15 February 2019, *Stability of periodic solutions of delay equations*, invited.
10. 10th International Conference DSABNS – Dynamical Systems Applied to Biology and Natural Sciences, U. Napoli (I), 3–6 February 2019, *Stability of periodic solutions of delay equations*.
9. 2nd DECOD Workshop – Delays and Constraints in Distributed Parameter Systems, Toulouse (F), 21–23 November 2018, *Stability of periodic solutions of delay equations: from Floquet theory to pseudospectral collocation*, invited.
8. 14th IFAC Workshop on Time Delay Systems, Budapest (H), 28–30 June 2018, thematic session "Numerical analysis for delay equations in population dynamics", *Pseudospectral methods for the stability of periodic solutions of delay equations*.
7. 14th IFAC Workshop on Time Delay Systems, Budapest (H), 28–30 June 2018, thematic session "Spectral methods for rightmost roots characterization in LTI time delay systems", *Pseudospectral approximation of characteristic roots and multipliers: how multiplicities affect convergence*.
6. CRM conference: New Trends in Mathematical Biology, CRM – Centre de Recerca Matemàtica, Barcelona (E), 4–8 June 2018, *Pseudospectral methods for the stability of periodic solutions of delay equations*.
5. 9th workshop DSABNS – Dynamical Systems Applied to Biology and Natural Sciences, U. Torino (I), 7–9 February 2018, *Pseudospectral methods for the stability of periodic solutions of delay equations*.
4. SciCADE 2017 – International Conference on Scientific Computation and Differential Equations, U. Bath (GB), 11–15 September 2017, minisymposium "Numerics, dynamics and models of delay equations", *Pseudospectral methods for the stability of linear periodic delay models*.
3. Workshop Populations in epidemics and ecology: Modeling and numerical simulations, BCAM, Bilbao (E), 4–5 July 2017, *Pseudospectral methods for the stability of linear periodic delay models*.
2. 9th workshop on Numerical Analysis of Evolution Equations, Innsbruck (A), 8–11 November 2016, *Approximating the stability of linear periodic delay models by pseudospectral methods*.
1. SDIDE 2016 – 5th workshop on Stability and Discretization Issues in Differential Equations, U. Trieste (I), 20–24 June 2016, *Approximating the dynamics of delay models by pseudospectral methods: solution operator for the linear case*.

Seminars

10. CDLab workshop, U. Udine (I), 22 February 2019, *Stability of periodic solutions of delay equations*.
9. Biomathematics Seminars, U. Helsinki (FI), 20 September 2018, *Stability of periodic solutions of delay equations: from Floquet theory to pseudospectral collocation*, invited.
8. CDLab, U. Udine (I), 6 April 2018, *Bifurcation analysis of delay differential equations: an introduction to DDE-BIFTOOL by examples*.
7. Complexity Laboratorium Utrecht (CLUe), U. Utrecht (NL), 19 April 2017, *CLUe Training #4 (MATLAB codes: Stability analysis of delay models)*, tutorial.
6. Seminar Mathematics of Complex Systems, U. Utrecht (NL), 9 March 2017, *Pseudospectral methods for the stability of linear periodic delay models*.

5. DMIF, U. Udine (I), 19 January 2017, *Pseudospectral methods for the stability of linear periodic delay models*.
4. U. Udine (I), 14 December 2016, *Approaches to platform-based system synthesis with answer set programming*.
3. DMIF, U. Udine (I), 28 July 2016, *Introduzione al calcolo dell'esponenziale di una matrice*.
2. DMIF, U. Udine (I), 22 April 2016, *Analisi degli errori per il metodo di Galërkin*.
1. DMIF, U. Udine (I), 7 January 2016, *Stability of periodic solutions of physiologically structured populations: a promising extension of the solution operator approach*.

Posters

7. STRUCTAPP2020 – A two-day workshop on structure-preserving approximation of evolutive problems and applications, U. L'Aquila (I), 23–24 January 2020, *Stability of periodic orbits of delay equations*.
6. Italian–Romanian Colloquium on Differential Equations and Applications, U. Udine (I), 11 April 2019, *Stability of periodic orbits of delay equations*.
5. PhD Expo 2017, U. Udine (I), 25 May 2017, *Pseudospectral methods for the stability of linear periodic delay models*.
4. NDNS+ PhD days 2017, Lunteren (NL), 20 April 2017, *Pseudospectral methods for the stability of linear periodic delay models*.
3. NMC 2017 – 53ste Nederlands Mathematisch Congres, U. Utrecht (NL), 11–12 April 2017, *Pseudospectral methods for the stability of linear periodic delay models*.
2. PhD Expo 2015, U. Udine (I). 18 June 2015. *Pseudospectral methods for the stability of linear periodic delay models*.
1. Short Thematic Program on Delay Differential Equations: Structured delay systems, Fields Institute, Toronto (CA), 19–22 May 2015, *Dynamics of host–parasitoid interactions and coexistence of different hosts*.

Participation in conferences

10. Workshop Nonlinear Dynamical Systems and Delay Equations, online, 26 October 2020.
9. 2nd Joint SIAM/CAIMS Annual Meeting, online, 6–17 July 2020.
8. Workshop Modellistica e COVID-19, online, 22 June 2020.
7. Workshop Around Dynamical Systems, U. Udine (I), 5–6 February 2018.
6. Symposium Mathematical and Theoretical Biology, U. Leiden (NL), 11 May 2017.
5. ODEs under the Christmas trees, workshop of the INdAM–GNAMPA project *Problemi differenziali non lineari: esistenza, molteplicità e proprietà qualitative delle soluzioni*, U. Udine (I), 22 December 2016.
4. Boundary Value problems in FVG, open final meeting of GNAMPA project 2015, SISSA, Trieste (I), 4 February 2016.
3. (gli ultimi) Dieci anni di pianoforte a modelli fisici, U. Udine (I), 18 June 2015.
2. Mini-Workshop on Dynamical Systems, U. Udine (I), 29 May 2015.
1. Metodi variazionali e applicazioni a modelli matematici, Giornata di studio in onore di Livio Clemente Piccinini, U. Udine (I), 23 January 2015.

Participation in schools

7. Dobbiaco Summer School 2023, Dobbiaco (I), 18–23 June 2023, theme *Data-driven methods for the computational sciences*, lecturers: Nathan Kutz, Karsten Urban.
6. School on *Mathematical modeling for epidemiology: analysis, simulation and forecasting*, Fondazione CIME, Cetraro (I), 5–9 September 2022, lecturers: Odo Diekmann, Maurizio Falcone, Tom Britton, Christl Donnelly, Andrea Bertozzi, Ilaria Dorigatti, Ganna Rozhnova, Antonio Capella.
5. School on *Recent stability issues for linear dynamical systems. Matrix nearness problems and eigenvalue optimization*, Fondazione CIME, Cetraro (I), 6–10 September 2021, lecturers: Nicolas Gillis, Nicola Guglielmi, Christian Lubich, Volker Mehrmann, Bart Vandereycken.

4. Advanced School on *Controlling delayed dynamics: advances in theory, methods and applications*, CISM – International Centre for Mechanical Sciences, Udine (I), 25–29 November 2019, lecturers: Dimitri Breda, Tamás Insperger, Bernd Krauskopf, Wim Michiels, Silviu-Iulian Niculescu, Sjoerd M. Verduyn Lunel.
3. Szeged School on *Computational Tools for Delay Differential Equations*, U. Szeged (HU), 9–11 September 2016, lecturers: Balázs Bánhelyi, Dimitri Breda, Tibor Csendes, Ferenc Hartung, János Karsai, Gábor Kiss, Tibor Krisztin, Mónika Polner, Jan Sieber, Gabriella Vas, Zsolt Vizi, Hans-Otto Walther, Jianhong Wu.
2. Helsinki Summer School on Mathematical Ecology and Evolution 2016, Turku (FI), 21–28 August 2016, theme *Structured populations*, lecturers: Reinhard Bürger, Mats Gyllenberg, Hisashi Inaba, Hans Metz, André de Roos.
1. Dobbiaco Summer School 2015, Dobbiaco (I), 21–26 June 2015, theme *Innovative concepts for complexity reduction in numerical PDEs: nonlinear approximation, sparsity, adaptivity, model reduction*, lecturers: Claudio Canuto, Wolfgang Dahmen.

Teaching

26. Support and exercise lessons of Calculus, BSc in Internet of Things, Big Data, Machine Learning, U. Udine (I), 60–120 hours, March–June 2024.
25. Laboratory sessions in the Advanced Course on *Delays and structures in dynamical systems: Modeling, analysis and numerical methods* in collaboration with Alessia Andò and Tedi Ramaj, CISM – International Centre for Mechanical Sciences, Udine (I), 5 hours, 20–24 November 2023; coordinators: Dimitri Breda, Jianhong Wu; other lecturers: Odo Diekmann, Tony Humphries, Stefano Maset, Shigui Ruan, Francesca Scarabel, Rossana Vermiglio.
24. Mathematics, BSc in Banking and Finance, U. Udine (I), 72 hours, September–December 2023.
23. Laboratory of computational mathematics, MSc in Mathematics, U. Udine (I), 24 hours, February–April 2023.
22. Exercise lessons of Calculus, BSc in Computer Science and in Internet of Things, Big Data, Machine Learning, U. Udine (I), 24 hours, October 2022 – April 2023.
21. Mathematics, BSc in Banking and Finance, U. Udine (I), 72 hours, October–December 2022.
20. Laboratory of computational mathematics, MSc in Mathematics, U. Udine (I), 24 hours, March–June 2022.
19. Exercise lessons of Scientific computing, BSc in Computer Science, U. Udine (I), 8 hours, March–June 2022.
18. Exercise lessons of Calculus, BSc in Computer Science and in Internet of Things, Big Data, Machine Learning, U. Udine (I), 24 hours, September 2021 – June 2022.
17. Exercise lessons of Mathematics, BSc in Banking and Finance, U. Udine (I), 10 hours, March–April 2022.
16. Mathematics, BSc in Banking and Finance, U. Udine (I), 72 hours, September–December 2021.
15. Laboratory of computational mathematics, MSc in Mathematics, U. Udine (I), 24 hours, March–June 2021.
14. Exercise lessons of Scientific computing, BSc in Computer Science, U. Udine (I), 8 hours, March–June 2021.
13. Algebra I, BSc in Mathematics, U. Udine (I), 20 hours, September 2020 – June 2021.
12. An introduction to the numerical study of dynamical systems, U. Valladolid (E), 8+2 hours, April 2021, funded by the Erasmus+/KA1 Staff Mobility for Teaching Assignment program.
11. Introductory course of basic mathematics, BSc in Computer Science and in Internet of Things, Big Data, Machine Learning, U. Udine (I), 20 hours, September 2020.
10. Exercise lessons of Numerical methods for differential equations, MSc in Mathematics, U. Udine (I), 6 hours, May–June 2020.
9. Laboratory of computational mathematics, MSc in Mathematics, U. Udine (I), 8 hours, May 2020.
8. Exercise lessons of Mathematics, BSc in Banking and Finance, U. Udine (I), 30+10 hours, October–December 2019.
7. Introductory course of Mathematics, BSc in Banking and Finance, U. Udine (I), 24 hours, August–September 2019.
6. Introduction to MATLAB, BSc and MSc in Engineering, U. Udine (I), 20 hours, March–May 2019.
5. Exercise lessons of Mathematics and statistics, BSc in Multimedia Science and Technology, U. Udine (I), 24 hours, October 2018 – June 2019.

4. Substitute teacher of Mathematics and physics, I.S.I.S.S. "F. Da Collo" (high school), Conegliano (I), November–December 2017.
3. Exercise lessons of Scientific computing, BSc in Computer Science, U. Udine (I), 8 hours, October–December 2016.
2. Exercise lessons of Scientific computing, BSc in Computer Science, U. Udine (I), 8 hours, October–December 2015.
1. Introduction to MATLAB for Numerical analysis II, MSc in Mathematics, U. Udine (I), 4 hours, October 2015.

Thesis supervision

- Enrico Santi, *Numerical bifurcation analysis of delay equations: a user-friendly extension of MatCont's interface*, BSc in Computer science, 2022, U. Udine (I), co-advisor (advisor Rossana Vermiglio).

Review activity

- Bulletin of Mathematical Biology
- International Journal of Computer Mathematics
- Mathematical and Computational Applications
- Mathematical Biosciences and Engineering
- Mathematics and Computers in Simulation
- Numerical Algorithms
- PLOS ONE
- Rendiconti dell'Istituto di Matematica dell'Università di Trieste

Other information

- Programming languages: good knowledge of MATLAB/Octave, Python, PHP.
- Percorso formativo 24 CFU (D.M. 616/2017), U. Udine (I), November 2017 – July 2018,
  courses: Pedagogia speciale (Lucio Cottini), Didattica dell'inclusione (Daniele Fedeli), Psicologia generale (Andrea Marini), Psicologia dello sviluppo e dell'educazione (Cosimo Urgesi).
- Courses of mathematics and computer science, topics: dynamical systems, numerical methods for (ordinary, delay, partial) differential equations, functional analysis, logic programming.
- Organisational and communication courses, topics: research planning and promoting, effective communication, English language for academic purposes.

Other professional experience

- Accompanist (piano, organ, other keyboards) for singers, instrumental soloists and choirs, also in chamber and orchestral ensembles, since 2004.
- Liturgical organist since 1999;
  appointed organist of the Parish of Bagnolo (San Pietro di Feletto, diocese of Vittorio Veneto, I) since 2013.
- Office worker, Birrificio Bradipongo S.r.l., Colle Umberto (I), April–August 2019.

Conegliano, 28 December 2023