

1 CV of the Experienced Researcher

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1.1 Research activities resume

My main research activities are focused on the numerical solution of the Optimal Transport problems. My contributions in this field result from an original formulation I introduced in my master thesis, that later became my PhD topic, supervised by Prof. [Mario Putti](#) and Prof. [Franco Cardin](#) from University of Padova. This new formulation led to the development of accurate and efficient numerical solvers for different transport problems, in particular the Branched Transport problem. In 2019, I moved to Scuola Normale Superiore to work with Prof. [Michele Benzi](#) on solution of the sparse saddle point linear systems arising from the solution of the Optimal Transport on graphs. We showed that in this setting the Optimal Transport problem can be solved with CPU time scaling slightly more than linearly with respect to the problem size, improving previous results that suggested a quadratic time complexity.

Recently (October 2021), I joined the [RASPODI](#) (Reliable numerical approximations of dissipative systems) team at INRIA in Lille. I will work on the numerical solution of a dynamical formulation of the Optimal Transport problem and development of structure-preserving discretization methods.

In parallel with my main research activities, I created an active research network, collaborating with Prof. [Kurt Mehlhorn](#) (Emeritus scientist at the Max Planck Institute for Computer Science in Saarbrücken, Germany) and Dr. [Caterina de Bacco](#) (Research Group Leader at Max Planck Institute for Intelligent Systems in Tübingen, Germany) on extensions and applications of the Optimal Transport theory.

1.1.1 Current and previous positions

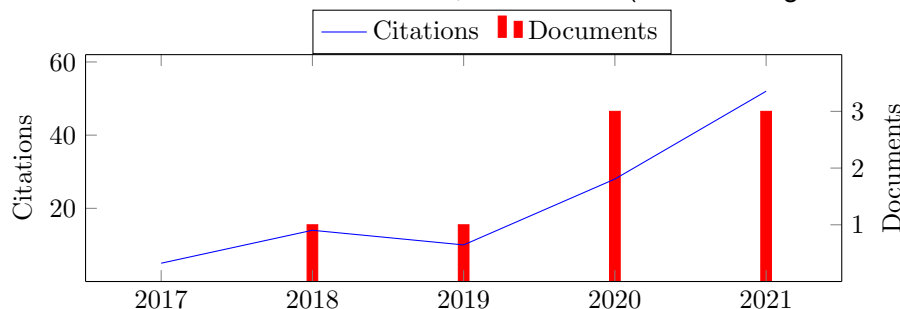
01/10/2021–	Postdoctoral researcher at RAPSODI project team at INRIA Lille Nord (France), supervisor: Andrea Natale
01/10/2019–30/09/2021	Postdoctoral researcher at Centro di Ricerca Matematica Ennio De Giorgi Scuola Normale Superiore in Pisa (Italy), supervisor: Michele Benzi
01/05/2018–30/09/2019	Postdoctoral researcher, University of Padova (Italy), supervisor: Mario Putti
01/01/2018–30/04/2018	Scholarship researcher, University of Padova (Italy), supervisor: Mario Putti

1.1.2 Education

01/03/2018	Philosophie doctor in Computational Mathematics, University of Padova (Italy) Dissertation: Biologically inspired formulation of Optimal Transport Problems Supervisors: Prof. Mario Putti, Franco Cardin
14/02/2014	Master degree in Mathematics, University of Padova (Italy)
21/07/2011	Bachelor degree in Mathematics, University of Padova (Italy)

1.2 Research records

Number of publications	Peer-reviewed journal articles: 8, Submitted: 5
Google Scholar (graph below):	h-index:5, 104 citations
Scopus:	h-index:3, 31 citations (18 excluding self-citations)



1.2.1 Publications¹

Journal articles on the optimal transport problem

- [1] E. Facca, F. Cardin, and M. Putti. "[Branching structures emerging from a continuous optimal transport model](#)". In: *Journal of Computational Physics* 447 (2021). (IF: 3.55 Citations:7).
- [2] E. Facca, S. Daneri, F. Cardin, and M. Putti. "[Numerical solution of Monge–Kantorovich Equations via a Dynamic Formulation](#)". In: *Journal of Scientific Computing* 82.3 (2020). (IF:2.59 Citations:24).
- [3] E. Facca, F. Cardin, and M. Putti. "[Towards a Stationary Monge–Kantorovich Dynamics: The Physarum Polycephalum Experience](#)". In: *SIAM Journal on Applied Mathematics* 78.2 (2018). (IF: 2.08 Citations:28).

Journal articles on linear algebra problems

- [1] E. Facca and M. Benzi. "[Fast Iterative Solution of the Optimal Transport Problem on Graphs](#)". In: *SIAM Journal on Scientific Computing* 43.3 (2021). (IF: 2.37 , Citations: 2).
- [2] L. Bergamaschi, E. Facca, A. Martínez Calomardo, and M. Putti. "[Spectral preconditioners for the efficient numerical solution of a continuous branched transport model](#)". In: *Journal of Computational and Applied Mathematics* 354 (2018). (IF:2.99 Citations:21).

Journal articles on applications of the optimal transport problem

- [1] A. Lonardi, E. Facca, M. Putti, and C. De Bacco. "[Designing optimal networks for multicommodity transport problem](#)". In: *Physical Review Research* 3 (4 2021). (IF:Not defined yet Citations:2).
- [2] D. Baptista, D. Leite, E. Facca, M. Putti, and C. D. Bacco. "[Network extraction by routing optimization](#)". In: *Scientific Reports* 10.20806 (2020).
- [3] E. Facca, A. Karrenbauer, P. Kolev, and K. Mehlhorn. "[Convergence of the non-uniform directed Physarum model](#)". In: *Theoretical Computer Science* 816 (2020). (IF:1.50 Citations:3).

1.2.2 List of Scientific Presentations²

Date	Conference/Location	Title
21/06/2021	8th European Congress of Mathematics, Portorôz (Slovenia)	" L^1 -Optimal Transport Problem on Graphs"
02/10/2019	European Numerical Mathematics and Advanced Applications Conference 2019, Egmond aan Zee (Netherland)	"Optimal Transport Tools on Surface"
26/06/2019	People in Optimal Transportation and Applications - Incontri Indam 2019, Cortona (Italy)	"A nature inspired optimization tool"
14/04/2019	SIAM Conference on Mathematical Computational Issues in the Geosciences, Houston (Texas, USA)	"Plant Root Modeling via Optimal Transport"
12/04/2019	SIAM Conference on Mathematical Computational Issues in the Geosciences, Houston (Texas, USA)	"Numerical Solution of L^1 -Optimal Transport Problem"
15/11/2018	Optimal Transportation and Applications, Pisa (Italy)	"Biologically inspired deduction of Optimal Transport Problems"

¹In green the documents that do not include my PhD supervisors, in blue the other ones. Impact factor taken from <https://www.resurchify.com>. Citations from Google Scholar

²Invited presentation in bold

06/07/2018	SIMAI 2018, Roma (Italy)	"Biologically inspired formulation of Optimal Transportation Problems"
04/06/2018	Computational Methods in Water Resources XXIII, Saint Malom, France	"Plant root dynamics via Optimal Transport"
05/04/2018	Terrestrial Systems Research: Monitoring, Prediction and High Performance Computing, Bonn (Germany)	"Hydrological networks as optimal transport structures"
11/09/2017	SIAM Conference on Mathematical and Computational Issues in the Geo-sciences, Erlangen, Germany	"Biologically inspired formulation of Optimal Transportation Problems"
18/12/2014	Current Problems in fluid-dynamics and non equilibrium thermodynamics, Bressanone (Italy)	"Biologically inspired formulation of Optimal Transportation Problem"

1.2.3 Mobility

Period	Hosts	Institution/Location
17–24/02/2020	Caterina de Bacco	Max Planck Institute for Intelligent Systems in Tübingen, (Germany)
04–08/03/2019	Kurt Mehlhorn	Max Plank Institute for Informatics, Saarbrücken (Germany)
01–08/09/2018	Jan Martin Nordbotten	Department of Mathematics, University of Bergen (Norway)
11–14/06/2018	Jean Virieux, Ludovic Metivier	Institut des Sciences de la Terre ISTerre, Grenoble (France)
7-18/12/2016	Filippo Santambrogio	Department of Mathematics, University of Paris Sud (France)
01/10/2015– 30/04/2016	Peter Knabner, Aldo Pratelli	Department of Mathematics, Friedrich-Alexander-Universität Erlangen-Nürnberg (Germany)

1.3 Teaching and supervision

- Matlab laboratory assistant for numerical calculus
Aerospace engineering bachelor, University of Padova (one semester, March/June 2019)
- Pre-course in physical-mathematical models
Mathematical Engineering Master, University of Padova (6 hours, September/2016)
- Tutorship for calculus and linear algebra courses (presentation and solution of exercises)
Engineering Bachelor, University of Padova (two semesters in total, September 2013/June 2014)
- Co-advisor of 7 master degree theses in Mathematics and Mathematical Engineering at University of Padova.

1.4 Organizing activities

Organizer of a two-days workshop "Seminari Padovani di Analisi Numerica 2018" 04–05/05/2018, Padova (Italy)

1.5 General skills

Languages	English (Fluent), Italian(Native speaker), Spanish(Good)
Software	Python, Matlab, Fortran (from Fortran 77 to object-oriented Fortran 2008), Unix-based system, Git, CMake, LaTeX