

Gabriele Todeschi – Résumé

Nationality: Italian
Date of birth: 9th February 1993
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Current position: Post doctoral researcher at [Labex Bézout](#), Université Gustave Eiffel, Paris (France), in the research project [New challenging Monge problems and their applications](#).

Spoken languages: Italian (mother tongue), English, French.

Previous positions

2022-2023 Post doctoral researcher at ISTerre, Université Grenoble Alpes, Grenoble (France)
07/2020 - 08/2020 Visiting PhD student at the Departement of Mathematics of Università degli Studi di Padova, Padova (Italy).
2018-2021 PhD student in the [MOKAPLAN](#) team, Inria-Ceremade, Paris (France).
Fellow of the Marie Skłodowska-Curie Cofund MathInParis Doctoral Program of the Fondation Sciences Mathématiques de Paris (FSMP).

Education

2018-2021 PhD in Applied Mathematics, Université Paris-Dauphine - PSL, Paris (France).
Thesis: *Finite volume approximation of optimal transport and Wasserstein gradient flows*.
HAL: tel-03500566. Advisors: [Jean-David Benamou](#) (Inria, Paris), [Thomas Gallouët](#) (Inria, Paris), [Clément Cancès](#) (Inria, Lille).
2017-2018 Master M2 in Optimization - Université Paris-Saclay, Orsay (France). Average: 15.533/20.
Thesis: *A new approach to compute Wasserstein gradient flows using an H^{-1} linearization of the Wasserstein W_2 distance and its application to the numerical approximation of the solutions of a nonlinear drift diffusion equation using finite volumes*. Advisors: [Thomas Gallouët](#) (Inria, Paris), [Clément Cancès](#) (Inria, Lille).
2015-2018 Master's Degree in Mathematical Engineering - Università degli Studi di Padova, Padova (Italy).
Curriculum: Mathematical Modelling for Engineering and Science. Score: 110/110 cum laude.
Thesis: *The non-conforming Virtual Element Method (VEM) for the solution of the Navier-Stokes equations*. Advisors: [Mario Putti](#) (Università degli Studi di Padova), [Marco Manzini](#) (Los Alamos National Laboratory).
2012-2015 Bachelor's Degree in Energy Engineering - Università degli Studi di Padova, Padova (Italy).
Curriculum: Electrical Engineering. Score: 110/110 cum laude.
Thesis: *Discrete geometric formulation for bidimensional magnetostatic problems*. Advisor: [Paolo Bettini](#) (Università degli studi di Padova).

2007-2012 High School Diploma (scientific studies) - Liceo Scientifico "A. Rosmini", Rovereto (Italy). Score: 100/100.

Teaching

2021-2022 Internship supervisor, 3rd year Mathematics, ENS Paris-Saclay, Paris (France).

2020-2021 Teaching assistant, Université Paris-Dauphine, Paris (France). Course: *Numerical methods for linear algebra and real univariate functions*.

2019-2020 Teaching assistant, Université Paris-Dauphine, Paris (France). Courses: *Analysis 3, Introduction to probability*.

2018-2019 Teaching assistant, Université Paris-Dauphine, Paris (France). Courses: *Analysis 3, Numerical methods for linear algebra and real univariate functions, Optimization*.

2016-2017 Teaching assistant, Università degli Studi di Padova, Padova (Italy). Courses: *Numerical methods for continuous systems, ordinary differential equations and partial differential equations, Programming (MATLAB/Fortran)*.

Journal publications

1. A. Natale, G. Todeschi. *A mixed finite element discretization of dynamical optimal transport*. Journal of Scientific Computing, 91(2), 1-26, 2022
2. A. Natale, G. Todeschi. *Computation of optimal transport with finite volumes*. ESAIM: Mathematical Modelling and Numerical Analysis, 55(5):1847-1871, 2021.
3. C. Cancès, T. O. Gallouët, G. Todeschi. *A variational finite volume scheme for Wasserstein gradient flows*. Numerische Mathematik, 146(3), pp. 437-480, 2020.

Conference proceedings

1. A. Natale, G. Todeschi. *TPFA finite volume approximation of Wasserstein gradient flows*. FVCA9 - International Conference on Finite Volumes for Complex Applications IX, 2020, Bergen, Norway.

Preprints

1. T. O. Gallouët, A. Natale, G. Todeschi. *From geodesic extrapolation to a variational BDF2 scheme for Wasserstein gradient flows*. arXiv:2209.14622, 2022.
2. E. Facca, G. Todeschi, A. Natale, M. Benzi. *Efficient preconditioners for solving dynamical optimal transport via interior point methods*. arXiv:2209.00315, 2022.

Talks

1. *Application of Optimal Transport to the computation of Wasserstein gradient flows and an inverse problem in seismic imaging*. Seminar of the [Laboratoire Jean Kuntzmann](#), 2023, Grenoble, France.

2. *From geodesic extrapolation to a variational BDF2 scheme for Wasserstein gradient flows.* Seminar GTCaVa ([Groupe de Travail de Calcul des Variations](#)), Université Paris-Dauphine, 2022, Paris, France.
3. *Computation of optimal transport with finite volumes.* Journées MAGA (annual meeting of the ANR project [MAGA](#)), 2022, Autrans, France.
4. *TPFA finite volume approximation of Wasserstein gradient flows.* FVCA9 - International Conference on Finite Volumes for Complex Applications IX, 2020, Bergen, Norway.

Softwares

1. Contribution to the Fortran software [TOY2DAC](#) developed by the [SEISCOPE](#) team for seismic imaging via Full Waveform Inversion in the acoustic regime. Specifically, design of new misfit functions based on optimal transport.
2. [OT-FV](#) (Matlab): computation of dynamical quadratic optimal transport with finite volumes, owing to an interior point method for the solution of the discrete optimization problem and efficient iterative linear solvers for the saddle point problems that arise from it.
3. [dynamic-ot](#) (Python): solution of dynamical quadratic optimal transport with mixed finite element discretizations and the implementation of proximal-splitting type optimization solvers.
4. [LJKO](#), [LJKO_IPM](#) (Matlab): reliable and efficient computation of Wasserstein gradient flows via variational finite volume schemes.