

# Curriculum Vitae

Filippo Zanetti

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## Contact information

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## Bio

Born in Pordenone (Italy), in 1995. Living in Edinburgh (UK).

## Experience

- ▷ HiGHS Senior Optimization Solver Developer 01/2024-present  
University of Edinburgh, School of Mathematics  
*Development of the new interior point solver for linear and quadratic programming for the open source optimization library HiGHS. Development of a specialized factorization code for positive definite and indefinite matrices.*  
Supervisor: Dr Julian Hall
- ▷ Postdoctoral Research Associate 09/2023-12/2023  
University of Edinburgh, School of Mathematics  
*Development of a factorization-based interior point method for the HiGHS software library.*  
Supervisor: Dr Julian Hall
- ▷ Tutor and Teaching Assistant 2018-2023
  - Tutor at the University of Padua: calculus, numerical analysis.
  - Tutor at the University of Edinburgh: calculus, linear algebra, optimization, OR.
  - Teaching assistant at the winter school *Advanced Methods for Mathematical Image Analysis*, Bologna, 18-25 January 2023.

## Education

- ▷ PhD in *Optimization and Operational Research* 09/2019-09/2023  
University of Edinburgh, School of Mathematics  
Thesis: *Efficient interior point algorithms for large scale convex optimization problems*  
Supervisors: Prof Jacek Gondzio, Dr John Pearson
- ▷ Master's Degree in *Mathematical Engineering* 09/2017-09/2019  
University of Padua, 110/110 with honors  
Thesis: *Block preconditioners for saddle point linear systems arising in the finite elements discretization of the Navier-Stokes equations.*  
Supervisor: Prof Luca Bergamaschi
- ▷ Bachelor's Degree in *Aerospace Engineering* 09/2014-07/2017  
University of Padua, 110/110 with honors  
Thesis: *Acceleration of the Jacobi-Davidson method with low-rank preconditioners for the computation of eigenvalues of large and sparse matrices.*  
Supervisor: Prof Luca Bergamaschi

## Publications

- S. Latva-Äijö, F. Zanetti, A. Honkanen, S. Huotari, J. Gondzio, M. Lassas, S. Siltanen. *Inner product regularized multi-energy X-ray tomography for material decomposition*. Applied Mathematics for Modern Challenges 2(1), 1-16, 2024. <https://doi.org/10.3934/ammc.2024001>

- S. Cipolla, J. Gondzio and F. Zanetti. *A regularized interior point method for sparse optimal transport on graphs*. European J Oper Res 319(2), 413-426, **2023**. <https://doi.org/10.1016/j.ejor.2023.11.027>
- F. Zanetti and J. Gondzio. *An interior-point-inspired algorithm for linear programs arising in discrete optimal transport*. INFORMS J Comput 35(5), 1061-1078, **2023**. <https://doi.org/10.1287/ijoc.2022.0184>
- F. Zanetti and J. Gondzio. *A new stopping criterion for Krylov solvers applied in interior point methods*. SIAM J Sci Comput 45(2), A703-A728, **2023**. <https://doi.org/10.1137/22M1490041>
- J. Gondzio, M. Lassas, S. Latva-Aijo, S. Siltanen and F. Zanetti. *Material-separating regularizer for multi-energy X-ray tomography*. Inverse Problems 38(2), 025013, **2022**. <https://doi.org/10.1088/1361-6420/ac4427>
- F. Zanetti and L. Bergamaschi. *Scalable block preconditioners for linearized Navier-Stokes equations at high Reynolds number*. Algorithms 13(8), 199, **2020**. <https://doi.org/10.3390/a13080199>

## Other publications

- F. Zanetti. *Efficient interior point algorithms for large scale convex optimization problems*. PhD Thesis, **2023**. <http://dx.doi.org/10.7488/era/4009>
- F. Zanetti. *Block preconditioners for saddle point linear systems arising in the FE discretization of the Navier-Stokes equations*. Master's Thesis, **2020**. <https://hdl.handle.net/20.500.12608/21375>
- L. Bergamaschi, A. Martinez and F. Zanetti. *A two-stage Jacobi-Davidson method with spectral preconditioners for the eigensolution of large SPD matrices*. Proceedings of the 17th International Conference on Computational and Mathematical Methods in Science and Engineering, CMMSE 2017, pp. 300-303, **2017**.

## Conferences

### Invited talks

- *Scalable interior point methods for large scale discrete optimal transport problems*, 25<sup>th</sup> International Symposium on Mathematical Programming . 22 July 2024, Montreal.
- *A regularized interior point method for sparse optimal transport on graphs*, 33<sup>rd</sup> European Conference on Operational Research. 2 July 2024, Copenhagen.
- *Accuracy and early termination of Krylov solvers in interior point methods*, Numerical Methods for Large Scale Problems. 8 June 2022, Belgrade.

### Contributed talks

- *A Hybrid Interior-Point-Column-Generation Method for Discrete Optimal Transport Problems*, SIAM Conference on Optimization. 2 June 2023, Seattle.
- *A sparse interior point method for linear programs arising in optimal transport*, 19<sup>th</sup> Workshop on Advances in Continuous Optimization. 30 July 2022, Lisbon.
- *New indicators for the early termination of the linear solver in Interior Point Methods*, 7<sup>th</sup> IMA Conference on Numerical Linear Algebra and Optimization. 29 June 2022, Birmingham.
- *Interior point method applications for very large problems arising in imaging and optimal transport*, Modern Techniques of Very Large Scale Optimization. 20 May 2022, Edinburgh.
- *New indicators for the early termination of the linear solver in interior point methods*, Recent Advances in Numerical Linear Algebra for PDEs, Optimization, and Data Assimilation. 12 April 2022, Edinburgh.
- *A new stopping criterion for Krylov solvers applied in Interior Point Methods*, 31<sup>st</sup> European Conference on Operational Research. 13 July 2021, Athens (hybrid).
- *A new stopping criterion for Krylov solvers applied in Interior Point Methods*, 18<sup>th</sup> Workshop on Advances in Continuous Optimization. 9 July 2021, Toulouse (hybrid).

### Other talks

- *A new parallel interior point solver for HiGHS*, HiGHS Workshop. 26 June 2024, Edinburgh.
- *Solving very large scale discrete optimal transport problems in linear time*, Polish Academy of Science Mechanics Committee. 17 February 2023, online.
- *Interior Point Methods for Optimal Transport with imaging applications*, OptimizEd wORld seminar series. 28 September 2022, Edinburgh.
- *Interior point methods for optimization problems arising in imaging and optimal transport*, SIAM UKIE National Student Chapter Conference. 23 June 2022, Edinburgh.

## Organized

- Co-organizer of the session *Modern techniques for network optimization* at the 33<sup>st</sup> European Conference on Operational Research. 2 July 2024, Copenhagen.
- Co-organizer of the workshop *Modern Techniques of Very Large Scale Optimization*. 19-20 May 2022, Edinburgh.

## Skills

- Languages: Italian, English
- Programming: C/C++, Matlab, Fortran, Python
- Other: Latex, Office, HTML, MPI, Bash

## Reviewer for the following journals

- SIAM Journal on Scientific Computing
- Computational Optimization and Applications
- Optimization Methods and Software
- Journal of Scientific Computing
- Computers and Operations Research
- Mathematical Programming Computation

## Awards & Scholarships

- Runner-up for the 2023 OR Society Doctoral Award.
- *School of Mathematics/Oracle Labs* PhD scholarship (Sep 2019 - Feb 2023)
- Extended PhD funding from *HiGHS* (Mar 2023 - Aug 2023)
- Associate Fellow of the Higher Education Academy, AFHEA (2021)
- *SIAM Student Travel Award* for the SIAM Conferences LA21, OP21, OP23. Total value  $\approx 1,100$ USD
- *Laura Wisewell Fund Award* to participate at the conferences 31<sup>st</sup> European Conference on Operational Research (2021), 7<sup>th</sup> IMA Conference on Numerical Linear Algebra and Optimization (2022). Total value  $\approx 500$ GBP