Federico Giovanni Poloni

Curriculum vitae

Personal data

- **Born** January 1, 1983 in Treviglio (Bergamo), Italy. Italian citizen.
- **Current work address** Dipartimento di Informatica; L.go Pontecorvo, 3; 56127 Pisa; Italy.
- **Contact info** mobile +39 340 2591953, e-mail fpoloni@di.unipi.it.

Academic positions

2012–present **Ricercatore universitario**, *University of Pisa, department of Computer Science*, Pisa, Italy.
Research-oriented position at the assistant professor level. Permanent after a tenure-track period ended in 2014.

2011–2012 **A. von Humboldt Postdoctoral Fellow**, *Technische Universität Berlin, institute of Mathematics*, Berlin, Germany.
Info: `http://en.wikipedia.org/wiki/Humboldt_Foundation`.

2011 **Wissenschaftlicher Mitarbeiter**, *Technische Universität Berlin, institute of Mathematics*, Berlin, Germany.
Short-term research assistant position (3 months).

Education

2008–2010 **Perfezionamento (Ph.D.) in Mathematics**, *Scuola Normale Superiore*, Pisa, Italy.
Thesis *Algorithms for Quadratic Matrix and Vector Equations*.
Advisors D. A. Bini and B. Meini.
Legally equivalent to a European PhD and to the Italian title of *dottore di ricerca*.

2002–2008 **Diploma (corso ordinario)**, *Scuola Normale Superiore*, Pisa, Italy.
Five-year honours programme, complementing the bachelor/master studies at the University of Pisa. The Scuola Normale is a public higher learning institution on the model of the French *grandes écoles*. Admission is extremely selective. Info: `http://en.wikipedia.org/wiki/Scuola_normale`.

2005–2007 **Laurea Specialistica (M.Sc.) in Mathematics**, *Università di Pisa*, Pisa, Italy.

2002–2005 **Laurea (B.Sc.) in Mathematics**, *Università di Pisa*, Pisa, Italy.

Research interests

Field: Numerical linear algebra. Main topic: **matrix equations**: **numerical algorithms** for their solution and theoretical aspects. In particular, **algebraic Riccati equations** and other nonlinear equations related to generalized eigenvalue and invariant subspace problems.

After my studies in pure and computational mathematics, I have expanded my horizons by collaborating with several researchers from **applications** in which these equations appear (**control theory**, applied probability and **queuing theory**, **econometric time series**), getting familiar with the problems and the language of these fields.

Publications

Over 25 papers in peer-reviewed journals, including **top journals** in the field such as Math Comp, Numer Math, SIAM J Matrix Anal Appl.

Scopus: `http://www.scopus.com/authid/detail.url?authorId=56071560300`.

Google Scholar: `https://scholar.google.com/citations?user=Sc-AccMAAAAJ`.

One **book** based on my PhD thesis: `http://www.springer.com/it/book/9788876423833`.

Other scientific activities

Conference organization

2016 **Mathematical Models and Computational Methods for Complex Networks**, *Two-day workshop held in Pisa*, member of the local organizing commitee.

2015 **Minisymposium on Numerical Methods for Markov Chains and Stochastic Models**, *SIAM conference on applied Linear Algebra, Atlanta, USA*, invited minisymposium organizer.

2011 **Young Researchers Minisymposium on algebraic Riccati equations**, *17th ILAS Conference, Braunschweig, Germany*, minisymposium co-organizer with T. Reis.

2010 **16th ILAS Conference**, *Pisa, Italy*, member of the local organizing committee.

Research visits

2014 & 2015 **University of Adelaide**, *Australia*, host: G. Nguyen.

2014 **Federal University of Rio De Janeiro**, *Brazil*, host: I. Nisoli.

2013 **University of Manchester**, *UK*, host: V. Noferini.

2012 & 2013 **Rouen Business School**, *France*, host: G. Sbrana.

2010 & 2013 **Technische Universität Berlin**, *Germany*, host: V. Mehrmann.

Grants

2015 ***Progetto di Ricerca di Ateneo*, Università di Pisa**.
Participant of a 15-people, 1-year research project funded by my university.

2014 ***Progetto di Ricerca*, GNCS/INDAM**.
Participant of a 6-people, 1-year research project funded by an Italian funding agency (INDAM).

2013 ***Progetto di Ricerca*, GNCS/INDAM**.
Principal investigator of a 8-people, 1-year research project.

2012 & 2014 ***Progetto Giovani Ricercatori*, GNCS/INDAM**.
Recipient of a small single-person grant for young researchers, in two separate years.

Teaching activities

Video recordings of my lectures are available for several courses; links on `http://fph.altervista.org/dida/index.html`.

2016 **Numerical Methods and Optimization**, *Università di Pisa*, graduate course for Computer Science students, main instructor of the numerical linear algebra module. Taught in English.

2015 & 16 **Matematica Discreta e Algebra lineare (lezioni)**, *Università di Pisa*, undergraduate course for computer science students, main instructor of the linear algebra module.

2013–2016 **Calcolo Numerico (esercitazioni)**, *Università di Pisa*, undergraduate course on numerical computing for biomedical engineering students, exercise classes supporting the course.

2014 **Laboratorio di Matematica Computazionale (lezioni)**, *Università di Pisa*, graduate lab course on applications of numerical mathematics and linear algebra, main instructor.

2008,09,10,12 **Laboratorio di Analisi Numerica (laboratorio)**, *Università di Pisa*, computer lab classes supporting an undergraduate numerical analysis course for maths students.

2008–10 **Complementi di Analisi (tutorato)**, *Scuola Normale Superiore, Pisa*, weekly tutoring activities and advanced exercises for a group of first-year Maths and Physics honours students of the Scuola Normale.

Awards

2011 **Shortlisted for the XIV Householder Award**.
Shortlist = qualified in the top 6. The Householder award is a prize for the best dissertation in numerical linear algebra in a 3-year period. Nominations are gathered worldwide.

2007 **2nd Matrix Prize for Young Speakers**, *International Conference in Matrix Methods and Operator Equations*, Moscow.

2003 **Championnat International de Jeux Mathématiques**, *1st place*, category L2 (undergrad).
The CIJM is an international contest in elementary and recreational mathematical problems, popular especially in the francophone countries.

2002 **43rd International Mathematical Olympiad**, *Bronze Medal (17 points)*.
Highest score *ex aequo* among the 6-people Italian team. The IMO, held annually, is the most important international problem-solving contest in mathematics for pre-collegiate students.

2001 **42nd International Mathematical Olympiad**, *Honorable Mention (9 points)*.

2001–2002 **Other results in national science Olympiads** Italian Math Olympiad: 2nd place in 2002, 3rd place in 2001. Finalist in the Italian physics (2002) and informatics (2001) Olympiads.

Other relevant activities

2009–present **Member, Commissione Olimpiadi**, *Unione Matematica Italiana*.
Since 2003, I take part actively in the training activities, the organization, and the grading of the Italian Mathematical Olympiad, after several participations as a contestant (see *Awards*). Since 2009, I am a member of the organizing board. I was **deputy leader** of the Italian team in the 2014 International Mathematical Olympiad, and followed the Italian team to several other international competitions as a member of the scientific staff. I taught in over 20 local and national **training camps** for high-school students or teachers.

2010 **Referee, CISIA admission tests**, reviewer for the Mathematics part.
Unified entry test used for admission in the schools of engineering of many Italian universities.

Skills

Languages

In parentheses: European reference levels, estimated from the levels of courses attended.

- **Italian** Mother tongue.
- **English** Excellent (C2).
- **German** Good (C1).
- **French** Adequate/rusty (B1).

Computer skills

OS Linux: very good knowledge (use and system administration).

Programming Very good knowledge of Matlab. Experience with short and medium-size programs in several languages: C, C++, Python (including Sage), Fortran, Perl, shell scripting, Mathematica. Some SQL.

Markup Very good knowledge of LaTeX. Basic HTML with CSS.

Tools Experience with revision control (Git, Mercurial) and open source software development.

Last update: 2016-10-31.

Full list of publications

Pdf files and a more up-to-date list are available on `http://fph.altervista.org/`.

The most common practice in mathematics is that the author order is alphabetical and does not reflect a difference in contribution.

Journal papers

2016 V Mehrmann and F Poloni. "An inverse-free ADI algorithm for computing Lagrangian invariant subspaces". In: *Numer. Linear Algebra Appl.* 23.1, pp. 147–168. DOI: 10.1002/nla.2018.

F Poloni and T Reis. "A structure-preserving doubling algorithm for Lur'e equations". In: *Numer. Linear Algebra Appl.* 23.1, pp. 169–186. DOI: 10.1002/nla.2019.

F Poloni and G Sbrana. "Multivariate trend-cycle extraction with the Hodrick-Prescott filter". In: *Macroeconomic Dynamics*. To appear in print. DOI: 10.1017/S1365100515000887.

F Poloni and N Strabić. "Principal pivot transforms of quasidefinite matrices and semidefinite Lagrangian surfaces". In: *Electron. J. Linear Algebra* 31, pp. 200–231. DOI: 10.13001/1081-3810.3132.

2015 V Noferini and F Poloni. "Duality of matrix pencils, Wong chains and linearizations". In: *Linear Algebra Appl.* 471, pp. 730–767. DOI: 10.1016/j.laa.2015.01.015.

F Poloni and G Sbrana. "A note on forecasting demand using the multivariate exponential smoothing framework". In: *Int. J. of Prod. Econ.* 162, pp. 143–150. DOI: 10.1016/j.ijpe.2015.01.017.

2014 GT Nguyen and F Poloni. "Componentwise accurate fluid queue computations using doubling algorithms". In: *Numer. Math.* 130.4, pp. 763–792. DOI: 10.1007/s00211-014-0675-4.

F Poloni and G Sbrana. "Feasible generalized least squares estimation of multivariate GARCH(1,1) models". In: *J. Multivariate Anal.* 129, pp. 151–159. DOI: 10.1016/j.jmva.2014.04.015.

2013 B Iannazzo and F Poloni. "A subspace shift technique for nonsymmetric algebraic Riccati equations associated with an M-matrix". In: *Numer. Linear Algebra Appl.* 20.3, pp. 440–452. DOI: 10.1002/nla.1836.

V Mehrmann and F Poloni. "A generalized structured doubling algorithm for the numerical solution of linear quadratic optimal control problems". In: *Numer. Linear Algebra Appl.* 20.1, pp. 112–137. DOI: 10.1002/nla.1828.

V Mehrmann and F Poloni. "Using permuted graph bases in $\mathcal{H}_\infty$ control". In: *Automatica J. IFAC* 49.6, pp. 1790–1797. DOI: 10.1016/j.automatica.2013.02.039.

F Poloni. "An algorithm for solving systems of quadratic equations in branching processes". In: *Boll. Unione Mat. Ital. (9)* 6.2, pp. 481–486.

F Poloni. "Quadratic vector equations". In: *Linear Algebra and its Applications* 438.4, pp. 1627–1644. DOI: 10.1016/j.laa.2011.05.036.

G Sbrana and F Poloni. "A closed-form estimator for the multivariate GARCH $(1,1)$ model". In: *J. Multivariate Anal.* 120, pp. 152–162. DOI: 10.1016/j.jmva.2013.05.005.

2012 F Greco, B Iannazzo, and F Poloni. "The Padé iterations for the matrix sign function and their reciprocals are optimal". In: *Linear Algebra Appl.* 436.3, pp. 472–477. DOI: 10.1016/j.laa.2011.04.016.

V Mehrmann and F Poloni. "Doubling Algorithms with Permuted Lagrangian Graph Bases". In: *SIAM J. Matrix Anal. Appl.* 33.3, pp. 780–805. DOI: 10.1137/110850773.

F Poloni and T Reis. "A Deflation Approach for Large-Scale Lur'e Equations". In: *SIAM J. Matrix Anal. Appl.* 33.4, pp. 1339–1368. DOI: 10.1137/120861679.

2011 DA Bini, B Meini, and F Poloni. "On the solution of a quadratic vector equation arising in Markovian binary trees". In: *Numer. Linear Algebra Appl.* 18.6, pp. 981–991. DOI: 10.1002/nla.809.

B Meini and F Poloni. "A Perron iteration for the solution of a quadratic vector equation arising in Markovian binary trees". In: *SIAM J. Matrix Anal. Appl.* 32.1, pp. 248–261. DOI: 10.1137/100796765.

2010 DA Bini, B Meini, and F Poloni. "An effective matrix geometric mean satisfying the Ando-Li-Mathias properties". In: *Math. Comp.* 79.269, pp. 437–452. DOI: 10.1090/S0025-5718-09-02261-3.

DA Bini, B Meini, and F Poloni. "Transforming algebraic Riccati equations into unilateral quadratic matrix equations". In: *Numer. Math.* 116.4, pp. 553–578. DOI: 10.1007/s00211-010-0319-2.

F Poloni. "A note on the $O(n)$-storage implementation of the GKO algorithm and its adaptation to Trummer-like matrices". In: *Numer. Algorithms* 55.1, pp. 115–139. DOI: 10.1007/s11075-010-9361-5.

F Poloni. "Constructing matrix geometric means". In: *Electron. J. Linear Algebra* 20, pp. 419–435.

2009 DA Bini, B Meini, and F Poloni. "Fast solution of a certain Riccati equation through Cauchy-like matrices". In: *Electron. Trans. Numer. Anal.* 33, pp. 84–104.

2008 DA Bini, B Iannazzo, and F Poloni. "A fast Newton's method for a nonsymmetric algebraic Riccati equation". In: *SIAM J. Matrix Anal. Appl.* 30.1, pp. 276–290. DOI: 10.1137/070681478.

Book chapters, proceedings, preprints and other publications

2016 GT Nguyen and F Poloni. *Componentwise accurate Brownian motion computations using Cyclic Reduction*. eprint: arXiv:1605.01482. URL: https://arxiv.org/abs/1605.01482.

FD Terán, B Iannazzo, F Poloni, and L Robol. *Uniqueness of solution of generalized Sylvester-like equations with rectangular coefficients*. eprint: arXiv:1608.01183. URL: https://arxiv.org/abs/1608.01183.

2015 GA Di Luna, P Flocchini, S Gan Chaudhuri, F Poloni, N Santoro, and G Viglietta. *Mutual Visibility by Luminous Robots Without Collisions*. To appear in Information and Computation. eprint: arXiv:1503.04347. URL: http://arxiv.org/abs/1503.04347.

T Haqiri and F Poloni. *Methods for verified solutions to continuous-time algebraic Riccati equations*. arXiv.org eprint. To appear in JCAM. eprint: arXiv:1509.02015. URL: http://arxiv.org/abs/1509.02015.

E Jarlebring and F Poloni. *Iterative methods for the delay Lyapunov equation with T-Sylvester preconditioning*. arXiv.org eprint. Submitted to APNUM. eprint: arXiv:1507.02100. URL: http://arxiv.org/abs/1507.02100.

F Poloni. "Permuted Graph Matrices and Their Applications". In: *Numerical Algebra, Matrix Theory, Differential-Algebraic Equations and Control Theory*. Ed. by P Benner, M Bollhöfer, D Kressner, C Mehl, and T Stykel. Springer International Publishing, pp. 107–129. ISBN: 978-3-319-15259-2. DOI: 10.1007/978-3-319-15260-8_5.

2014 GA Di Luna, P Flocchini, F Poloni, N Santoro, and G Viglietta. "The Mutual Visibility Problem for Oblivious Robots". In: *Proceedings of the 26th Canadian Conference on Computational Geometry*. URL: https://projects.cs.dal.ca/cccg2014/proceedings/.

2013 T Brüll, F Poloni, G Sbrana, and C Schröder. *Enforcing solvability of a nonlinear matrix equation and estimation of multivariate ARMA time series*. Tech. rep. Matheon Preprint #1027. DFG-Forschungszentrum Matheon. URL: http://nbn-resolving.de/urn:nbn:de:0296-matheon-12409.

2010 DA Bini, B Iannazzo, B Meini, and F Poloni. "Nonsymmetric algebraic Riccati equations associated with an M-matrix: recent advances and algorithms." In: *Matrix Methods: Theory, Algorithms and Applications*. Ed. by V Olshevsky and E Tyrtyshnikov. World Scientific Publishing. Chap. 10, pp. 176–209. ISBN: 978-981-283-601-4. DOI: 10.1142/9789812836021_0010.

2006 DA Bini and F Poloni. *A note on the location of polynomial roots*. arXiv.org eprint. Never submitted to a peer-reviewed journal. eprint: arXiv:math/0609297. URL: http://arxiv.org/abs/math/0609297.

Books

2011 F Poloni. *Algorithms for quadratic matrix and vector equations*. Vol. 16. Theses of Scuola Normale Superiore di Pisa (New Series). Book based on my Ph.D. Thesis. Publications of the Scuola Normale Superiore, Pisa (distributed by Birkhäuser), pp. xvi+239. ISBN: 978-88-7642-383-3. URL: http://www.springer.com/birkhauser/mathematics/scuola+normale+superiore/book/978-88-7642-383-3.

Software

2012 F Poloni. *PGDoubling – A MATLAB package to solve algebraic Riccati equations and optimal control problems using permuted graph bases*. URL: https://bitbucket.org/fph/pgdoubling.