

Paolo Novati

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Degrees

- *Ph.D. in Computational Mathematics*, University of Padova, Italy, February 2001. Ph.D. Thesis: *Polynomial methods for the computation of functions of large unsymmetric matrices*. Advisor: Prof. I.Moret, University of Trieste, Italy. Reviewer: Prof. L.Dieci, Georgia State University, USA.
- *M.Sc. in Applied Mathematics* (mark 110/100 cum Laude), University of Trieste, Italy, July 1996. Thesis: *On hybrid semi-iterative methods for solving large linear systems*. Advisor: Prof. I.Moret, University of Trieste, Italy.

Academic positions

- March 2015 - present. *Associate Professor* of Numerical Analysis. University of Trieste, Italy, Department of Mathematics and Geosciences.
- December 2009 - February 2015. *Assistant Professor* of Numerical Analysis. University of Padova, Italy, Faculty of Engineering, Department of Mathematics.
- December 2003 - June 2010. *Teaching Assistant* of Analysis, Linear Algebra, Geometry. Nettuno University, Rome, Italy, Faculty of Engineering.
- December 2001 - December 2009. *Assistant Professor* of Numerical Analysis. University of L'Aquila, Italy, Faculty of Science, Department of Pure and Applied Mathematics.
- April 2001 - November 2001. *Post-Doc Fellowship* in Numerical Analysis. University of Trieste, Italy, Faculty of Science, Department of Mathematics.
- December 1997 - December 2000. *Ph.D. in Computational Mathematics*, University of Padova.

Research topics

- Polynomial and rational methods for the computation of Functions of Matrices.
- Numerical methods for Fractional Differential Equations.
- Krylov methods for the regularization of ill-conditioned linear systems.

Publications and Preprints

1. P.Novati, *Some properties of the Arnoldi based methods for linear ill-posed problems*. Submitted.
2. I.G.A. Abdelsheed, P.Novati, *The solution of fractional order epidemic model by implicit Adams methods*, Appl. Math. Model., to appear. DOI: 10.1016/j.apm.2016.10.054.
3. L.Aceto, P.Novati, *Rational approximation to the fractional Laplacian operator in reaction-diffusion problems*, SIAM J. Sci. Comput., to appear.
4. I.Moret, P.Novati, *Krylov subspace methods for functions of fractional differential operators*. Submitted.
5. P.Novati, *A convergence result for some Krylov-Tikhonov methods*. Submitted.
6. S.Gazzola, P.Novati, *On the inheritance of the discrete Picard condition*, BIT 56 (2016) pp. 893-918.
7. S.Gazzola, P.Novati and M.R.Russo, *On Krylov projection methods and Tikhonov regularization*, Electronic Transactions on Numerical Analysis 44 (2015), pp. 83-123
8. L.Aceto, C.Magherini, P.Novati, *Short-term recursion for fractional differential equations*, AIP Conf. Proc. 1648 (2015), pp. 020001-1-020001-4.
9. L.Aceto, C.Magherini and P.Novati, *On the construction and properties of m-step methods for Fractional Differential Equations*, SIAM J. Sci. Comput. 37 (2015), pp. A653-A675.
10. S.Gazzola, P.Novati and M.R.Russo, *Embedded techniques for choosing the parameter in Tikhonov regularization*, Numerical Linear Algebra with Applications, 21 (2014), pp. 796-812.
11. P.Novati and M.R.Russo, *A GCV based Arnoldi-Tikhonov regularization method*, BIT 54 (2014), pp. 501-521.
12. L.Aceto, C.Magherini and P.Novati, *Fractional convolution quadrature based on generalized Adams methods*, Calcolo 51 (2014), pp. 441-463.

13. P.Novati, *Numerical approximation to the fractional derivative operator*, Numerische Mathematik 127 (2014), pp. 539-566.
14. S.Gazzola and P.Novati, *Automatic parameter setting for Arnoldi-Tikhonov methods*, Journal of Computational and Applied Mathematics 256 (2014), pp 180-195.
15. P.Novati and M.R.Russo, *Adaptive Arnoldi-Tikhonov regularization for image restoration*, Numerical Algorithms 65 (2014), pp. 745-757.
16. S.Gazzola and P.Novati, *Multiparameter Arnoldi-Tikhonov methods*, Electronic Transactions on Numerical Analysis 40 (2013), pp. 452-475.
17. L.Aceto, C.Magherini and P.Novati, *Generalized Adams methods for Fractional Differential Equations*, AIP Conf. Proc. 1479 (2012), pp. 250-253.
18. P.Novati, M.Redivo-Zaglia and M.R.Russo, *Preconditioning linear systems via matrix function evaluation*, Applied Numerical Mathematics 62 (2012), pp. 1804-1818.
19. P.Novati, *Using the RD-rational Arnoldi method for exponential integrators*, PAMM, 11 (2011), pp. 19-22.
20. P.Novati, *Efficient Computation of the Core Functions of Exponential Itegrators*, AIP Conf. Proc. 1389 (2011), pp. 233-236.
21. C.Brezinski, P.Novati and M.Redivo-Zaglia, *A rational Arnoldi approach for ill-conditioned linear systems*, Journal of Computational and Applied Mathematics, 263 (2012), pp. 2063-2077.
22. P.Novati, *Using the Restricted-Denominator rational Arnoldi method for exponential integrators*, SIAM J. Matrix Anal. Appl., 32 (2011), pp. 1537-1558.
23. I.Moret and P.Novati, *On the convergence of Krylov subspace methods for matrix Mittag-Leffler functions*, SIAM J. Numer. Anal., 49 (2011), pp. 2144-2164.
24. P.Novati, *On the construction of Restricted-Denominator Exponential W-methods*, Journal of Computational and Applied Mathematics, 221 (2008), pp. 86-101.
25. P.Novati, *Some secant approximations for Rosenbrock W-methods*, Applied Numerical Mathematics, 58 (2008), pp. 195-211.
26. I.Moret and P.Novati, *Rational Krylov methods for solving time-periodic differential equations*, Applied Numerical Mathematics, 58 (2008), pp. 212-222.
27. P.Novati, *A class of explicit one-step methods of order 2 for stiff problems*, Journal of Numerical Mathematics, 13 (2005), pp. 219-236.
28. I.Moret and P.Novati, *Interpolating functions of matrices on zeros of quasi-kernel polynomials*, Numerical Linear Algebra with Applications, 12 (2005), pp. 337-353.

29. P.Novati, *A low cost Arnoldi method for large linear initial value problems*, International Journal of Computer Mathematics, 81 (2004), pp. 835-844.
30. I.Moret and P.Novati, *RD-rational approximation of the matrix exponential operator*, BIT, 44 (2004), pp. 595-615.
31. P.Novati, *An explicit one-step method for stiff problems*, Computing, 71 (2003), pp. 133-151.
32. P.Novati, *Solving initial value problems by Faber polynomials*, Numerical Linear Algebra with Applications, 10 (2003), pp. 247-270.
33. P.Novati, *A polynomial method based on Fejer points for the computation of functions of nonsymmetric matrices*, Applied Numerical Mathematics, 44 (2003), pp. 201-224.
34. I.Moret and P.Novati, *The computation of functions of matrices by truncated Faber series*, Numerical Functional Analysis and Optimization, 22 (2001), pp. 697-719.
35. I.Moret and P.Novati, *An interpolatory approximation of the matrix exponential based on Faber polynomials*, Journal of Computational and Applied Mathematics, 131 (2001), pp. 361-380.
36. P.Novati, *Metodi polinomiali per il calcolo di funzioni di matrici non simmetriche e di grandi dimensioni*, U.M.I. Buletin, Series VIII, Vol. IV-A (2001), pp. 515-518.
37. P.Novati, *A polynomial method based on truncating Faber series for the computation of the matrix exponential operator*, Technical Report, Department of Mathematics, University of Trieste, 415 (1997).
38. P.Novati, *Metodi polinomiali per l'approssimazione di funzioni di matrici*, Technical Report, Department of Mathematics, University of Trieste, 410 (1997).

Contributions in Conferences, Seminars and Posters

1. Cycle of seminars: *Krylov subspace methods for linear systems*, University of Insubria, Italy, May 2015.
2. *Short-recursion formulas for Fractional Differential Equations*, ICFDA14, Catania, Italy, June 2014.
3. Poster: *Arnoldi-Tikhonov methods for sparse reconstruction* (with S.Gazzola and J.Nagy), Householder Symposium XIX, Spa, Belgium, June 2014.
4. Seminar: *On Krylov methods and regularization*, University of Insubria, Italy, February 2014.

5. *Numerical methods for Fractional Differential Equations*, Annual GNCS conference, Montecatini, Italy, February 2014.
6. *On the construction of k-step methods for Fractional Differential Equations*, Numerical Simulation of Evolutionary Processes, Bari, Italy, January 2014.
7. Poster: *Parameter selection strategies for the Arnoldi-Tikhonov method* (with S.Gazzola and M.R.Russo), Nonlinear Evolution Equations and Linear Algebra, Cagliari, Italy, September 2013.
8. Poster: *Generalized Adams Product Quadrature Rules for Fractional Differential Equations* (with L.Aceto and C.Magherini), IWATA, Potenza, Italy, September 2013.
9. Seminar: *Rational approximations to the fractional derivative operator*, University of Pisa, Italy, June 2013.
10. *Numerical approximation to the fractional derivative operator*, FUN13, Manchester, Great Britain, April 2013.
11. *Tikhonov regularization and matrix function evaluation*, "Due giorni di algebra lineare numerica", Genova, Italy, February 2012.
12. Poster: *Tikhonov regularization and matrix function evaluation* (with M.R.Russo), SC2011, Cagliari, Italy, October 2011.
13. *Efficient Computation of the Core Functions of Exponential Integrators*, ICNAAM 2011, Halkidiki, Greece, September 2011.
14. *Using the RD rational Arnoldi method for exponential integrators*, GAMM 2011, Graz, Austria, April 2011.
15. *Preconditioning linear systems via matrix function evaluation*, Numerical linear algebra in inverse problems, Como, Italy, March 2011.
16. Cycle of seminars: *Numerical treatment of Fractional Differential Equations*, University of Pisa, Italy, December 2010.
17. Seminar: *A rational Arnoldi approach for ill-conditioned linear systems*, University of Padova, Italy, October 2010.
18. Poster: *A rational Arnoldi approach for ill-conditioned linear systems* (with C.Brezinski and M.Redivo-Zaglia), DRWA10, Canazei, Italy, September 2010.
19. *A rational Arnoldi approach for ill-conditioned linear systems*, IPCA10, Luminy, France, June 2010.
20. Seminar: *The Lawson-Adams methods for Stiff problems*, University of Padova, Italy, October 2009.

21. *Implementation of Lawson-Adams multistep methods for large stiff problems*. DW-CAA09, Canazei, Italy, Settembre 2009.
22. Seminar: *Exponential Integrators for Ordinary Differential Equations*, University of Newcastle, Australia, August 2009.
23. Seminar: *The computation of functions of matrices in the context of the numerical solution of stiff problems*. University of Verona, Verona, Italy, April 2008.
24. *Restricted Denominator Rational Krylov approximations to the matrix exponential*, Dynamical Systems on Matrix Manifolds: Numerical Methods and Application, Bari, Italy, May 2004.
25. *RD-rational approximations of the matrix exponential*, XVII UMI Conference, Milano, Italy, September 2003.
26. *Polynomial methods for the computation of functions of large unsymmetric matrices*. Numerical Methods and Scientific Computation, Torino, Italy, February 2001.
27. *A polynomial method based on truncating Faber series for the computation of functions of unsymmetric matrices*, Numerical Analysis: methods and software, Ferrara, Italy, January 2000.
28. *Using Faber polynomials for solving ODEs*. Numerical methods for ODEs, Bari, Italy, June 1998.
29. *The approximation of the matrix exponential by means of Faber polynomials*, National Conference of Numerical Analysis, Montecatini Italy, April 1998.
30. *A polynomial method based on truncating Faber series for the computation of the matrix exponential operator*, SciCADE97, Grado, Italy, September 1997.

Organization of Conferences and Symposia

- Member of the organization committee of the international conference SDIDE2016, Trieste, Italy, June 2016.
- Member of the organization committee of the international conference SC2011, Sardinia, Italy, October 2011.
- Co-organizer of the session "*Young Researchers Symposium on Numerical Methods for Differential Problems of Practical Interest*" within the international conference ICNAAM2011, Halkidiki, Greece, September 2011.

Visiting

- University of Insubria (Como), Italy, May 2015.
- University of Pisa, Italy, December 2010, June 2011, November 2012, June 2013, February 2014.
- University of Newcastle, Australia, August 2009.
- University of Padova, Italy, October 2009.
- University of Verona, Italy, April 2008.

Referee Activity

- Journal papers: 5-10 reviews per year for:

Applied Numerical Mathematics, Numerical Algorithms, Journal of Computational and Applied Mathematics, SIAM Journal of Numerical Analysis, SIAM Journal of Matrix Analysis and Applications, Numerical Linear Algebra with Applications, Numerical Functional Analysis and Optimization, Abstract and Applied Analysis, The European Physical Journal Special Topics, Mathematical Methods in the Applied Sciences, Applied Mathematics and Computation, Mathematical Modeling and Numerical Analysis, Journal of Computational Physics, BIT, Inverse Problems in Science and Engineering, Journal of Vibration and Control, Linear Algebra and its applications, IMA Journal of Numerical Analysis, Journal of Scientific Computing, Calcolo, Zentralblatt.

- Proposals from MIUR.

Research Grants

As Scientific Responsible:

- Two-year (2010-2011) University Research Project *Numerical treatment of ill-posed linear problems with applications*, prot. CPDA104492, University of Padova, Italy. Grant: 38000 (peer reviewed).
- Research program *Regularization techniques based on Krylov methods for ill-posed linear systems*, for a 3-year (2011-2013) Scholarship for the Ph.D. School of Mathematics, prot. PARO104017, University of Padova, Italy. Grant: 30000 (peer reviewed).

- Research program *Numerical methods for ill-posed linear systems with applications to image restoration*, for a two-year (2013-2014) Post-doc position at the Department of Mathematics, prot. CPDR111899, University of Padova, Italy. Grant: 36000 (peer reviewed).
- GNCS (Italian National Group of Numerical Analysis) research program *Numerical methods for Fractional Differential Equations*, (2013). Grant: 5000.

As Participant:

- PRIN 2003 - "Matrix function approximation for the numerical solution of differential equations". Scientific Coordinator: L. Lopez; Scientific Responsible: M. Vianello.
- PRIN 2007 - "Numerical methods for delay and fractional differential equations". Scientific Coordinator: A. Bellen; Scientific Responsible: N.Guglielmi.
- Two-year (2009-2010) University Research Project *Interpolation and Extrapolation: new algorithms and applications*, University of Padova, Italy. Scientific Responsible: M. Redivo-Zaglia.
- Two-year (2013-2014) University Research Project *Multivariate approximation with application to image reconstruction*, University of Padova, Italy. Scientific Responsible: S. De Marchi.
- PRIN 2012 - "Structured Matrices in Signal and Image Processing". Scientific Coordinator: M. Donatelli. Scientific Responsible: M.Donatelli.
- GNCS (Italian National Group of Numerical Analysis) research program *Metodi numerici per modelli di propagazione di onde elettromagnetiche in tessuti biologici*, (2014). Scientific Responsible: R.Garrappa.
- GNCS (Italian National Group of Numerical Analysis) research program *Metodi numerici per problemi di diffusione anomala* (2015). Scientific Responsible: L.Aceto.
- GNCS (Italian National Group of Numerical Analysis) research program *Metodi numerici per operatori non-locali e/o di natura frazionaria*, (2016). Scientific Responsible: R.Garrappa.

Teaching activity

Courses:

- **2001-2002** *Analysis I* (30 h) – B.Sc. Mathematics, University of L'Aquila. *Numerical Analysis II* (30 h) – M.Sc. Mathematics, M.Sc. Computer Science, University of L'Aquila.

- **2002-2003** *Numerical Analysis I* (30 h) – B.Sc. Mathematics, B.Sc. Computer Science, University of L’Aquila. *Numerical Analysis II* (30 h) – M.Sc. Mathematics, M.Sc. Computer Science, University of L’Aquila. *Numerical Methods for Ordinary Differential Equations* (10 h) – Ph.D. Mathematics, University of L’Aquila.
- **2003-2004** *Numerical Analysis* (30 h) – B.Sc. Chemistry, University of Trieste. *Introductory Statistics* (20 h) – B. Psychology, University of Trieste. *Mathematics I* (10 h) – B. Eng., Nettuno University. *Mathematics II* (10 h) – B. Eng., Nettuno University. *Numerical Analysis I* (30 h) – B.Sc. Mathematics, B.Sc. Computer Science, University of L’Aquila. *Numerical Analysis II* (30 h) – M.Sc. Mathematics, University of L’Aquila.
- **2004-2005** *Numerical Analysis I* (30 h) – B.Sc. Mathematics, B.Sc. Computer Science, University of L’Aquila. *Biomathematics* (30 h) – B. Biotechnology, University of L’Aquila. *Numerical Analysis* (30 h) – M.Sc. Geophysics, University of Trieste. *Introductory Statistics* (20 h) – B. Psychology, University of Trieste. *Mathematics I* (10 h) – B. Eng., Nettuno University. *Mathematics II* (10 h) – B. Eng., Nettuno University.
- **2005-2006** *Numerical Analysis and Laboratory* (60 h) – B.Sc. Mathematics, University of L’Aquila. *Numerical Analysis* (30 h) – M.Sc. Computer Science, University of L’Aquila. *Mathematics I* (10 h) – B. Eng., Nettuno University. *Mathematics II* (10 h) – B. Eng., Nettuno University.
- **2006-2007** *Numerical Analysis and Laboratory* (30 h) – B.Sc. Mathematics, University of L’Aquila. *Numerical Analysis* (60 h) – M.Sc. Computer Science, University of L’Aquila. *Mathematics I* (10 h) – B. Eng., Nettuno University. *Mathematics II* (10 h) – B. Eng., Nettuno University.
- **2007-2008** *Numerical Analysis and Laboratory* (60 h) – B.Sc. Mathematics, M.Sc. Computer Science, University of L’Aquila. *Numerical Analysis II* (30 h) – M.Sc. Mathematics, University of L’Aquila. *Mathematics I* (10 h) – B. Eng., Nettuno University. *Mathematics II* (10 h) – B. Eng., Nettuno University.
- **2008-2009** *Numerical Analysis and Laboratory* (60 h) – B.Sc. Mathematics, M.Sc. Computer Science, University of L’Aquila. *Numerical Analysis II* (30 h) – M.Sc. Mathematics, University of L’Aquila.
- **2009-2010** *Numerical Analysis and Laboratory* (60 h) – B.Sc. Mathematics, M.Sc. Computer Science, University of L’Aquila. *Numerical Analysis and Laboratory* (60 h) – B. Eng., University of Padova.
- **2010-2011** *Numerical Analysis and Laboratory* (90 h) – B. Eng., University of Padova.
- **2011-2012** *Numerical Analysis and Laboratory* (50 h) – B. Eng., University of Padova.

- **2012-2013** *Numerical Analysis and Laboratory* (60 h) – B. Eng., University of Padova.
- **2013-2014** *Numerical Linear Algebra* (30 h) – M.Sc. Mathematics, University of Padova, *Numerical methods for Differential Equations* (30 h) – M.Sc. Mathematics, University of Padova, *Numerical Analysis and Laboratory* (30 h) – B. Eng., University of Padova.
- **2014-2015** *Numerical Analysis and Laboratory* (24 h) – M.Sc. Astronomy, University of Padova, *Numerical methods for Differential Equations* (22 h) – M.Sc. Mathematics, University of Padova, *Mathematics and Computer Science* (60 h) – B.Sc. Pharmaceutics, University of Trieste, *Mathematical Modeling* (24h) – M.Sc. Mathematics, University of Trieste, *Numerical Analysis II* (24 h) – B./M.Sc. Mathematics, University of Trieste.
- **2015-2016** *Mathematics and Computer Science* (64 h) – B.Sc. Pharmaceutics, University of Trieste, *Numerical Analysis II* (48 h) – B./M.Sc. Mathematics, University of Trieste, *Numerical Methods for PDEs* (16h) – M.Sc. Mathematics, University of Trieste.

Student supervision:

- Currently supervising (University of Padova):
 1. Ismail Gad, Ph.D.
- Former supervisions (University of Trieste):
 1. Martina Orlando, M.Sc. (2014-2015).
 2. Valentina Sepe, M.Sc. (2015-2016).
- Former supervisions (University of Padova):
 1. Valentina Nigrelli, B.Sc. (2013-2014).
 2. Silvia Gazzola, Ph.D. (2011-2013).
 3. Giulio Sisti, M.Sc. (2013-2014).
 4. Jacopo Cacco, B.Sc. (2010-2011)
 5. Francesca Miscioscia, B.Sc. (2011-2012).

University service activities

- Member of the scientific board of the Ph.D. in Earth Science and Fluid Mechanic of the University of Trieste, since 2016.
- Member of the scientific board of the Ph.D. in Computational Mathematics of the University of Padova (2010-2015).
- Responsible of the Numerical Laboratory (NumLab), Department of Mathematics, University of Padova, (2012-2014).
- Member of the scientific committee for the Ph.D. admission (foreign students) at the School of Mathematics of the University of Padova (2014).
- Member of the scientific committee for the Ph.D. admission at the School of Mathematics of the University of Padova (2010).
- Member of the scientific committee for a position of Assistant Professor in Numerical Analysis at the University of Roma Tor Vergata (2008).

November, 2016