Prof. Daniela di Serafino

Curriculum Vitae

June 2, 2020

Personal data

Place and date of birth: Naples (Italy), April 8, 1966.

Citizenship: Italian.

Permanent address: viale Michelangelo 74, 80129 Naples, Italy.

Workplace: Department of Mathematics and Physics, University of Campania "Luigi Vanvitelli", viale A. Lincoln 5, 81100 Caserta, Italy.

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Education and habilitation

Oct 2014: Italian National Scientific Habilitation to Full Professor in Numerical Analysis.

1995: PhD in Applied Mathematics and Computer Science, University of Naples Federico II, Italy (four-year PhD Course, Joint PhD Program with University of Salerno, University of Palermo and University of Catania, Italy).

1989 – 1991 (24 months): National Research Council (CNR) Fellowship, Center of Research for Parallel Computing and Supercomputers, Naples, Italy.

1989: Laurea (four-year Master Degree) in Mathematics, summa cum laude, University of Naples Federico II.

1988-1989 (11 months): CNR Undergraduate Fellowship.

Positions

Dec 2018 – present: Full Professor of Numerical Analysis, Department of Mathematics and Physics, University of Campania "Luigi Vanvitelli", Caserta, Italy.

Jan 2005 – Dec 2018: Associate Professor of Numerical Analysis, Department of Mathematics and Physics, University of Campania "Luigi Vanvitelli" (formerly Second University of Naples).

Nov 1995 – Jan. 2005: Assistant Professor of Numerical Analysis, Second University of Naples.

July 2006 – June 2011, Jan. 2012 - June 2014: Research Associate, Institute for High-Performance Computing and Networking (ICAR), Italian National Research Council (CNR).

Professional experience

May 2015 – present: President, Mathematics and Computer Science (Area 01) Research Committee, University of Campania "Luigi Vanvitelli"; member of the Committee since July 2009.

March 2014 – present: Director, Research Unit of the Istituto Nazionale di Alta Matematica (INdAM) at the University of Campania "Luigi Vanvitelli".

Feb 2013 – May 2020: Vice-Director, Department of Mathematics and Physics, University of Campania "Luigi Vanvitelli" (formerly Second University of Naples).

Jan 2013 – present: Scientific Supervisor, ICT Service (Servizio Informatica e Calcolo) of the Department of Mathematics and Physics, University of Campania "Luigi Vanvitelli" (formerly Second University of Naples).

July 2013 – Dec 2018: Delegate for Teaching Activities, Department of Mathematics and Physics, University of Campania "Luigi Vanvitelli".

Research topics

The research activity of Daniela di Serafino is concerned with the development and analysis of numerical methods and software for large-scale scientific computing. Currently, her main research topics are:

- preconditioning of large and sparse linear systems arising in optimization methods (constraint preconditioners for saddle-point systems, preconditioner updating techniques, matrix-free preconditioners);
- interior point methods for quadratic programming and first-order method for nonlinear optimization, with applications to image processing and, recently, to portfolio selection problems.
- parallel algebraic multigrid preconditioners, with applications to linear systems arising in computational fluid dynamics simulations;

She is co-author of about 70 publications on peer-reviewed scientific journals, books and conference proceedings. She is also co-developer of Matlab or Fortran 90/95 numerical software for the solution of problems in the areas of Numerical Linear Algebra and Optimization.

Participation in scientific projects as principal investigator or research unit leader

2015-2018 (36 months): EoCoE - Energy oriented Centre of Excellence for computing applications, *Horizon 2020 Programme, Call H2020-EINFRA-2015-1*, Project ID 676629. Scientific responsibility of the activities at the University of Campania "Luigi Vanvitelli" (Linked Third Party of CNR) and member of the Project Steering Board.

2014 (12 months): First-Order Optimization Methods for Image Restoration and Analysis, *INdAM-GNCS Project*, funded by Istituto Nazionale di Alta Matematica (INdAM). Scientific Coordinator.

2013 (12 months): Numerical Methods and Software for Large-Scale Optimization with Applications to Image Processing, *INdAM-GNCS Project*. Scientific Coordinator.

2012 (12 months): Advanced Numerical Methods for Preconditioning Linear Systems Arising from PDE and Optimization Problems, *INdAM-GNCS Project*. Scientific Coordinator.

2009-2011 (36 months): HYDROMED - Hydrologie et Problèmes Inverses, *INRIA Programmme EuroMéditerranée 3+3*. Scientific Coordinator of the Research Unit (RU) at the Second University of Naples.

2008-2010 (24 months): Nonlinear Optimization, Variational Inequalities and Equilibrium Problems, *PRIN Project*, funded by the Italian Ministry for Education, University and Research. Scientific Coordinator of the RU at the Second University of Naples since September 2009.

2007-2009 (36 months): High-Performance Scientific Computing and Econometric Modelling, *Protocol for Scientific and Technological Cooperation between Italy and Cyprus*. Italian Scientific Coordinator.

2006-2008 (36 months): Numerical Computing for Groundwater Flows, *INRIA Programme 3+3 Méditerranée*. Second University of Naples RU Leader.

Organization of conferences, workshops and minisymposia (last 10 years)

- Co-organizer, session on *Optimization for Machine Learning and Big Data*, 2nd IMA and OR Society Conference on Mathematics of Operational Research, Birmingham, UK, 25-26/4/2019.
- Program Committee Member, *Workshop "Parallel and Distributed Computing for Life Sciences: Algorithms, Methodologies and Tools"*, International Conference Euro-Par 2018, Torino, 27-31/8/2018.
- Program Committee Member, *Special Session on Parallel Numerical Methods and Libraries for Heterogeneous Multi/Manycores*, 26th Euromicro International Conference on Parallel, Distributed and Network-Based Processing (Cambridge, UK, March 21-23, 2018).
- Co-organizer, *Special Session on Large-Scale Numerical Computations for Sustainable Energy Production and Storage*, 11th International Conference on Large-Scale Scientific Computations (Sozopol, BG, June 5-9, 2017).

- Organizer, *Minisymposium on First-Order Methods and Application*s, SIAM Conference on Optimization (Vancouver, May 22-25, 2017).
- Technical Papers Committee Member, *Supercomputing 2015 - Applications Area* (Austin, TX, November 15-20, 2015).
- Program Committee Member, *28th IEEE International Parallel & Distributed Processing Symposium* (Phoenix, USA, May 19-23, 2014).
- Program Committee Member, *16th IEEE Conference on Computational Science and Engineering* (Sydney, Dec. 3-5, 2013).
- Organizer, *Session on "Metodi e software numerici per il precondizionamento di sistemi lineari nella risoluzione di PDE e di problemi di ottimizzazione",* Conference on "Algebra Lineare Numerica e Applicazioni" (Rome, Jan. 29-31, 2013).
- Technical Program Committee Member, *Applications Track, Supercomputing 2012* (Salt Lake City, USA, Nov. 10-16, 2012).
- Program Committee Member, *15th IEEE Conference on Computational Science and Engineering, Distributed and Parallel Computing Track* (Paphos, Cyprus, Oct. 3-5, 2012).
- *Parallel Numerical Algorithms Topic* Committee Member, Euro-Par 2012 (Rhodes Island, Aug. 27-31, 2012).
- Global Chair, *Parallel Numerical Algorithms Topic*, and Program Committee Member, *Workshop on Algorithms and Programming Tools for Next-Generation High-Performance Scientific Software,* Euro-Par 2011 (Bordeaux, Aug. 29 - Sept. 2, 2011).
- Co-organizer, *Minisymposium "Preconditioning Linear Systems in Large-Scale Optimization"*, SIAM Conference on Optimization (Darmstadt, May 16-19, 2011).
- Local Chair, *Parallel Numerical Algorithms Topic*, *Euro-Par 2010* (Ischia (Naples), Sept. 1-3, 2010).
- Co-organizer, *Special Session on Parallel Algorithms and Software for Sparse Linear Algebra Computations*, 18th Euromicro International Conference on Parallel, Distributed and Network-Based Computing (Pisa, Feb. 17-19, 2010).
- Co-organizer, *Session on "Large-scale sparse matrix computations: software tools and applications"*, 5th International Workshop on Parallel Matrix Algorithms and Applications (Neuchâtel, June 20-22, 2008).

Editorial and review activity

- August 2018 – present: member of the Editorial Board, Computational Optimization and Applications (Springer, ISSN: 0926-6003).
- 2011 – present: member of the Editorial Board, Optimization Letters (Springer, ISSN: 1862-4472).
- 2005 – present: member of the Editorial Board, Quaderni di Matematica book series (University of Campania "Luigi Vanvitelli").
- Guest Editor (with P. D'Ambra, M. Guarracino and F. Perla), special issue of "Scalable Computing: Practice and Experience" on "Parallel, Distributed and Network-based Computing: an Application Perspective" (vol. 11, n. 3, 2010).
- Guest Editor (with P. D'Ambra and M. Danelutto), special issue of "Parallel Computing" on "Advanced Environments for Parallel and Distributed Computing" (vol. 28, n. 12, 2002).
- Reviewer for scientific journals in the areas of Numerical Analysis, Optimization and Scientific Computing (SIAM Journal on Optimization, SIAM Journal on Scientific Computing, ACM Transactions on Mathematical Software, Mathematical Programming, Computational Optimization and Applications, Journal of Global Optimization, Informs Journal on Computing, European Journal of Operational Research, Applied Numerical Mathematics, Journal of Computational Physics, International Journal on Computational Science and Engineering, Parallel Computing, ...).
- Reviewer for Mathematical Reviews since 2008.

Membership of scientific societies

- Society for Industrial and Applied Mathematics (SIAM).
- Società Italiana di Matematica Applicata e Industriale (SIMAI).
- Gruppo Nazionale per il Calcolo Scientifico (GNCS), Istituto Nazionale di Alta Matematica.
- Unione Matematica Italiana (UMI).
- ERCIM (European Research Consortium for Informatics and Mathematics) Working Group on Computational and Methodological Statistics.

Participation in PhD Boards

From A.Y. 2016-17 to A.Y. 2019-20: PhD Program in Mathematics, Physics and Applications for Engineering, University of Campania “Luigi Vanvitelli”.

A.Y. 2015-16: PhD Program in Mathematics, Physics and Applications, University Campania “Luigi Vanvitelli”.

2013 and A.Y. 2014-15: PhD Program in Mathematics, Physics and Applications, University Salerno (Joint PhD Program with the Second University of Naples).

2012: PhD Program in Automatica and Operations Research, Sapienza University of Rome.

From 2003 to 2012: PhD Program in Computational Biology, Second University Naples.

Teaching Activity

Since A.Y. 1999-2000 Daniela di Serafino has been teaching courses of Scientific Computing, Numerical Computing and Numerical Optimization (including applications to image processing), for undergraduate and graduate programs in Mathematics and in Mathematics and Computer Science at the University Campania “Luigi Vanvitelli” (formerly Second University of Naples).

Software development

1. *SBSA_QP - Split Bregman method with Subspace Acceleration for Quadratic Problems modeling sparse data recovery with fused lasso regularization*, MATLAB, https://github.com/diserafi/SBSA_QP,
   co-authors: Valentina De Simone and Marco Viola (University of Campania "Luigi Vanvitelli", Caserta, Italy).
2. *CPKRYLOV - Constraint-Preconditioned Krylov solvers for regularized saddle-point linear systems*, MATLAB, https://github.com/optimizers/cpkrylov,
   co-author: Dominique Orban (Polytechnique Montréal and GERAD, Montréal, QC, Canada).
3. *ACQUIRE - Algorithm based on Consecutive QUadratic and Iteratively REweighted norm approximations for TV-based Poisson image restoration*,
   MATLAB, https://github.com/diserafi/ACQUIRE,
   co-authors: Germana Landi (University of Bologna, Italy) and Marco Viola (University of Campania "Luigi Vanvitelli", Caserta, Italy).
4. *P2GP - Proportionality-based 2-phase Gradient Projection method*, MATLAB,
   https://github.com/diserafi/P2GP,
   co-authors: G. Toraldo (University of Naples Federico II, Italy) and Marco Viola (Sapienza University of Rome, Italy).
5. *MLD2P4 - Multi-Level Domain Decomposition Parallel Preconditioners Package based on PSBLAS,*
   Fortran 2003, https://github.com/sfilippone/mld2p4-2,
   co-authors: S. Filippone (Cranfield University, UK) and Pasqua D’Ambra (ICAR-CNR, Naples, Italy).
6. *PRQP - Potential Reduction solver for Quadratic Programming*, Fortran 90,
   co-authors: S. Cafieri (École Nationale de l'Aviation Civile, Toulouse), V. De Simone (University of Campania Luigi Vanvitelli), G. Toraldo (University of Naples Federico II), M. D’Apuzzo, F. Riccio (formerly at the Second University of Naples).

Recent Publications

1. D. di Serafino, G. Toraldo, M. Viola, *Using gradient directions to get global convergence of Newton-type methods*, submitted. Preprint available from Optimization Online, http://www.optimization-online.org/DB_HTML/2020/04/7717.html, and arXiv, https://arxiv.org/abs/2004.00968.
2. D. di Serafino, D. Orban, *Constraint-preconditioned Krylov solvers for regularized saddle-point systems*, Cahier du GERAD G-2019-72, GERAD, Montŕeal, QC, Canada, submitted. Preprint available from Optimization Online, http://www.optimization-online.org/DB_HTML/2019/10/7411.html, and arXiv, https://arxiv.org/abs/1910.02552.
3. V. De Simone, D. di Serafino, M. Viola, *A subspace-accelerated split Bregman method for sparse data recovery with joint l1-type regularizers*, Electronic Transactions on Numerical Analysis, 53, 2020, pp. 406-425, ISSN: 10689613, (doi: 10.1553/etna_vol53s406).
4. D. di Serafino, G. Landi, M. Viola, *ACQUIRE: an inexact iteratively reweighted norm approach for TV-based Poisson image restoration*, Applied Mathematics and Computation, 364, 2020, article 124678, ISSN: 0096-3003, published online in 2019 (doi: 10.1016/j.amc.2019.124678).
5. D. di Serafino, G. Toraldo, M. Viola, *A Gradient-Based Globalization Strategy for the Newton Method*, in "Numerical Computations: Theory and Algorithms. NUMTA 2019", Y.D. Sergeyev and D.E. Kvasov eds., Lecture Notes in Computer Science, vol. 11973, Springer, 2020, pp. 177-185, ISBN: 978-3-030-39080-8 (doi: 10.1007/978-3-030-39081-5_16).
6. L. Antonelli, D. di Serafino, E. Francomano, F. Gregoretti, M. Paliaga, *Towards an Efficient Implementation of an Accurate SPH Method*, in "Numerical Computations: Theory and Algorithms. NUMTA 2019", Y.D. Sergeyev and D.E. Kvasov eds., Lecture Notes in Computer Science, vol. 11973, Springer, 2020, pp. 3-10, ISBN: 978-3-030-39080-8 (doi: 10.1007/978-3-030-39081-5_1).
7. A. Abdullahi Hassan, V. Cardellini, P. D'Ambra, D. di Serafino, S. Filippone, *Efficient Algebraic Multigrid Preconditioners on Clusters of GPUs*, Parallel Processing Letters, 29 (1), 1950001, 2019, ISSN: 0129-6264 (doi: 10.1142/S0129626419500014).
8. D. di Serafino, G. Toraldo, M. Viola, J. Barlow, *A two-phase gradient method for quadratic programming problems with a single linear constraint and bounds on the variables*, SIAM Journal on Optimization, 28 (4), 2018, pp. 2809-2838, ISSN: 1052-6234 (doi: 10.1137/17M1128538).
9. L. Bergamaschi, V. De Simone, D. di Serafino, A. Martínez, *BFGS-like updates of constraint preconditioners for sequences of KKT linear systems in quadratic programming*, Numerical Linear Algebra with Applications, 25 (5), 2018, e2144, ISSN: 1099-1506 (doi: 10.1002/nla.2144).
10. V. De Simone, D. di Serafino, B. Morini, *On preconditioner updates for sequences of saddle-point linear systems*, Communications in Applied and Industrial Mathematics, 9 (1), 2018, pp. 35-41, ISSN 2038-0909 (doi: 10.1515/caim-2018-0003).
11. D. di Serafino, V. Ruggiero, G. Toraldo, L. Zanni, *On the steplength selection in gradient methods for unconstrained optimization*, Applied Mathematics and Computation, 318, 2018, pp. 176-195, published online in 2017 (doi: 10.1016/j.amc.2017.07.037).
12. A. Abdullahi, P. D'Ambra, D. di Serafino, S. Filippone, *Parallel Aggregation Based on Compatible Weighted Matching for AMG*, in "Large-Scale Scientific Computing", I. Lirkov and S. Margenov eds., Lecture Notes in Computer Science, vol. 10665, Springer, 2018, pp. 563-571, ISBN: 978-3-319-73440-8 (doi: 10.1007/978-3-319-73441-5_6).
13. S. Bellavia, V. De Simone, D. di Serafino, B. Morini, *On the update of constraint preconditioners for regularized KKT systems*, Computational Optimization and Applications, 65 (2), 2016, pp. 339-360 ISSN: 0926-6003 (doi: 10.1007/s10589-016-9830-4).
14. R. De Asmundis, D. di Serafino, G. Landi, *On the regularizing behavior of the SDA and SDC gradient methods in the solution of linear ill-posed problems*, Journal of Computational and Applied Mathematics, 302, 2016, pp. 81-93, ISSN: 0377-0427 (doi: 10.1016/j.cam.2016.01.007).

15. L. Antonelli, V. De Simone, D. di Serafino, *On the application of the spectral projected gradient method in image segmentation*, Journal of Mathematical Imaging and Vision, 54 (1), 2016, pp. 106-116, ISSN: 0924-9907 (doi: 10.1007/s10851-015-0591-y).
16. D. di Serafino, V. Ruggiero, G. Toraldo, L. Zanni, *A note on spectral properties of some gradient methods*, in "Numerical Computations: Theory and Algorithms (NUMTA-2016)", AIP Conference Proceedings, vol. 1776, 040003, 2016, ISBN: 978-0-7354-1438-9 (doi: 10.1063/1.4965315).
17. S. Bellavia, V. De Simone, D. di Serafino, B. Morini, *Updating constraint preconditioners for KKT systems in quadratic programming via low-rank corrections*, SIAM Journal on Optimization, 25 (3), 2015, pp. 1787-1808, ISSN: 1052-6234 (doi: 10.1137/130947155).
18. A. Aprovitola, P. D'Ambra, F.M. Denaro, D. di Serafino, S. Filippone, *SParC-LES: enabling large eddy simulations with parallel sparse matrix computation tools*, Computers and Mathematics with Applications, 70 (11), 2015, pp. 2688-2700 ISSN: 0898-1221 (doi: 10.1016/j.camwa.2015.06.028).
19. R. De Asmundis, D. di Serafino, W.W. Hager, G. Toraldo, H. Zhang, *An efficient gradient method using the Yuan steplength*, Computational Optimization and Applications, 59 (3), 2014, pp. 541-563, ISSN: 0926-6003 (doi: 10.1007/S10589-014-9669-5).
20. V. De Simone, D. di Serafino, *A matrix-free approach to build band preconditioners for large-scale bound-constrained optimization*, Journal of Computational and Applied Mathematics, 268, 2014, pp. 82-92, ISSN: 0377-0427 (doi: 10.1016/j.cam.2014.02.035).
21. A. Borzì, V. De Simone, D. di Serafino, *Parallel algebraic multilevel Schwarz preconditioners for a class of elliptic PDE systems*, Computing and Visualization in Science, 16 (1), 2013, pp. 1-14, ISSN: 1432-9360, published in 2014 (doi: 0.1007/s00791-014-0220-0).
22. R. De Asmundis, D. di Serafino, F. Riccio, G. Toraldo, On spectral properties of steepest descent methods, IMA Journal of Numerical Analysis, 33, 2013, pp. 1416-1435, ISSN: 0272-4979 (doi: 10.1093/imanum/drs056).
23. P. D'Ambra, D. di Serafino, S. Filippone, *Performance analysis of parallel Schwarz preconditioners in the LES of turbulent channel flows*, Computers and Mathematics with Applications, 65, 2013, pp. 352-361, ISSN: 0898-1221 (doi:10.1016/j.camwa.2012.06.023).
24. S. Bellavia, V. De Simone, D. di Serafino, B. Morini, *A preconditioning framework for sequences of diagonally modified linear systems arising in optimization*, SIAM Journal on Numerical Analysis, 50 (6), 2012, pp. 3280-3302, ISSN: 0036-1429 (doi: 10.1137/110860707).
25. S. Bellavia, V. De Simone, D. di Serafino, B. Morini, *Building preconditioners for sequences of linear systems arising in optimization, in "Applied Mathematical Optimization and Modelling - APMOD 2012 Extended Abstracts", DS*&OR Lab, University of Paderborn, pp. 17-22, 2012, ISBN: 9783844817942.
26. S. Bellavia, V. De Simone, D. di Serafino, B. Morini, *Efficient Preconditioner Updates for Shifted Linear Systems, SIAM Journal on Scientific Computing*, 33 (4), 2011, pp. 1785-1809, ISSN: 1064-8275 (doi: 10.1137/100803419).
27. D. di Serafino, G. Liuzzi, V. Piccialli, F. Riccio, G. Toraldo, *A Modified DIviding RECTangles Algorithm for a Problem in Astrophysics, Journal of Optimization Theory and Applications*, 151, 2011, pp. 175-190, ISSN: 1573-2878 (doi: 10.1007/s10957-011-9856-9).
28. P. D'Ambra, D. di Serafino, S. Filippone, MLD2P4: *a Package of Parallel Algebraic Multilevel Domain Decomposition Preconditioners in Fortran 95*, ACM Transactions on Mathematical Software, 37 (3), 2010, art. 30, ISSN: 0098-3500 (doi: 10.1145/1824801.1824808).
29. M. D'Apuzzo, V. De Simone, D. di Serafino, *Starting-Point Strategies for an Infeasible Potential Reduction Method, Optimization Letters*, 4 (1), 2010, pp. 131-146, ISSN: 1862-4472 (doi: 10.1007/s11590-009-0150-9).
30. M. D'Apuzzo, V. De Simone, D. di Serafino, *On mutual impact of numerical linear algebra and large-scale optimization with focus on interior point methods*, Computational Optimization and Applications, 45 (2), 2010, pp. 283-310, ISSN: 0926-6003, published online in 2008 (doi: 10.1007/s10589-008-9226-1). *COAP 2010 Best Paper Award.*

31. D. di Serafino, S. Gomez, L. Milano, F. Riccio, G. Toraldo, *A genetic algorithm for a global optimization problem arising in the detection of gravitational waves*, Journal of Global Optimization, 48 (1), 2010, pp. 41-55, ISSN: 1573-2916 (doi: 10.1007/s10898-010-9525-9).
32. D. di Serafino, F. Riccio, *On the application of multiple-deme parallel genetic algorithms in astrophysics*, in "Proceedings of the 18th Euromicro International Conference on Parallel, Distributed and Network-Based Computing", IEEE Conference Publishing Services (CPS), pp. 231-237, 2010, ISBN: 978-0-7695-3939-3.
33. A. Aprovitola, P. D'Ambra, D. di Serafino, S. Filippone, *On the use of Aggregation-based Parallel Multilevel Preconditioners in the LES of Wall-bounded Turbulent Flows*, in "Large-Scale Scientific Computing", Lecture Notes in Computer Science, vol. 5910, Springer, 2010, pp. 67-75, ISSN: 0302-9743 (doi: 10.1007/978-3-642-12535-5).
34. A. Aprovitola, P. D'Ambra, F. Denaro, D. di Serafino, S. Filippone, *Scalable algebraic multilevel preconditioners with application to CFD*, invited paper, in "Parallel Computational Fluid Dynamics 2008", D. Tromeur-Dervout, G. Brenner, D. Emerson, J. Erhel eds., Lecture Notes in Computational Science and Engineering, vol. 74, Springer, 2010, pp. 15-27, ISSN: 1439-7358 (doi: 10.1007/978-3-642-14438-7).