

Leonardo Robol

Curriculum Vitae

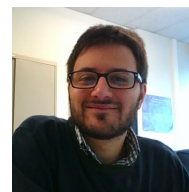
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Personal data

- Born on May, 2, 1988 in Rovereto (TN), Italy.

Academic positions

- 2021 – Now **Senior Assistant Professor (tenure-track)**
Department of Mathematics, University of Pisa, Italy.
September, 1, 2021 – current position
- 2018 – Now **Junior Assistant professor**
Department of Mathematics, University of Pisa, Italy.
November, 5, 2018 – August, 31, 2021.
- 2017 – 2018 **Researcher**
ISTI, Area della Ricerca CNR, Pisa, Italy.
April, 3, 2017 – November, 2, 2018.
- 2015 – 2017 **Postdoc researcher**
Department of Computer Science, KU Leuven, Belgium.
November, 1, 2015 – March, 31, 2017.
- 2011 – 2012 **Research scholarship**
Scholarship on the study of numerical methods for the computation of the zeros of matrix and scalar polynomials at arbitrary precision and their implementation, “Department of Mathematics, University of Pisa”
March, 1, 2011 – February, 29, 2012.

Education

- 2012 – 2015 **PhD in Mathematics, Scuola Normale Superiore, Pisa, Italy**
Thesis Exploiting rank structures for the numerical treatment of matrix polynomials.
Advisor Prof. Dario A. Bini.
Date November, 30, 2015.
Final mark 70/70 cum laude.
- 2010 – 2012 **Master degree in Mathematics, Università di Pisa, Italy**
Thesis A rootfinding algorithm for polynomials and secular equations.
Advisor Prof. Dario A. Bini.
Date September, 17, 2012.
Final mark 110/110 cum laude.
- 2007 – 2010 **Bachelor degree in Mathematics, Università di Pisa, Italy**
Thesis Compressione di immagini mediante trasformata wavelet: l'algoritmo EZW.
Advisor Prof. Dario A. Bini.
Date September, 24, 2010.
Final mark 110/110 cum laude.

Research interests

- **Low-rank approximation:** fast methods for approximating low-rank matrices tensors, and matrices with an (adaptively determined) hierarchical rank-structure.
- Solution of large scale **matrix and tensor equations**.
- **Toeplitz-like** matrices: fast solvers and matrix functions, spectra of infinite-dimensional Toeplitz operators.
- **Matrix polynomials** and **structure-preserving** linearizations. Design of fast methods for **polynomial and nonlinear eigenvalue problems**.
- **Rootfinding methods** to approximate polynomials' roots. Design of efficient methods for particular classes of polynomials.

Further info at <https://leonardo.robol.it/research/>.

Teaching experience

2018 – Now **PhD mentoring activity**

- A. Casulli (PhD program in Computational Science, Scuola Normale Superiore), in progress: expected PhD defense at the end of 2024.
- A. Bucci (PhD program in mathematics, University of Pisa), in progress: expected PhD defense at the end of 2024.

2019 **PhD program on Mathematics and Computer Science, University of Cagliari**

- *Low-rank Approximation*
 - Academic year 2018 – 2019, 20 hours.

2019 – 2020 **Courses for the Mathematics Master Degree, University of Pisa**

- *Advisor for 3 master theses.*
- *Numerical methods for ODEs*
 - Academic year 2020 – 2021, 48 hours.
 - Academic year 2021 – 2022, 48 hours.

2012 – 2020 **Courses for the Mathematics Bachelor Degree, University of Pisa**

- *Laboratorio di Comunicazione mediante calcolatore*
 - Academic year 2018 – 2019, 24 hours.
 - Academic year 2019 – 2020, 32 hours.
 - Academic year 2019 – 2020, 34 hours.
- *Laboratorio Sperimentale di Matematica Computazionale*
 - Academic year 2018 – 2019, 14 hours.
 - Academic year 2019 – 2020, 22 hours.
- *Numerical analysis*
 - Academic year 2012 – 2013, 22 hours of exercise sessions.
 - Academic year 2013 – 2014, 22 hours of exercise sessions.
 - Academic year 2017 – 2018, 20 hours of exercise sessions.
 - Academic year 2018 – 2019, 22 hours of exercise sessions.
 - Academic year 2019 – 2020, 20 hours of exercise sessions.
 - Academic year 2020 – 2021, 20 hours of exercise sessions.
 - Academic year 2021 – 2022, 20 hours of exercise sessions.
- *Scientific Computing*
 - Academic year 2020 – 2021, 30 hours.

- 2017 – 2018 **Computer Science Bachelor Degree, University of Pisa**
- *Computational methods for Learning and Data Analysis*
 - Academic year 2017 – 2018, 20 hours of exercise sessions.
- 2015 – 2016 **Master degree in Mathematics Engineering, KU Leuven, Belgium**
- *Numerical Linear Algebra*
 - Academic year 2015 – 2016, 16 hours.
 - Academic year 2016 – 2017, 16 hours.
- 2013 – 2020 **Scuola Normale Superiore, Pisa**
- *Complementi di analisi*
 - Academic year 2013 – 2014, tutoring; 1 hour per week (equivalent to approximately 35 hours).

Prizes and awards

- 2020 **National habilitation, associate professor**
National habilitation for the role of associate professor in Numerical Analysis. Valid until 02/07/2029.
- 2018–2019 **YRA (Young Researcher Award)**
The ISTI Young Researcher Award (YRA) is an annual award that honors its staff of less than 35 years old for a distinct contribute to the Institute activity with their scientific production. Obtained for two consecutive years.
- 2017 **Honorable mention for the Householder prize**
Awarded for the PhD thesis, Householder symposium HHXX.

International collaborators

- Jared L. Aurentz, Instituto de Ciencias Matemáticas, Spain.
- Fernando De Terán, Universidad Carlos III de Madrid, Spain.
- Daniel Kressner, EPFL, Lausanne, Switzerland.
- Thomas Mach, Nazarbayev University, Kazakhstan.
- Raf Vandebril, KU Leuven, Belgium.
- Paul Van Dooren, Université Catholique de Louvain, Belgium.
- David S. Watkins, Washington State University, WA, USA.

Other scientific activities

Conference and workshop organization

- 2022 **Workshop in honor of Michele Benzi's 60th birthday, Pisa, Italy**
Member of the local organizing committee.
- 2021 **METT IX, Perugia, Italy**
Member of the local organizing committee.
- 2018 **SIAM ALA 2018, Hong Kong**
Organizer of the minisymposium "Recent applications of rank structures in matrix analysis".
- 2018 **Research in pairs, Luminy, France**
Co-organizer of a 'Research in pairs' workshop at the CIRM in Luminy, titled "Fast solvers for fractional differential equations".

2016 **ILAS 2016**, *Leuven, Belgium*
Member of the local organizing committee.

Invited plenary talks

1. **SIAM UKIE National Student Chapter Conference**, Manchester, UK, 2019
Rank structures in matrix equations and matrix functions.
2. **Householder symposium XX**, Blacksburg, VA, USA, 2017.
Fast and backward stable computation of the eigenvalues of matrix polynomials.

Invitation to conferences

3. **Householder Symposium XXI**, Selva di Fasano, Italy, 2022.
Mixed precision recursive block diagonalization for bivariate functions of matrices.
4. **NUCLEi Worksop**, L'Aquila, Italy.
Hierarchical adaptive low-rank format with applications to discretized PDEs.
5. **SIAM ALA 2021**, New Orleans (online), 2021.
Rational Krylov for Stieltjes matrix functions: convergence and pole selection
6. **ICIAM2019**, Valencia, Spain, 2019.
Low-rank updates for linear matrix equations.
7. **ILAS2019**, Rio de Janeiro, Brazil, 2019.
Fast solvers for 2D fractional differential equations using rank structured matrices — Fast computation of the eigenvalues of matrix polynomials.
8. **ETNA25**, Cagliari, Italy, 2019.
Solving quadratic matrix equations with infinite size coefficients.
9. **SIMAI 2018**, Rome, Italy, 2018.
A Krylov-based trust region scheme for model updating.
10. **Structured Matrices in Numerical Linear Algebra**, Cortona, Italy, 2017.
Backward error analysis for structured polynomial root-finders.
11. **ILAS 2017**, minysymposium “Matrix Polynomials”, Ames, Iowa, USA, 2017.
Fast and backward stable computation of the eigenvalues of matrix polynomials.
12. **CMMSE 2017**, minysymposium “Rank structured matrices: recent developments and new perspectives”, Cadiz, Spain, 2017.
Solving large scale quasiseparable Lyapunov equations.
13. **NL2A**, Luminy, France, 2016.
Fast and backward stable computation of the eigenvalues of matrix polynomials.
14. **ILAS 2016**, Leuven, Belgium, minysymposium “Polynomial and rational eigenvalue problems”, 2016.
A Framework for Structured Linearizations of Matrix Polynomials in Various Bases.
15. **Structured Matrix Days 2016**, Limoges, France, 2016.
A Framework for Structured Linearizations of Matrix Polynomials in Various Bases.
16. **Structured Matrix Computations with Applications**, Sanya, China, 2016.
Ehrlich–Aberth iteration for rank structured pencils.
17. **SIAM ALA 2015**, minysymposium “Polynomial eigenvalue problems”, Atlanta, USA, 2015.
A Diagonal Plus Low Rank Family of Linearizations for Matrix Polynomials.
18. **IWOTA 2015**, session on *Structured linear algebra*, Tbilisi, Georgia, 2015.
Efficient cyclic reduction for QBDs with rank structured blocks.
19. **SLA2014**, Kalamata, Greece, 2014.

- Hessenberg reduction of diagonal plus low rank matrices.
20. **Workshop on Nonlinear Eigenvalue Problems**, Manchester, UK, 2014.
Solving matrix polynomials of large degrees: some computational issues.
 21. **ILAS 2013**, Providence, Rhode Island, USA, 2013.
Solving secular and polynomial equations: a multiprecision algorithm.

Conferenze nazionali su invito

22. **Congresso GNCS**, Montecatini, Italy, 2022.
Hierarchical adaptive low-rank format with applications to discretized PDEs.
23. **Due Giorni di Algebra Lineare Numerica**, Napoli, Italy, 2022.
Mixed precision recursive block diagonalization for bivariate functions of matrices.
24. **Congresso UMI 2019**, Pavia, Italy, 2019.
When is a matrix unitary or Hermitian plus low-rank?
25. **Congresso UMI 2015**, session on *Linear Algebra and Optimization*, Siena, Italy, 2015.
A new class of rank structured linearizations for matrix polynomials.

Other conferences

26. **DSN2022**, Baltimore, USA, 2022.
Solution Bundles of Markov Performability Models through Adaptive Cross Approximation.
27. **ALAMA 2022**, Alcalà, Spain, 2022.
Approximation of inverse fractional powers by exponential sums.
28. **METT IX**, Perugia, Italy, 2021.
Mixed precision recursive block diagonalization for bivariate functions of matrices.
29. **MAM 2019**, Hobart, Tasmania, 2019.
Matrix Analytic Methods for reflected random walks with stochastic restarts.
30. **SIAM ALA 18**, Hong Kong, 2018.
Solving 2D fractional differential equations using rank-structured matrix equations.
31. **METT 2017**, Pisa, Italy, 2017.
Off-diagonal singular values decay in cyclic reduction.
32. **ALAMA 2016**, León, Spain, 2016.
A Framework for Structured Linearizations of Matrix Polynomials in Various Bases.
33. **NETNA2015**, Falerna, Italy, 2015.
A new class of rank structured linearizations for matrix polynomials.
34. **Structured Matrix Days 2015**, Limoges, France, 2015.
Quasiseparable Hessenberg triangular reduction for some diagonal plus low rank matrices.
35. **GAMM 2015**, Lecce, Italy, 2015.
Hessenberg reduction of diagonal plus low rank matrices.
36. **ILAS 2014**, Seoul, South Korea, 2014.
A new class of block companion matrices related to matrix polynomials.
37. **SNC 2014**, Shanghai, China, 2014.
A multiprecision algorithm for the solution of polynomials and polynomial eigenvalue problems.

Other conferences

30. **Due Giorni di Algebra Lineare 2019**, Rome, Italy, 2019.
Distance from rank-structured matrices.
31. **Due Giorni di Algebra Lineare 2018**, Padova, Italy, 2018.

- A Krylov-based trust region scheme for model updating.
32. **Due Giorni di Algebra Lineare**, Como, Italy, 2017.
Decay bounds for the numerical quasiseparable preservation in matrix functions.
33. **Due Giorni di Algebra Lineare**, Rome, Italy, 2013.
Solving secular and polynomial equations: a multiprecision algorithm.

Summer schools

- 2013 **Gene Golub Summer School**, *Shanghai, China*

Invited seminars

- 2022 **Department of Mathematics**, *Manchester, UK*
Sampling the eigenvalues of random matrices.
- 2021 **TU Eindhoven**, *Eindhoven, Netherlands*
Sampling the eigenvalues of random matrices.
- 2019 **École polytechnique fédérale de Lausanne - EPFL**, *Lausanne, Switzerland*
Fractional diffusion equations and rank-structured matrices.
- 2018 **École polytechnique fédérale de Lausanne - EPFL**, *Lausanne, Switzerland*
Distance from rank-structured matrices.
- Instituto de Ciencias Matemáticas, ICMAT**, *Madrid, Spain*
Low-rank updates for linear matrix equations.
- 2017 **Max Planck Institute for Plasma Physics**, *Munich, Germany*
Solving PDEs using rank-structured matrix equations.
- École polytechnique fédérale de Lausanne - EPFL**, *Lausanne, Switzerland*
Backward error analysis for polynomial root-finders.
- Dipartimento di Matematica**, *Pisa, Italy*
Backward error analysis for polynomial root-finders.
- 2016 **KU Leuven**, *Leuven, Belgium*
A multiprecision algorithm for polynomial rootfinding
- Université des Sciences et Technologies de Lille**, *Lille, France*
On the decay of the off-diagonal singular values in cyclic reduction.
- 2015 **KU Leuven**, *Leuven, Belgium*
Solving polynomial eigenvalue problems (and other related issues).
- 2014 **KU Leuven**, *Leuven, Belgium*
MPSolve: how it works.

Projects and Grants

- 2020 **Progetto GNCS “Metodi low-rank per problemi di algebra lineare con struttura data-sparse”**
Coordinator of the research project “Metodi low-rank per problemi di algebra lineare con struttura data-sparse”, supported by INdAM/GNCS with a grant of 4400 euros.
- 2019 **Progetto Giovani Ricercatori GNCS**
Grant of 1200 euros for the GNCS Giovani Ricercatori project “Metodi di proiezione per equazioni di matrici e sistemi lineari con operatori definiti tramite somme di prodotti di Kronecker, e soluzioni con struttura di rango.”

- 2018 **Grant for Young Mobility**
Grant of 4000 euros by ISTI-CNR supporting research visits to the department of Computer Science at KU Leuven, Belgium.
- 2017 **Research in pairs**
Granted travel and lodging support for the project "Fast solvers for fractional differential equations", requested to organize a workshop "Research in pairs" at CIRM in Luminy. Il finanziamento ha coperto le spese di soggiorno per il workshop.
- 2017 **ProgettISTI**
1 year project funded by ISTI-CNR: "Tensor algorithms for performability analysis of large systems". Grant of 2500 euros.
- 2016 – 2017 **C1 project / KU Leuven**
Participation to the project "Inverse-free Rational Krylov Methods: Theory and Applications"
- 2015 – 2017 **Participation in INdAM/GNCS projects**
- GNCS 2022 "Tecniche avanzate per problemi differenziali evolutivi: discretizzazione, algebra lineare numerica e ottimizzazione";
 - GNCS 2020 "Metodi low-rank per problemi di algebra lineare con struttura data-sparse";
 - GNCS 2018 "Tecniche innovative per problemi di algebra lineare";
 - GNCS 2017 "Metodi numerici avanzati per equazioni e funzioni di matrici con struttura";
 - GNCS 2016 "Equazioni e funzioni di matrici con struttura: analisi e algoritmi";
 - GNCS 2015 "Metodi numerici per autovalori e funzioni di matrici con strutture";

Editorial activity

2020 – now **Associate editor**, *Applied Mathematics and Computation*

2015 – now **Referee for the following journals**

- Applied Mathematics and Computation.
- Applied Numerical Mathematics.
- ACM Transactions on Mathematical Software.
- BIT Numerical Mathematics.
- Calcolo.
- Computer Methods in Applied Mechanics and Engineering.
- Electronic Journal of Linear Algebra.
- Electronic Transactions of Numerical Analysis
- Journal of Nonlinear Mathematical Physics.
- Journal of Numerical Mathematics.
- Linear Algebra and its Applications.
- Linear and Multilinear Algebra
- Mathematics of Computations.
- Numerical Algorithms.
- Numerical Linear Algebra with Applications.
- SIAM Journal on Matrix Analysis and Applications.

Research visits

2021 **TU/e, Eindhoven, Netherlands(1 week)**

Visit to Stefano Massei to collaborate on the design of fast methods for Sylvester-like tensor equations.

2019 **École polytechnique fédérale de Lausanne - EPFL, Lausanne, Switzerland (1 week)**

Visit to Daniel Kressner to collaborate on the design of fast methods for HSS matrices.

- KU Leuven, Leuven, Belgium (8 days)**
Visit to Raf Vandebril to continue an ongoing collaboration on stability of polynomial rootfinding.
- 2018 **École polytechnique fédérale de Lausanne - EPFL, Lausanne, Switzerland (1 week)**
Visit to Daniel Kressner to collaborate on the design of fast methods for HSS matrices.
- Instituto de Ciencias Matemáticas, ICMAT, Madrid, Spain (10 days)**
Workshop “Autumn of Eigenvalues” on fast methods for computing eigenvalues of rank structured matrices and rootfinding problems.
- KU Leuven, Leuven, Belgium (2 weeks)**
Visit to Raf Vandebril to continue an ongoing collaboration on computing eigenpairs of matrix polynomials.
- Department of Mathematics, University of Essex, Colchester, UK (1 week)**
Visit to Vanni Noferini to collaborate on the backward error analysis of structured root-finders.
- 2017 **Max Planck Institute for Plasma Physics, Munich, Germany (1 week)**
Visit to Mariarosa Mazza to collaborate on solver for fractional order PDEs based on rank-structured matrix equations.
- École polytechnique fédérale de Lausanne - EPFL, Lausanne, Switzerland (1 week)**
Visit to Daniel Kressner to collaborate on the design of fast methods for rank-structured Lyapunov equations.
- KU Leuven, Leuven, Belgium (2 weeks)**
Visit to Raf Vandebril to continue an ongoing collaboration on computing eigenpairs of matrix polynomials.
- 2016 **Université de Lille, Lille, France (1 day)**
Visit to Bernhard Beckermann to give a seminar in the Numerical analysis seminar series in Lille.
- Università di Perugia, Perugia, Italy (1 day)**
Visit to continue an ongoing collaboration with B. Iannazzo, F. De Terán and F. Poloni.
- 2015 **Università di Perugia, Perugia, Italy (2 days)**
Visit that started the collaboration with B. Iannazzo, F. De Terán and F. Poloni on the uniqueness of solutions for generalized Sylvester equations.
- 2014 **KU Leuven, Leuven, Belgium (1 week)**
Visited Raf Vandebril in Leuven to start the collaboration on the topic of polynomial eigenvalue problems.

Foreign languages

Italian Mother tongue
English C1 Level

Fluent speaking and writing skills

Publications

To see an up-to-date list of my publications, check my Google Scholar profile or my personal web page.

Google Scholar [610 citations, h-index 14]

https://scholar.google.com/citations?user=j9WP_U4AAAAJ

Scopus [328 citations, h-index 10]

<https://www.scopus.com/authid/detail.uri?authorId=55748770500>

Books

1. **Core-Chasing Algorithms for the Eigenvalue Problem**, J. L. Aurentz, T. Mach, L. Robol, R. Vandebril, D. S. Watkins, SIAM, 2018.

Journal papers

2. **Computing eigenvalues of semi-infinite quasi-Toeplitz matrices**, D.A. Bini, B. Iannazzo, B. Meini, J. Meng, L. Robol, to appear on Numerical Algorithms, 2022..
3. **Hierarchical adaptive low-rank format with applications to discretized PDEs**, S. Massei, L. Robol, D. Kressner, Numerical Linear Algebra with Applications, 2022. — DOI: 10.1002/nla.2448.
4. **Mixed precision recursive block diagonalization for bivariate functions of matrices**, S. Massei, L. Robol, SIAM Journal on Matrix Analysis and Applications, 2022 — DOI: 10.1137/21M1407872.
5. **Rank-structured QR for Chebyshev rootfinding**, A. Casulli, L. Robol, SIAM Journal on Matrix Analysis and Applications, 2021 — DOI: 10.1137/20M1375115.
6. **Sampling the eigenvalues of random orthogonal matrices**, M. Fasi, L. Robol, Linear Algebra and Its Applications, 2021 — DOI: 10.1016/j.laa.2021.02.031.
7. **Structured backward errors in linearizations**, V. Noferini, L. Robol, R. Vandebril, ETNA, 2021 — DOI: 10.1553/etna_vol54s420.
8. **A finite element model updating method based on global optimization**, M. Girardi, C. Padovani, D. Pellegrini, L. Robol, Mechanical Systems and Signal Processing, 152, 2021 — DOI: 10.1016/j.ymsp.2020.107372.
9. **Rational Krylov for Stieltjes matrix functions: convergence and pole selection**, S. Massei, L. Robol, BIT Numerical Math., 2020 — DOI: 10.1007/s10543-020-00826-z.
10. **A computational framework for two-dimensional random walks with restarts**, D. A. Bini, S. Massei, B. Meini, L. Robol, SIAM Journal on Scientific Computing, Volume 42, 2020 — DOI: 10.1137/19M1304362.
11. **Rational Krylov and ADI iteration for infinite size quasi-Toeplitz matrix equations**, L. Robol, Linear Algebra and Its Applications, 604, 2020 — DOI: 10.1016/j.laa.2020.06.013.
12. **hm-toolbox: Matlab software for HODLR and HSS matrices**, S. Massei, L. Robol, D. Kressner, SIAM Journal on Scientific Computing, Volume 42, 2020 — DOI: 10.1137/19M1288048.
13. **Finite element model updating for structural applications**, M. Girardi, C. Padovani, D. Pellegrini, L. Robol, Journal of Computational and Applied Mathematics, 370, 2020 — DOI: 10.1016/j.cam.2019.112675.
14. **Computing performability measures by means of matrix functions**, G. Masetti, L. Robol, Journal of Computational and Applied Mathematics, 368, 2020 — DOI: 10.1016/j.cam.2019.112534.
15. **When is a matrix unitary or Hermitian plus low rank?**, G. M. Del Corso, F. Poloni, L. Robol, R. Vandebril, Numerical Linear Algebra with Applications, 26(6), 2019 — DOI: 10.1002/nla.2266.
16. **Nonsingular systems of generalized Sylvester equations: an algorithmic approach**,

- F. De Terán, B. Iannazzo, F. Poloni, L. Robol, *Numerical Linear Algebra with Applications*, 2019 — DOI: 10.1002/nla.2261.
17. **Model Updating Procedure to Enhance Structural Analysis in FE Code NOSA-ITACA**, M. Girardi, C. Padovani, D. Pellegrini, L. Robol, *Journal of Performance of Constructed Facilities*, 2019, 33(4) — DOI: 10.1061/(ASCE)CF.1943-5509.0001303.
 18. **Fast solvers for Two-dimensional fractional diffusion equations using rank structured matrices**, S. Massei, M. Mazza, L. Robol, *SIAM Journal on Scientific Computing*, Volume 41, 2019 — DOI: 10.1137/18M1180803.
 19. **Low-rank updates and a divide-and-conquer method for linear matrix equations**, D. Kressner, S. Massei, L. Robol, *SIAM Journal on Scientific Computing*, Volume 41, 2019 — DOI: 10.1137/17M1161038.
 20. **Factoring block Fiedler Companion Matrices**, G. M. Del Corso, F. Poloni, L. Robol, R. Vandebril, Springer INdAM series, 2019 — DOI: 10.1007/978-3-030-04088-8_7.
 21. **Quasi-Toeplitz matrix arithmetic: a MATLAB toolbox**, D. A. Bini, S. Massei, and L. Robol, *Numerical Algorithms*, 81.2, 2019 — DOI: 10.1007/s11075-018-0571-6.
 22. **Fast and backward stable computation of the eigenvalues and eigenvectors of matrix polynomials**, J. L. Aurentz, T. Mach, L. Robol, R. Vandebril, D. S. Watkins, *Mathematics of Computation*, Volume 88, Issue 315, 2018 — DOI: 10.1090/mcom/3338.
 23. **Solving rank structured Sylvester and Lyapunov equations**, S. Massei, D. Palitta, and L. Robol, *SIAM Journal on Matrix Analysis and Applications*, Volume 39 (4), 2018 — DOI: 10.1137/17M1157155.
 24. **Fast and backward stable computation of roots of polynomials, Part II: general backward error analysis**, J. L. Aurentz, T. Mach, L. Robol, R. Vandebril, and D. S. Watkins, *SIAM Journal on Matrix Analysis and Applications*, Volume 39 (3), 2018 — DOI: 10.1137/17M1152802.
 25. **On quadratic matrix equations with infinite size coefficients encountered in QBD stochastic processes**, D. A. Bini, S. Massei, B. Meini, L. Robol, *Numerical Linear Algebra with Applications*, Volume 25, Issue 6, 2018 — DOI: 10.1002/nla.2128.
 26. **Solvability and uniqueness criteria for generalized Sylvester-type equations**, F. De Terán, B. Iannazzo, F. Poloni, L. Robol, *Linear Algebra and its Applications*, Volume 542, April 2018, Pages 501–521 — DOI: 10.1016/j.laa.2017.07.010.
 27. **Efficient Ehrlich–Aberth iteration for finding intersections of interpolating polynomials and rational functions**, L. Robol and R. Vandebril, *Linear Algebra and its Applications*, Volume 542, April 2018, Pages 282–309 — DOI: 10.1016/j.laa.2017.05.010.
 28. **On the decay of the off-diagonal singular values in cyclic reduction**, D. A. Bini, S. Massei, L. Robol, *Linear Algebra and its Applications*, Volume 519, 15 April 2017, Pages 27–53 — DOI: 10.1016/j.laa.2016.12.027.
 29. **Fast Hessenberg reduction of some rank structured matrices**, L. Gemignani, L. Robol, *SIAM Journal on Matrix Analysis and Applications*, Volume 38 (2), 22 June 2017, Pages 574–598 — DOI: 10.1137/16M1107851.
 30. **Efficient cyclic reduction for Quasi-Birth-Death problems with rank structured blocks**, D. A. Bini, S. Massei, L. Robol, *Applied Numerical Mathematics*, Volume 116, 30 June 2017, Pages 37–46 — DOI: 10.1016/j.apnum.2016.06.014.
 31. **A framework for structured linearizations of matrix polynomials in various bases**, L. Robol, R. Vandebril, P. Van Dooren, *SIAM Journal on Matrix Analysis and Applications*, Volume 38 (1), 16 March 2017, Pages 188–216 — DOI: 10.1137/16M106296X.
 32. **Decay bounds for the numerical quasiseparable preservation in matrix functions**, S. Massei, L. Robol, *Linear Algebra and its Applications*, Volume 516, 1 March 2017, Pages 212–242 — DOI: 10.1016/j.laa.2016.11.041.
 33. **Quasiseparable Hessenberg reduction of real diagonal plus low rank matrices and applications**, D. A. Bini, L. Robol., *Linear Algebra and Its Applications*, Volume 502, 1 August 2016, Pages 186–213 — DOI: 10.1016/j.laa.2015.08.026.

34. **On a Class of Matrix Pencils Equivalent to a Given Matrix Polynomial**, D. A. Bini, L. Robol, Linear Algebra and Its Applications, Volume 502, 1 August 2016, Pages 275-298 — DOI: 10.1016/j.laa.2015.07.017.
35. **Solving secular and polynomial equations, a multiprecision algorithm**, D. A. Bini, L. Robol, Journal of Computational and Applied Mathematics, Volume 272, 15 December 2014, Pages 276-292 — DOI: 10.1016/j.cam.2013.04.037.

Proceedings

34. **FE model updating of masonry towers: Modeling and numerical issues**, R.M. Azzara, M. Girardi, C. Padovani, D. Pellegrini, L. Robol, Proceedings of the International Conference on Structural Dynamic , EUROODYN, 2020 — ISBN: 978-618850720-3.
35. **Nonlinear FE model updating for masonry constructions via linear perturbation and modal analysis**, M. Girardi, C. Padovani, D. Pellegrini, L. Robol, COMPDYN Proceedings, 2019 — ISBN: 978-618828446-3.
36. **Stochastic Evaluation of Large Interdependent Composed Models Through Kronecker Algebra and Exponential Sums**, G. Masetti, L. Robol, S. Chiaradonna, F. Di Giandomenico, Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), 2019 — ISBN: 978-303021570-5.
37. **Model parameter estimation using Bayesian and deterministic approaches: The case study of the Maddalena Bridge**, A. De Falco, M. Girardi, D. Pellegrini, L. Robol, G. Sevieri, Procedia Structural Integrity, 2018 — DOI: 10.1016/j.prostr.2018.11.028.
38. **FEA for masonry structures and vibration-based model updating using NOSA-ITACA**, M. Girardi, C. Padovani, D. Pellegrini, L. Robol, 10th International Masonry Conference, Milano, 9-11 July 2018.
39. **NOSA-ITACA: a free FE program for historic masonry buildings**, M. Girardi, C. Padovani, D. Pellegrini, L. Robol, CoRASS 2017 - ECCOMAS Conference on Recent Advances in Nonlinear Models - Design and Rehabilitation of Structures (Coimbra, Portugal, 16-17 November 2017) — ISBN: 978-989-96461-8-6.
40. **A multiprecision algorithm for the solution of polynomials and polynomial eigenvalue problems**, D. A. Bini, L. Robol, Proceedings of the 2014 Symposium on Symbolic-Numeric Computation, 2014 — ISBN: 978-1-4503-2963-7.

Theses

40. **Exploiting rank structures for the numerical treatment of matrix polynomials**, L. Robol, PhD thesis, Scuola Normale Superiore di Pisa, 2015.
41. **A rootfinding algorithm for polynomials and secular equations**, L. Robol, Master thesis, Università di Pisa, 2012.

Software

I develop and contribute to a broad range of software. Most of my contributions are available on my Github page at <https://github.com/robo1>.

- 2011 – Now **MPSolve**, *multiprecision polynomial solver that computes the roots of univariate polynomial at arbitrary precision*, The project is written in C/C++, and it amounts to more than 50k LOC. The code is open source and available at <http://numpi.dm.unipi.it/software/mpsolve/>. Bindings for several languages (Python, MATLAB, Octave, Fortran, ...), a desktop user interface, and an Android app are available. The implementation relies on pthreads for parallelism

- 2017 – Now **cqt-toolbox**, a *MATLAB* toolbox to compute with infinite Toeplitz matrices with finite corrections, <https://github.com/numpi/cqt-toolbox/>
- 2017 – Now **hm-toolbox**, a *MATLAB* toolbox to compute with Hierarchical matrices and HSS, and to solve some kinds of matrix equations, <https://github.com/numpi/hm-toolbox/>
- 2017 – Now **NOSA**, a finite element code for masonry-like structures, with modules for static, dynamic, and modal analysis, as well as support for advanced model updating features, <http://www.nosaitaca.it/>