Javier Pérez Álvaro

Curriculum Vitae

Department of Mathematical Sciences
University of Montana

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EDUCATION

Universidad Carlos III de Madrid, Spain

    Ph.D, Mathematical Engineering (summa cum laude)   June 2015

    MA, Mathematical Engineering   September 2011

Universidad Autónoma de Madrid, Spain

    BA, Physics   June 2009

PROFESSIONAL APPOINTMENTS

Department of Mathematical Sciences, University of Montana, USA

    Assistant Professor.   August 2019

Department of Mathematical Sciences, University of Montana, USA

    Adjunct Assistant Professor.   August 2017

Department of Computer Science, KU Leuven, Belgium

    Research Associate.   October 2016

School of Mathematics, The University of Manchester, UK

    Research Associate.   September 2014

Department of Mathematics, Universidad Carlos III de Madrid, Spain

    PIF Scholarship for research.   September 2010

PUBLICATIONS

Publications

1. Condition Numbers for Inversion of Fiedler Companion Matrices, with Fernando De Terán, and Froilán M. Dopico. *Linear Algebra and its Applications*, 439, pp. 944–981, 2013.

2. New Bounds for Roots of Polynomials Based on Fiedler Companion Matrices, with Fernando De Terán, and Froilán M. Dopico. *Linear Algebra and its Applications*, 451, pp. 197–230, 2014.

3. Backward Stability of Polynomial Root-Finding Using Fiedler Companion Matrices, with Fernando De Terán, and Froilán M. Dopico. *IMA Journal of Numerical Analysis*, 36, pp. 133–173, 2015.

4. Chebyshev Rootfinding via Computing Eigenvalues of Colleague Matrices: When Is It Stable?, with Vanni Noferini. *Mathematics of Computations*, 86(306), pp. 1741–1767, 2016.

5. Fiedler–comrade and Fiedler–Chebyshev Pencils, with Vanni Noferini. *SIAM Journal on Matrix Analysis and Applications,* 37(4), pp. 1600–1624, 2016.

6. Pseudospectra and Eigenvalue Condition Numbers of Fiedler Matrices, with Fernando De Terán and Froilán M. Dopico. *Calcolo*, 54(1), pp. 319–365, 2017.

7. Constructing Strong Linearizations for Matrix Polynomials in the Chebyshev Bases, with Piers W. Lawrence. *SIAM Journal on Matrix Analysis and Applications*, 38(3), pp. 683–709, 2017.

8. Block Kronecker Linearizations of Matrix Polynomials and their Backward Errors, with Piers W. Lawrence, Froilán M. Dopico, and Paul Van Dooren. Numerische Mathematik, 140(2), pp. 373–426, 2018.

9. *Structured Backward Error Analysis of Linearized Structured Polynomial Eigenvalue Problems*, with Froilán Dopico and Paul Van Dooren. *Mathematics of Computation*, 88, pp. 1189–1228, 2018,

10. *A Simplified Approach to Fiedler-Like Pencils Via Block Minimal Bases Pencils*, with Maribel Bueno, Froilán M. Dopico, R. Saavedra and B. Zykoski. *Linear Algebra and its Applications*, 547, pp. 45–104, 2018.

11. *Mixed Forward-Backward Stability of the Two-Level Orthogonal Arnoldi Method for Quadratic Problems*, with Karl Meerbergen. *Linear Algebra and its Applications*, 553, pp. 1–15, 2018.

12. *Explicit Block-Structures for Block-Symmetric Fiedler-Like Pencils*, with Maribel Bueno, M. Martin, A. Song, and I. Viviano. *Electronic Journal of Linear Algebra*, 34, pp. 472–499, 2018.

13. *Block Minimal Bases ℓ-ifications of Matrix Polynomials*, with Froilán M. Dopico and Paul Van Dooren. *Linear Algebra and its applications*, 562, pp. 163–204, 2019.

14. *Automatic Rational Approximation and Linearization of Nonlinear Eigenvalue Problems*, with Pieter Lietaert, Bart Vandereycken, and Karl Meerbergen. *IMA Journal of Numerical Analysis*, 42(2), pp. 1087–1115, 2022.

15. *Linearizations for interpolation bases–a comparison I*, with M. Bueno, R. Kassem and D. Mileeva. *The Electronic Journal of Linear Algebra*, 36, 2020.

16. *Linearizations of rational matrices from general representations*, with María C. Quintana. *Linear Algebra and its Applications*, 647, pp. 89–126, 2022.

17. *Structured strong ℓ-ifications for structured matrix polynomials in the monomial basis*, with Fernando De Terán and Carla Hernando. *The Electronic Journal of Linear Algebra*, 37, 2021.

18. *On why using $\mathbb{DL}(P)$ for the symmetric polynomial eigenvalue problem might need to be reconsidered.*, with M. Bueno, S. Rogers. Available as arXiv:2001.03268. To appear in *Calcolo*.

19. *A Note on Eigenvector Error Bounds for Polynomial Eigenvalue Problems*. Available as arXiv:1808.04012. To appear in The Electronic Journal of Linear Algebra.

20. *The Conditioning of Block Kronecker ℓ-ifications of Matrix Polynomials*. Available as arXiv:1808.01078. To appear in Calcolo.

21. *Perturbation Theory of Transfer Function Matrices*, with Vanni Noferini, Lauri Nyman, and Maria C. Quintana. Submitted. Available as arXiv:2207.06791.

Technical Reports

1. *Technical report on backward stability of polynomial root-finding using Fiedler companion matrices.* Available as MIMS EPrint 2014.38, School of Mathematics, The University of Manchester, UK, 2014.

2. Conditioning and backward errors of polynomial eigenvalue problems solved via a sparse linearization of Hermite interpolation polynomials, with Heike Fassbender, and Nikta Shayanfar. Available as MIMS EPrint 2015.98, School of Mathematics, The University of Manchester, UK, 2015.

3. Symmetric and skew-symmetric block Kronecker linearizations, with Heike Fassbender, and Nikta Shayanfar. Available as arXiv:1606.01766.

CONTRIBUTED TALKS AT CONFERENCES

Eigenvector Error Bounds for Linearized Polynomial Eigenvalue Problems　　　　June 2022
　　　ALAMA meeting, Alcala de Henares, Spain

Linearizations for rational equations　　　　October 2019
　　　2nd Biennial Meeting of the SIAM Pacific Northwest Section, Seattle 2019

Automatic rational approximation and linearization for nonlinear eigenvalue problems　　May 2018
　　　ALAMA meeting, Spain

Structured backward error analysis of linearized structured polynomial eigenvalue problems　June 2017
　　　Householder meeting, USA

Fiedler-Chebyshev pencils　　　　June 2016
　　　ALAMA meeting,
　　　León, Spain

*Fiedler-like pencils and backward stability of polynomial eigensolvers
using linearizations*　　　　January 2016
　　　Joint Mathematics Meetings,
　　　Seattle, USA

Chebyshev rootfinding via computing eigenvalues of colleague matrices　　October 2015
　　　SIAM Conference on Applied Linear Algebra,
　　　Atlanta, USA

Pseudospectra and eigenvalue condition numbers of Fiedler companion matrices　　June 2015
　　　26th Biennial Numerical Analysis Conference,
　　　University of Stratchclyde, Glasgow, UK

On the backward stability of computing polynomial eigenvalues via colleague matrices　　May 2015
　　　Conference in Honor of Volker Mehrmann on the Occasion of his 60th Birthday,
　　　TU Berlin, Berlin, Germany

Backward stability of polynomial root–finding using Fiedler companion matrices　　August 2014
　　　19th Conference of the International Linear Algebra Society,
　　　Seoul, Korea

Backward stability of polynomial root–finding using Fiedler companion matrices　　July 2014
　　　Joint ALAMA-GAMM/ANLA 2014 Meeting,
　　　Universitat Politecnica de Catalunya, Barcelona, Spain

New bounds for roots of polynomials from Fiedler companion matrices　　June 2013
　　　18th Conference of the International Linear Algebra Society,
　　　Providence, RI, USA

Sensitivity Problems for Fiedler Matrices　　September 2012
　　　Workshop of Young Researchers in Mathematics,
　　　Universidad Complutense de Madrid, Madrid, Spain

Condition Numbers of Fiedler Companion Matrices　　June 2012

ALAMA 2012 Meeting,
Leganés, Spain

Condition Numbers of Fiedler Companion Matrices   August 2011
17th Conference of the International Linear Algebra Society,
Braunschweig, Germany

INVITED TALKS AT CONFERENCES

Eigenvector Error Bounds for Linearized Polynomial Eigenvalue Problems   June 2022
24th ILAS Conference 2022, Galway, Ireland.
Invited talk in in the minisymposium "Companion Matrix Forms".

Eigenvector Error Bounds for Linearized Polynomial Eigenvalue Problems   May 2021
SIAM Conference on Applied Linear Algebra (LA21), Virtual Conference
Invited talk in in the minisymposium "Structured Eigenvalue Problems".

On even-degree symmetric matrix polynomials and their structure-preserving linearizations   July 2019
The 22th ILAS Conference 2019, Rio de Janeiro, Brasil
Invited talk in the minisymposium "Perturbation of Eigenstructures"

Structured perturbations of structured polynomials   July 2019
The 22th ILAS Conference 2019, Rio de Janeiro, Brasil
Invited talk in the minisymposium "Matrices over elementary divisor domains"

Accuracy and stability of polynomial eigenvalue solvers based on linearization   July 2019
ICIAM 2019, Valencia, Spain
Invited talk in the minisymposium "Nonlinear and Multiparameter
Eigenvalue Problems"

Automatic rational approximation and linearization of nonlinear eigenvalue problems   February 2019
SIAM CSE 2019, Spokane, USA
Invited talk in the minisymposium "Algorithms and Software for
Nonlinear Eigenvalue Problems"

On the numerical stability of the two-level orthogonal Arnoldi method for quadratic eigenvalue problems   May 2018
SIAM ALA Conference 2018, Hong Kong

Global and structured backward error analysis of structured polynomial eigenvalue problems solved via structure-preserving linearizations   July 2017
The 21th ILAS Conference 2017, USA
Invited talk in the minisymposium "Matrix polynomials"

Structured and unstructured backward error analyses of linearized polynomial eigenvalue problems   June 2017
CEDYA–CMA 2017, Cartagena, Spain
Invited talk in the minisymposium "Conditioning and Perturbation of Matrices"

Backward error analysis of computing roots of polynomials as generalized eigenvalues   July 2016
The 20th ILAS Conference 2016, Leuven, Belgium
Invited talk in the minisymposium
"Matrix structures and univariate polynomial rootfinding"

Backward stability of polynomial root–finding using Fiedler companion matrices   April 2014
Manchester Workshop on Nonlinear Eigenvalue Problems,
The University of Manchester, UK, April 23-25, 2014
Invited by Francoise Tisseur

OTHER INVITED TALKS

Nonlinear Eigenvalue Problems	March 2019
Department of Mathematical Sciences, University of Montana	
Recent advances on the theory of linearizing matrix polynomials	December 2016
Computer Science Department, KU Leuven	

*When solving polynomial eigenvalue problems via block Kronecker linearizations
is backward stable?* — March 2016
Department of Mathematical Sciences, University of Montana, USA
Invited by Emily Stone

Computing roots of polynomials: a numerical linear algebra point of view	January 2016

Department of Mathematical Sciences, Essex University, UK
Invited by Vanni Noferini

Constructing strong linearizations of matrix polynomials	October 2015

Numerical Linear Algebra meeting,
School of Mathematics, The University of Manchester

Fiedler companion matrices: structural and numerical properties	June 2015

Colloquium,
Department of Mathematics, Universidad Carlos III de Madrid, Spain
Invited by Froilán M. Dopico

On the stability of computing (matrix) polynomial roots via colleague matrices	May 2015

Institut Computational Mathematics, AG Numerik,
Technische Universität Braunschweig, Germany
Invited by Heike Fassbender

On the stability of computing (matrix) polynomial roots via colleague matrices	November 2014

Numerical Linear Algebra meeting,
School of Mathematics, The University of Manchester

Computing roots of polynomials as eigenvalues of Fiedler companion matrices	July 2013

SIAM Gene Golub Summer School 2013,
University of Shanghai

Sensitivity Problems for Fiedler Matrices	April 2012

Colloquium,
Department of Mathematics, Universidad Carlos III de Madrid

MINISYMPOSIA ORGANIZED

Polynomial and Rational Matrices	May 2018
SIAM Conference on Applied Linear Algebra, Hong Kong Baptist University	
Conditioning and Perturbation of Matrices	June 2017
CEDYA-CMA 2017, Cartagenta, Spain	
Polynomial and Rational Eigenvalue Problems	July 2016
20th Conference of the International Linear Algebra Society, Leuven, Belgium	

AWARDS AND HONORS

Early career travel award to attend **The SIAM Conference on Applied Linear Algebra (ALA18)**	May 2018

Up to $950 for travel expenses and local accommodation.

Outstanding reviewer – Applied Mathematics and Computation   January 2018
Recognition that I am within the top 10th percentile of reviewers for this Journal,
in terms of the number of manuscript reviews completed in the last two years

Organization committee of the 21st Conference of the ILAS Society   July 2017
Local accommodation expenses fully covered.

Outstanding reviewer – Linear Algebra and its Applications   January 2017
Recognition that I am within the top 10th percentile of reviewers for this Journal,
in terms of the number of manuscript reviews completed in the last two years

Universidad Carlos III of Madrid   2012-2014
During this period I received four letters from the Universidad Carlos III de Madrid
congratulating my outstanding ratings in the student surveys of teacher evaluation.

Organization committee of the 19th Conference of the ILAS Society   August 2014
Local accommodation expenses fully covered.

Organization committee of the Gene Golub SIAM Summer School   July 2013
Local accommodation and meals expenses fully covered.
Up to $1100 for travel expenses.

Organization committee of the Second ALAMA Course   May 2013
on Matrix Polynomials
Local accommodation and travel expenses fully covered.

Organization committee of the Gene Golub SIAM Summer School   June 2010
Up to €650 for travel and accommodation expenses.

Ministry of Education and Science of Spain   2009
Research grant of €3000.

TEACHING EXPERIENCE

Instructor, University of Montana

Theoretical Big Data Analytics	Spring 2022
Linear Algebra and Optimization for Machine Learning	Fall 2021
Data Science Analytics	Fall 2021
Data Science Projects	Spring 2021
Theoretical Big Data Analytics	Spring 2021
Data Science Analytics	Fall 2020
Linear Algebra	Fall 2020
Theoretical Big Data Analytics	Spring 2020
Numerical Analysis	Fall 2019
Differential Equations	Fall 2019
Linear Algebra (2 sections)	Spring 2019
Data Science Analytics	Fall 2018
Numerical Analysis	Fall 2018
Linear Algebra	Spring 2018
Calculus I	Spring 2018
Calculus I (2 sections)	Fall 2017

Teaching Assistance, KU Leuven (Belgium)

     Genetic Algorithms and Evolutionary Computing (2 sections)   Fall 2016

Teaching Assistance,   The University of Manchester (UK)

     Foundational course in Logic and Set Theory   Spring 2015
     Foundational course in Calculus and Algebra   Fall 2015
     Foundational course in Probability Theory and Linear Algebra   Fall 2015
     Foundational course in Newtonian Mechanics   Fall 2015

Teaching Assistance,   Universidad Carlos III de Madrid (Spain)

     Multivariable Calculus (3 sections)   Fall 2014
     Multivariable Calculus (2 sections)   Fall 2013
     Numerical Methods for Engineers   Spring 2013
     Linear Algebra (2 sections)   Spring 2012

SERVICE TO THE DEPARTMENT AND PROFESSION

Supervisor, CapSource Summer Internship, Summer 2021

Supervisor, CapSource Summer Internship, Summer 2020

Member, Undergraduate Committee, Fall 2019 - present

Mentor, (MT)2: Montana Trains the Mathematicians of Tomorrow, August 2019 - May 2020

Session facilitator, at Montana Math Day for secondary students (2017). Session title: "Hexaflexagons"

Session facilitator at Montana Math Day for secondary students (2018). Session title: "The Perfect Cipher"

MEMBERSHIPS

I am a member of the following professional bodies.
– ILAS (International Linear Algebra Society)
– SIAM (Society for Industrial and Applied Mathematics)
– Spanish Thematic Network ALAMA (Linear Algebra, Matrix Analysis, and Applications)

REFEREEING

I have refereed for the following journals:
– Linear Algebra and its Applications
– Mathematics of Computation
– SIAM Journal on Matrix Analysis and Applications
– Applied Mathematics and Computation
– Linear and Multilinear Algebra
– Computers and Mathematics with Applications
– Calcolo
– Electronic Journal of Linear Algebra
– Revista de la Real Academia de Ciencias Exactas, Físicas y Naturales
– Journal of Computational and Applied Mathematics