

# JAVIER PÉREZ ÁLVARO

## Curriculum Vitae

Department of Mathematical Sciences, University of Montana

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### EDUCATION

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**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

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**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

### MEMBERSHIPS

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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)

### PUBLICATIONS

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#### Refereed Journal Articles

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. Also available as MIMS EPrint 2015.90, School of Mathematics, The University of Manchester, UK, 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. Also available at [http://gauss.uc3m.es/web/personal\\_web/fdopico/papers/calcolo2015.pdf](http://gauss.uc3m.es/web/personal_web/fdopico/papers/calcolo2015.pdf).
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. Also available as MIMS EPrint 2016.12, School of Mathematics, The University of Manchester, UK, 2016.

### Submitted papers and Preprints

1. Block Kronecker Linearizations of Matrix Polynomials and their Backward Errors, with Piers W. Lawrence, Froilán M. Dopico, and Paul Van Dooren. Submitted to Numerische Mathematik, 2016. Also available as MIMS EPrint 2016.34, School of Mathematics, The University of Manchester, UK, 2016.
2. Symmetric and skew-symmetric block Kronecker linearizations, with Heike Fassbender, and Nikta Shayanfar. Submitted to Linear Algebra and its Applications, 2016. Also available as arXiv:1606.01766, 2016.
3. *A unified approach to Fiedler-like pencils via strong block minimal bases pencils*, with Maribel Bueno, Froilán Dopico, R. Saavedra and B. Zykoski. Submitted to Linear Algebra and its Applications, 2016. Also available as arXiv:1611.07170, 2016.
4. *Structured backward error analysis of linearized structured polynomial eigenvalue problems*, with Froilán Dopico and Paul Van Dooren. Submitted to Mathematics of Computation. Also available as arXiv:1612.07011, 2016.
5. *Mixed forward-backward stability of the two-level orthogonal Arnoldi method for quadratic problems*, with Karl Meerbergen. Submitted to Linear Algebra and its Applications. Also available as arXiv:1707.00930, 2017.

### 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.

## RESEARCH EXPERIENCE

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### School of Mathematics, The University of Manchester, UK

2014–2016

During this period I was a member in the research project

– Nonlinear Eigenvalue Problems: Theory and Numerics project (EP/I005293).

Funded by the British Engineering and Physical Sciences Research Council.

Principal Investigator: Francoise Tisseur.

### Department of Mathematics, Universidad Carlos III de Madrid, Spain

2010–2014

During this period I was a member in the following research projects:

– Structured Numerical Linear Algebra: Matrix Polynomials, Special Matrices, and Conditioning (MTM-2012-32542).

– Numerical Linear Algebra: Theory, Structures and Algorithm (MTM2009-09281).

Both funded by the Spanish National Science Foundation.

Principal Investigator: Froilán M. Dopico.

## REFEREEING

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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

## CONTRIBUTED TALKS AT CONFERENCES

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| <i>Structured backward error analysis of linearized structured polynomial eigenvalue problems</i>          | June 2017      |
| Householder meeting, USA   |                |
| <i>Fiedler-Chebyshev pencils</i>   | June 2016      |
| ALAMA meeting,<br>León, Spain  |                |
| <i>Fiedler-like pencils and backward stability of polynomial eigensolvers using linearizations</i>         | January 2016   |
| Joint Mathematics Meetings,<br>Seattle, USA  |                |
| <i>Chebyshev rootfinding via computing eigenvalues of colleague matrices</i>                               | October 2015   |
| SIAM Conference on Applied Linear Algebra,<br>Atlanta, USA   |                |
| <i>Pseudospectra and eigenvalue condition numbers of Fiedler companion matrices</i>                        | June 2015      |
| 26th Biennial Numerical Analysis Conference,<br>University of Strathclyde, Glasgow, UK                     |                |
| <i>On the backward stability of computing polynomial eigenvalues via colleague matrices</i>                | May 2015       |
| Conference in Honor of Volker Mehrmann on the Occasion of his 60th Birthday,<br>TU Berlin, Berlin, Germany |                |
| <i>Backward stability of polynomial root-finding using Fiedler companion matrices</i>                      | August 2014    |
| 19th Conference of the International Linear Algebra Society,<br>Seoul, Korea                               |                |
| <i>Backward stability of polynomial root-finding using Fiedler companion matrices</i>                      | July 2014      |
| Joint ALAMA-GAMM/ANLA 2014 Meeting,<br>Universitat Politècnica de Catalunya, Barcelona, Spain              |                |
| <i>New bounds for roots of polynomials from Fiedler companion matrices</i>                                 | June 2013      |
| 18th Conference of the International Linear Algebra Society,<br>Providence, RI, USA                        |                |
| <i>Sensitivity Problems for Fiedler Matrices</i>   | September 2012 |
| Workshop of Young Researchers in Mathematics,<br>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

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- 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

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- 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
- 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

## DEPARTMENTAL AND OTHER TALKS

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- Recent advances on the theory of linearizing matrix polynomials* December 2016  
 Computer Science Department, KU Leuven
- Constructing strong linearizations of matrix polynomials* October 2015

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| Numerical Linear Algebra meeting,<br>School of Mathematics, The University of Manchester |               |
| <i>On the stability of computing (matrix) polynomial roots via colleague matrices</i>    | November 2014 |
| Numerical Linear Algebra meeting,<br>School of Mathematics, The University of Manchester |               |
| <i>Computing roots of polynomials as eigenvalues of Fiedler companion matrices</i>       | July 2013     |
| SIAM Gene Golub Summer School 2013,<br>University of Shanghai                            |               |
| <i>Sensitivity Problems for Fiedler Matrices</i>   | April 2012    |
| Colloquium,<br>Department of Mathematics, Universidad Carlos III de Madrid               |               |

## MINISYMPOSIA ORGANIZED

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|---|-----------|
| <i>Polynomial and Rational Eigenvalue Problems</i>                              | July 2016 |
| 20th Conference of the International Linear Algebra Society,<br>Leuven, Belgium |           |
| <i>Conditioning and Perturbation of Matrices</i>                                | June 2017 |
| CEDYA-CMA 2017, Cartagena, Spain  |           |

## AWARDS AND HONORS

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|---|-------------|
| <b>Organization committee of the 21st Conference of the ILAS Society</b><br>Local accommodation expenses fully covered.   | July 2017   |
| <b>Universidad Carlos III of Madrid</b><br>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. | 2012-2014   |
| <b>Organization committee of the 19th Conference of the ILAS Society</b><br>Local accommodation expenses fully covered.   | August 2014 |
| <b>Organization committee of the Gene Golub SIAM Summer School</b><br>Local accommodation and meals expenses fully covered.<br>Up to \$1100 for travel expenses.  | July 2013   |
| <b>Organization committee of the the Second ALAMA Course on Matrix Polynomials</b><br>Local accommodation and travel expenses fully covered.  | May 2013    |
| <b>Organization committee of the Gene Golub SIAM Summer School</b><br>Up to €650 for travel and accommodation expenses.   | June 2010   |
| <b>Ministry of Education and Science of Spain</b><br>Research grant of €3000.   | 2009        |

## TEACHING EXPERIENCE

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|   |           |
|---|-----------|
| <b>Teaching Assistance,</b> KU Leuven (Belgium)                   |           |
| <i>Genetic Algorithms and Evolutionary Computing</i> (2 sections) | Fall 2016 |

**Teaching Assistance,** The University of Manchester (UK)

|   |             |
|---|-------------|
| <i>Foundational course in Logic and Set Theory</i>                  | Winter 2015 |
| <i>Foundational course in Calculus and Algebra</i>                  | Fall 2015   |
| <i>Foundational course in Probability Theory and Linear Algebra</i> | Fall 2015   |
| <i>Foundational course in Newtonian Mechanics</i>                   | Fall 2015   |

**Teaching Assistance,** Universidad Carlos III de Madrid (Spain)

|  |             |
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| <i>Multivariable Calculus</i> (3 sections) | Fall 2014   |
| <i>Multivariable Calculus</i> (2 sections) | Fall 2013   |
| <i>Numerical Methods for Engineers</i>     | Winter 2013 |
| <i>Linear Algebra</i> (2 sections)         | Winter 2012 |