

PERSONAL INFORMATION

Stavros Vologiannidis



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Sex Male | Date of birth 27/10/1974 | Nationality Greek

WORK EXPERIENCE

26/01/2017–Present

Assistant Professor

Dpt of Informatics Engineering, Technical Educational Institute of Central Macedonia, Serres (Greece)
Classical and intelligent control systems and Robotics.

01/03/2012–01/05/2014

Founder and General manager

Vologiannidis Avramis & SIA OE (DataScouting), Thessaloniki (Greece)

01/02/2016–29/02/2016

Software Engineer and consultant

GRNET SA, Athens (Greece)

I participated in the project "GN4-1 GÉANT Research and Education Networking" and specifically in the task "T3: The GÉANT Green Team" funded by the EU.

03/10/2012–30/09/2015

Software Engineer and IT consultant

GRNET SA, Athens (Greece)

Worked in the project entitled «Services for optimizing and updating advanced network services by the research and academic community" with code MIS 296113.

My main responsibilities was updating and creating the necessary infrastructures for a teleconferencing web application for the academic community.

01/05/2013–31/08/2015

Researcher

Educational Institute of Technology of Thessaloniki, Thessaloniki (Greece)

Researcher in Archimedes II project funded by the Greek Secretariat of Research and Technology. The project was entitled "Numerical and Symbolic polynomial methods in mathematical systems theory".

14/05/2014–19/05/2015

Assistant Professor

Dpt of Informatics Engineering, Technical Educational Institute of Central Macedonia, Serres (Greece)

Classical and intelligent control systems and Robotics.

03/02/2014–28/02/2014

Software engineer and consultant

GRNET SA, Athens (Greece)

I participated in the project «The Greening of Services», in the framework of «GN3plus-Multi-Gigabit European Research and Education Network and Associated Services», funded by EU.

2005–2013

Visiting professor

Dpt of Informatics Engineering, Technical Educational Institute of Central Macedonia, Serres (Greece)

www.teicm.gr

Teaching lessons such as:

- Systems Control Theory
- Intelligent Control Theory
- Industrial informatics

2002–2011 **IT Consultant and software development**

Enimerosi

www.apo.gr

01/01/2010–31/12/2010 **Researcher**

Dpt of Mathematics, Aristotle university of Thessaloniki, Thessaloniki (Greece)

Postdoctoral researcher in the department of Mathematics, Aristotle university of Thessaloniki, funded by an excellence grant from the university's research committee.

17/06/2009–20/06/2009 **Researcher**

GRNET S.A., Athens (Greece)

<https://grnet.gr/en/company/>

I participated in the research and development of a telepresence solution for GRNET. The outcome of the project is www.epresence.gr.

GRNET S.A. provides Internet connectivity, high-quality e-Infrastructures and advanced services to the Greek Educational, Academic and Research community, aiming at minimizing the digital divide and at ensuring equal participation of its members in the global Society of Knowledge. Additionally, GRNET develops digital applications that ensure resource optimization for the Greek State, modernize public functional structures and procedures, and introduce new models of cooperation between public bodies, research and education communities, citizens and businesses.

01/04/2007–31/03/2008 **Researcher**

Dpt of Mathematics, Aristotle university of Thessaloniki, Thessaloniki (Greece)

I worked as a researcher and programmer for the development of an automatic control package for descriptor state space systems on Mathematica. The package was developed in cooperation with Wolfram Research as an add-on to Control System Professional.

(<http://www.wolfram.com/products/applications/control/>).

09/02/2005–09/11/2005 **Software analyst - programmer**

Greek Army

<http://nrdc.army.gr/>

During my military service I was part of NDC-GR (NATO Rapid Deployable Corps - Greece) in the NATO global exercise «Gordian Knot 2005». Among others I as involved in managing Active Directory Services in Windows 2003 server, Exchange servers, and Cisco switches και routers. I was also in charge of the teleconferencing system.

10/04/2004–10/09/2005 **Researcher**

Dpt of Mathematics, Aristotle university of Thessaloniki, Thessaloniki (Greece)

I collaborated with the Institute of Information Theory and Automation (UTIA is a research institute of the Academy of Sciences of the Czech Republic), in a research project entitled "*Analysis and synthesis of discrete time digital filters for communications based on advanced polynomial methods*"

03/06/1999–01/01/2005 **Personal company in research, software design and development**

06/11/2000–06/11/2001

Researcher

Dpt of Mathematics, Aristotle university of Thessaloniki, Thessaloniki (Greece)

I worked as a researcher and software engineer in the project entitled *"Integrated software package for industrial and educational automatic control applications"*. Several algorithms useful in the analysis and synthesis of state space and descriptor systems were implemented in Mathematica and MAPLE.

01/12/2000–02/11/2001

Researcher

Dpt of Mathematics, Aristotle University of Thessaloniki, Thessaloniki (Greece)

I collaborated with the Institute of Information Theory and Automation (UTIA is a research institute of the Academy of Sciences of the Czech Republic), in a research project entitled *"Development of algorithms and of a web-based mathematical package for analysis and synthesis of multivariable Control Systems"*. The project was funded by the Greek Secretariat of Research and Technology (GSRT).

01/04/2000–31/12/2000

Researcher

Dpt of Mathematics, Aristotle university of Thessaloniki, Thessaloniki (Greece)

I participated as a researcher, software engineer and analyst in the project *GALENOS (Generic advanced low-cost trans-European network over satellite)*. The project was included in the TEN-Telecom Programme of the European Community. This project allowed the establishment of a trans-European competence network via satellite dedicated to real-time telemedical applications. In total, 14 terminals have been installed and operated for over a year in six countries (France, Italy, Greece, Germany, Bulgaria and Tunisia), connecting up to 15 different hospitals. The operation of the network has been successfully demonstrated in 9 occasions during exhibitions of worldwide renown (CEBIT, SATEXPO, MEDICA, etc.).

11/1997–03/1998

Software Engineer

Intermall SA, Thessaloniki (Greece)

- Web development using Microsoft DNA (ASP, Microsoft SQL Server, Visual Basic)
- Network and services administration

EDUCATION AND TRAINING

1992–1997

Bsc on Mathematics

Dpt of Mathematics, Aristotle University of Thessaloniki, Thessaloniki (Greece)

<http://www.math.auth.gr/>

1998–2005

PhD

Computer Science and Numerical Analysis Group, Department of Mathematics, Thessaloniki (Greece)

<http://anadrasis.web.auth.gr/>

Supervisor: Professor A.I.G. Vardoulakis

Phd thesis entitled "Algebraic - polynomial computational methods in Control Theory"

PERSONAL SKILLS

Mother tongue(s)

Greek

Other language(s)

English

UNDERSTANDING		SPEAKING		WRITING
Listening	Reading	Spoken interaction	Spoken production	

French

Certificate of Proficiency in English, University of Michigan

Sorbonne 1er degré
Certificat de langue FrançaiseLevels: A1 and A2: Basic user - B1 and B2: Independent user - C1 and C2: Proficient user
Common European Framework of Reference for Languages

ADDITIONAL INFORMATION

Publications

- [1] N. P. Karampetakis and S. Vologianidis, **DFT calculation of the generalized and drazin inverse of a polynomial matrix**, Applied Mathematics and Computation, 143 (2003), pp 501-521.
- [2] S. Vologianidis and N. P. Karampetakis, **Inverses of Multivariable Polynomial Matrices by Discrete Fourier Transform**, Multidimensional Systems and Signal Processing, 15 (4): 341-361, October 2004.
- [3] N. P. Karampetakis and S. Vologianidis, **Infinite elementary divisor structure-preserving transformations for polynomial matrices**, International Journal of Applied Mathematics and Computer Science, 2003, Vol. 13, No 4, pp 493-503.
- [4] N. P. Karampetakis S. Vologianidis and A.I.G. Vardulakis, **A new notion of equivalence for discrete time AR representations**, International Journal of Control, 15 April 2004, Vol. 77, No. 6, pp 584-597.
- [5] E.N. Antoniou, S. Vologianidis, **A new family of companion forms of polynomial matrices**, Electronic Journal of Linear Algebra, 2004, Vol. 11, pp 78-87.
- [6] E.N. Antoniou, A.I.G. Vardulakis and S. Vologianidis, **Numerical Computation of Minimal Polynomial Bases: A Generalized Resultant Approach**, Linear Algebra and its Applications, Volume 405, 1 August 2005, Pages 264-278.
- [7] E.N. Antoniou, S. Vologianidis, **Linearizations of polynomial matrices with symmetries and their applications**, Electronic Journal of Linear Algebra, volume 15 (2006), pages 107-114.
- [8] N. Karampetakis, E.N. Antoniou, A.I.G. Vardulakis, S. Vologianidis, **Symbolic Computations on Rings of Rational Functions and Applications in Control Engineering**, Symbolic Computations on Rings of Rational Functions and Applications in Control Engineering, Lecture Notes in Computer Science, Theoretical Computer Science and General Issues, Springer, 2009, ISBN: 978-3-642-04771-8.
- [9] N.P. Karampetakis, S. Vologianidis, **On the fundamental matrix of the inverse of a polynomial matrix and applications to ARMA representations**, Linear Algebra and its Applications, Volume 431, Issue 11, 1 November 2009, pages 2261-2276.
- [10] S. Vologianidis, E.N. Antoniou, **A permuted factors approach for the linearization of polynomial matrices**, Mathematics of Control, Signals, and Systems, March 2011
- [11] E.N. Antoniou, S. Vologianidis, **On the characterization and parametrization of strong linearizations of polynomial matrices**, Electronic Journal of Linear Algebra, volume 31 (2016), pages 610-619.
- [12] S. Vologianidis, E.N. Antoniou, N. Karampetakis, A.I.G. Vardulakis, **Polynomial matrix equivalences: system transformations and structural invariants**, IMA Journal of Mathematical Control and Information (2016) 32, 1–20.

Publications in Conferences

- [1] N. P. Karampetakis, S. Vologianidis and A.I. Vardulakis, Notions of equivalence for discrete time AR-representations, 15th IFAC World Congress 2002, Barcelona.
- [2] N. P. Karampetakis and S. Vologianidis, Infinite elementary divisor structure-preserving transformations for polynomial matrices, 8th IEEE International Conference on Methods and Models in Automation and Robotics, Szczecin, Poland, 2-5 September, 2002.
- [3] N. P. Karampetakis and S. Vologianidis, DFT calculation of the generalized and drazin inverse of a polynomial matrix, IEEE Conference on Computer Aided Control System Design CACSD'02, Glasgow, Scotland, 18-20 September 2002.
- [4] A.I. Vardulakis, N. P. Karampetakis, E. Antoniou, P. Tzekis and S. Vologianidis, 2003, A descriptor systems package for Mathematica, 11th IEEE Mediterranean Conference on Control and Automation (MED'03), Rhodes, Greece.
- [5] S. Vologianidis and N. P. Karampetakis, Inverses of Multivariable Polynomial Matrices by Discrete

Fourier Transforms, European Control Conference 2003, Cambridge, 1-4 September 2003, U.K.

[6] N. P. Karampetakis and S. Vologianidis, On the Laurent series expansion of the resolvent of a polynomial matrix and applications, 12th IEEE Mediterranean Conference on Control and Automation (MED'04), Kusadasi, 6-9 June 2004, Turkey.

[7] E.N. Antoniou, A.I.G. Vardulakis and S. Vologianidis, On the Computation of Minimal Polynomial Bases, 12th IEEE Mediterranean Conference on Control and Automation (MED'04), Kusadasi, 6-9 June 2004, Turkey.

[8] Petr Kujan, Martin Hromcik, Michael Sebek, N.P. Karampetakis, E.N. Antoniou, S. Vologianidis, Effective computations with 2-variable polynomial matrices in Mathematica, 12th IEEE Mediterranean Conference on Control and Automation (MED'04), Kusadasi, 6-9 June 2004, Turkey.

[9] E.N. Antoniou, S. Vologianidis, N. Karampetakis, Linearizations of polynomial matrices with symmetries and their applications, Proc. of the Joint 2005 International Symposium on Intelligent Control & 13th Mediterranean Conference on Control and Automation (2005 ISIC-MED), June 2005, Limassol, Cyprus.

[10] Antonis Vardulakis, Nikos Karampetakis, Efstathios Antoniou, Stavros Vologianidis, A Mathematica-based Package for Descriptor Systems, 9th IEEE International Symposium on Computer-Aided Control System Design, September 3-5, 2008, San Antonio, Texas (USA).

[11] N. Karampetakis, E.N. Antoniou, A.I.G. Vardulakis, S. Vologianidis, Symbolic Computations on Rings of Rational Functions and Applications in Control Engineering, Eurocast 2009 Workshop on Intelligent Information Processing, 15/2/2009 – 20/2/2009, Las Palmas de Gran Canaria, Spain.

[12] S. Vologianidis, E.N. Antoniou, M. Kasidiaris, Zero coprime equivalent matrix pencils of a 2 - D polynomial matrix, 7th Workshop on Multidimensional Systems (nDS 11), Poitiers, France, 2011.

[13] A. Vardulakis, N. Karampetakis, E. Antoniou, S. Vologianidis, Notions of equivalence for linear multivariable systems, 21st Mediterranean Conference on Control and Automation, Chania, Greece, 2013

[14] P. Tzekis, E. Antoniou, S. Vologianidis, Computation of the general solution of a multivariate polynomial matrix Diophantine equation, 21st Mediterranean Conference on Control and Automation, Chania, Greece, 2013

[15] Grigorios Tsoumakas, Apostolos Papadopoulos, Weining Qian, Stavros Vologianidis, Alexander D'yakonov, Antti Puurula, Jesse Read, Jan Švec, Stanislav Semenov, WISE 2014 Challenge: Multi-label Classification of Print Media Articles to Topics, Web Information Systems Engineering – WISE 2014, Thessaloniki, Greece, 2014

[16] E. Antoniou, S. Vologianidis, On the parametrization of linearizations of polynomial matrices, 22nd Mediterranean Conference on Control & Automation, Palermo, Italy, 2014

Invited talks

[1] Automated Logo Detection meets Speech2Text Recognition, Keynote, Stavros Vologianidis, Media Intelligence & Technology Talks, WMI September 8, Vienna

[O-2] Online Monitoring & Analysis - Panel discussion, Stavros Vologianidis, DataScouting, Christoph Prinz, Sail Labs, Magdalena Horanska, CEO, MCA Grupa, Media Intelligence & Technology Talks, WMI September 8, Vienna

[3] Keeping the Knowledge Treasure and Making it Usable - Panel discussion, Christa Müller, Austrian National Library, Konstantin Thaa, Qidenus Technologies, Stavros Vologianidis, CEO, DataScouting, Media Intelligence & Technology Talks, WMI September 8, Vienna

[4] "Audio and video processing for Radio, TV Monitoring: Latest Developments", Keynote, Stavros Vologianidis, 16th November 2016, FIBEP World media intelligence conference, Washington DC, USA

[5] New World of Semantics and Artificial Intelligence (AI) - Panel discussion, DI Wolfgang Nimführ, Business Development Executive, IBM Analytics Group, Stavros Vologianidis, General Manager, DataScouting, Sharat Jain, CTO, Impact India, Fady El-Murr, Managing Partner Pressrelations, Mohan Doshi, CTO, Ninestars, Moderator: Oresti Patricios, CEO, Ornicogroup Pty Ltd, FIBEP WMI Congress 17–20 November 2015 Vienna, Austria

[6] "The Fiedler family of linearizations of Polynomial Models", 3-7-2012, School of Engineering and Mathematical Sciences, City University, London.

[7] Chatbots: How AI is changing the way we interact with information, Keynote, Stavros Vologianidis, 5th October 2017, FIBEP World media intelligence conference, Berlin

Online Books (Creative commons)

- S. Vologianidis, Linear Control Systems, Theory and Applications, 2007, <http://teachers.teicm.gr/vologian/files/sae.pdf>
- S. Vologianidis, Intelligent Control Systems, Theory and Applications, 2007, <http://teachers.teicm.gr/vologian/files/intel.pdf>

Citations

- Antoniou, George E. "n-Order Linear State Space Systems: Computing the Transfer Function Using the DFT." *Applied Mathematics and Computation* 170, no. 2 (2005): 1077–84.
- Petković, Marko D., and Predrag S. Stanimirović. "Interpolation Algorithm for Computing Drazin Inverse of Polynomial Matrices." *Linear Algebra and Its Applications* 422, no. 2 (2007): 526–39.
- Petković, Marko D., Predrag S. Stanimirović, and Milan B. Tasić. "Effective Partitioning Method for Computing Weighted Moore–Penrose Inverse." *Computers & Mathematics with Applications* 55, no. 8 (2008): 1720–34.
- Stanimirović, Predrag S., and Milan B. Tasić. "On the Leverrier-Faddeev Algorithm for Computing the Moore-Penrose Inverse." *Journal of Applied Mathematics and Computing* 35, no. 1–2 (2011): 135–41.
- Stanimirović, Predrag S., Milan B. Tasić, and Ky M. Vu. "Extensions of Faddeev's Algorithms to Polynomial Matrices." *Applied Mathematics and Computation* 214, no. 1 (2009): 246–58.
- Tasić, Milan B., and Predrag S. Stanimirović. "Symbolic and Recursive Computation of Different Types of Generalized Inverses." *Applied Mathematics and Computation* 199, no. 1 (2008): 349–67.
- Tasic, Milan B., Predrag S. Stanimirovic, and Marko D. Petkovic. "Symbolic Computation of Weighted Moore-Penrose Inverse Using Partitioning Method." *arXiv Preprint arXiv:1104.1696*, 2011. <http://arxiv.org/abs/1104.1696>.
- Tasić, Milan B., Predrag S. Stanimirović, and Marko D. Petković. "Symbolic Computation of Weighted Moore–Penrose Inverse Using Partitioning Method." *Applied Mathematics and Computation* 189, no. 1 (2007): 615–40.
- U Nivsu, Univerzitet, and Marko D. Petkovic. "SIMBOLIČKO IZRAČUNAVANJE HANKELOVIH DETERMINANTI I GENERALISANIH INVERZA MATRICA." Accessed June 4, 2014. <http://tesla.pmf.ni.ac.rs/people/DeXteR/old/Papers/MDPPhd.pdf>.
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- Hunek, Wojciech, Krzysztof Latawiec, R. Stanislawski, M. Lukaniszyn, and Piotr Dzierwa. "A New Form of a Σ -inverse for Nonsquare Polynomial Matrices." In *Methods and Models in Automation and Robotics (MMAR), 2013 18th International Conference On*, 282–86. IEEE, 2013. http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6669920.
- Lobo, R., D. Bitzer, and M. Vouk. "Inverses of Multivariate Polynomial Matrices Using Discrete Convolution." In *Proceedings of the 2005 International Workshop on Coding and Cryptography (WCC 2005)*, Bergen, Norway, 481–90, 2005.
- Lobo, Ruben G., Donald L. Bitzer, and Mladen A. Vouk. "Locally Invertible Multivariate Polynomial Matrices." In *Coding and Cryptography*, 427–41. Springer, 2006. http://link.springer.com/chapter/10.1007/11779360_33.
- Petković, Marko D., Predrag S. Stanimirović, and Milan B. Tasić. "Effective Partitioning Method for Computing Weighted Moore–Penrose Inverse." *Computers & Mathematics with Applications* 55, no. 8 (2008): 1720–34.
- Stanimirović, Predrag S., and Milan B. Tasić. "On the Leverrier-Faddeev Algorithm for Computing the Moore-Penrose Inverse." *Journal of Applied Mathematics and Computing* 35, no. 1–2 (2011): 135–41.
- Stanimirović, Predrag S., Milan B. Tasić, and Ky M. Vu. "Extensions of Faddeev's Algorithms to Polynomial Matrices." *Applied Mathematics and Computation* 214, no. 1 (2009): 246–58.
- Tasić, Milan B., and Predrag S. Stanimirović. "Symbolic and Recursive Computation of Different

- Types of Generalized Inverses." *Applied Mathematics and Computation* 199, no. 1 (2008): 349–67.
- Tasic, Milan B., Predrag S. Stanimirovic, and Marko D. Petkovic. "Symbolic Computation of Weighted Moore–Penrose Inverse Using Partitioning Method." *arXiv Preprint arXiv:1104.1696*, 2011. <http://arxiv.org/abs/1104.1696>.
 - Tasić, Milan B., Predrag S. Stanimirović, and Marko D. Petković. "Symbolic Computation of Weighted Moore–Penrose Inverse Using Partitioning Method." *Applied Mathematics and Computation* 189, no. 1 (2007): 615–40.
 - De Terán, Fernando, Froilán M. Dopico, and D. Steven Mackey. "Spectral Equivalence of Matrix Polynomials and the Index Sum Theorem," 2013. <http://eprints.ma.man.ac.uk/2017/>.
 - Juan C. Zuniga–Anaya. "Structural Properties of Polynomial and Rational Matrices, a Survey." Accessed June 4, 2014. http://www.e-hilaris.com/MA/MA_6_4.pdf.
 - Spectral equivalence of matrix polynomials and the index sum theorem, F De Terán, FM Dopico, DS Mackey - *Linear Algebra and its Applications*, 2014 - Elsevier
 - Bourles, Henri, and Bogdan Marinescu. "Linear Time-Varying Systems." *Lecture Notes in Control and Inform. Sci* 410. Accessed June 4, 2014. <http://link.springer.com/content/pdf/10.1007/978-3-642-19727-7.pdf>.
 - MOYSIS S. LAZAROS. "Modeling of Discrete Time Auto-regressive Systems with Given Forward and Backward Behavior." PhD Thesis. Accessed June 4, 2014. <http://users.auth.gr/lazarosm/Thesis-MoysisLazaros.pdf>.
 - Spectral equivalence of matrix polynomials and the index sum theorem, F De Terán, FM Dopico, DS Mackey - *Linear Algebra and its Applications*, 2014 - Elsevier
 - Ahn, Hyo-Sung, and YangQuan Chen. "CSOIS Interval Computation Technical Report Series-4: New Sufficient Schur Stability Conditions of Interval Polynomial Matrix," 2005. <http://mechatronics.ece.usu.edu/reports/USU-CSOIS-TR-05-05.pdf>.
 - ———. New Sufficient Schur Stability Conditions of Interval Polynomial Matrix. Tech. Rep., Center for Self-Organizing and Intelligent Systems, Utah State University, 2005. <http://mechatronics.ece.usu.edu/reports/USU-CSOIS-TR-04-15.pdf>.
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 - Al-Ammari, Maha. "Analysis of Structured Polynomial Eigenvalue Problems." the University of Manchester, 2011. <http://eprints.ma.man.ac.uk/1694/>.
 - Bueno, María I., and Fernando De Terán. "Eigenvectors and Minimal Bases for Some Families of Fiedler-like Linearizations." *Linear and Multilinear Algebra*, no. ahead-of-print (2013): 1–24.
 - Bueno, María I., Fernando de Terán, and Froilán M. Dopico. "Recovery of Eigenvectors and Minimal Bases of Matrix Polynomials from Generalized Fiedler Linearizations." *SIAM Journal on Matrix Analysis and Applications* 32, no. 2 (2011): 463–83.
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Applications 429, no. 10 (2008): 2373–2400.

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- De Terán, Fernando, Froilán M. Dopico, and Paul Van Dooren. "Matrix Polynomials with Completely Prescribed Eigenstructure," 2014. http://gauss.uc3m.es/web/personal_web/fteran/papers/ddv-2014.pdf.
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- De Terán, Fernando, Froilán M. Dopico, and D. S. Mackey. "Linearizations of Matrix Polynomials: Sharp Lower Bounds for the Dimension and Structures." In *Actas Del XXI Congreso de Ecuaciones Diferenciales y Aplicaciones/XI Congreso de Matemática Aplicada, Held at Ciudad Real, 21–25, 2009*. http://matematicas.uclm.es/cedya09/archive/textos/133_DE-TERAN-VERGARA-F.pdf.
- De Terán, Fernando, Froilán M. Dopico, and D. Steven Mackey. "Fiedler Companion Linearizations and the Recovery of Minimal Indices." *SIAM Journal on Matrix Analysis and Applications* 31, no. 4 (2010): 2181–2204.
- ———. "Linearizations of Singular Matrix Polynomials and the Recovery of Minimal Indices." *Electron. J. Linear Algebra* 18 (2009): 371–402.
- De Terán, Fernando, Froilán M. Dopico, and D. Steven Mackey. "Fiedler Companion Linearizations for Rectangular Matrix Polynomials." *Linear Algebra and Its Applications* 437, no. 3 (2012): 957–91.
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- ———. "Structured Linearizations for Palindromic Matrix Polynomials of Odd Degree," 2010. <http://eprints.ma.man.ac.uk/1441/>.
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- ———. "New Bounds for Roots of Polynomials Based on Fiedler Companion Matrices," 2013. http://gauss.uc3m.es/web/personal_web/fteran/papers/bounds-fiedler.pdf.
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