Nithin Govindarajan

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Areas of expertise

Numerical linear algebra, Numerical analysis, systems theory, dynamical systems and control, signal processing.

Education

Oct. 2014 - Dec. 2018 PhD in Mechanical Engineering, University of California in Santa Barbara
Dissertation title: "Periodic approximations and spectral analysis of the Koopman operator: theory and applications".
Advisors: I. Mezić, S. Chandrasekaran.

Sep. 2009 - Oct. 2012 MSc in Aerospace Engineering (with distinction), Technische Universiteit Delft
Master thesis: "An Optimal Control Approach for Estimating Aircraft Command Margins".
Advisors: Q.P. Chu, C.C. de Visser.

Sep. 2006 - Jul. 2009 BSc in Aerospace Engineering (with distinction), Technische Universiteit Delft

Work experience

Aug. 2019 - present Postdoctoral researcher, KU Leuven, Belgium

Nov. 2018 - present Co-founder and technical brain of software startup www.matisse.ai in dentistry

Feb. 2019 - July 2019 Lecturer Mathematics, University of Amsterdam (UvA), The Netherlands

Nov. 2012 - May 2013 Junior R&D engineer, National Aerospace Laboratory (NLR), Amsterdam, The Netherlands

Sep. 2011 - May 2012 Intern, Mission Critical Technologies Inc. (on site at NASA Ames), Moffet Field, CA

Fellowships, honors & awards

Apr. 2016 CCDC fellowship, Center for Control, Dynamics and Computation, Santa Barbara, CA

Apr. 2014 Department Merit Fellowship (UCSB Mech. Eng), Santa Barbara, CA

May 2011 Huygens Scholarship Programme, Nuffic, The Hague, The Netherlands

Publications

Journal Publications

2024 Govindarajan, N., Widdershoven, R., Chandrasekaran, S., & De Lathauwer, L. (2023). A fast algorithm for computing Macaulay nullspaces of bivariate polynomial systems. SIAM Journal on Matrix Analysis and Applications, 45(1), 368-396.

2022 Govindarajan, N., Vervliet, N., & De Lathauwer, L. (2022). Regression and classification with spline-based separable expansions. Frontiers in big Data, 5, 688496.

2022 Govindarajan, N., Epperly, E. N., & Lathauwer, L. D. (2022). $(L_r, L_r, 1)$-Decompositions, Sparse Component Analysis, and the Blind Separation of Sums of Exponentials. SIAM Journal on Matrix Analysis and Applications, 43(2), 912-938.

2021 Epperly, E. N., Govindarajan, N., & Chandrasekaran, S. (2021). Minimal rank completions for overlapping blocks. Linear Algebra and its Applications, 627, 185-198.

2021 Govindarajan, N., Mohr, R., Chandrasekaran, S., & Mezic, I. (2021). On the approximation of Koopman spectra of measure-preserving flows. SIAM Journal on Applied Dynamical Systems, 20(1), 232-261.

2019 Govindarajan, N., Mohr, R., Chandrasekaran, S., & Mezic, I. (2019). On the approximation of Koopman spectra for measure preserving transformations. SIAM Journal on Applied Dynamical Systems, 18(3), 1454-1497.

2015 Govindarajan, N., De Visser, C. C., Van Kampen, E., Krishnakumar, K., Barlow, J., & Stepanyan, V. (2015). Optimal control framework for estimating autopilot safety margins. Journal of Guidance, Control, and Dynamics, 38(7), 1197-1207.

2014 Govindarajan, N., de Visser, C. C., & Krishnakumar, K. (2014). A sparse collocation method for solving time-dependent HJB equations using multivariate B-splines. Automatica, 50(9), 2234-2244.

Conference proceedings

2023 Widdershoven, R., Govindarajan, N., De Lathauwer, L. (2023, September). Overdetermined systems of polynomial equations: tensor-based solution and application. Proceedings of EUSIPCO 2023, Helsinki, Finland.

2018 Chandrasekaran, S., Govindarajan, N., & Rajagopal, A. (2018, July). Fast Algorithms for Displacement and Low-Rank Structured Matrices. In Proceedings of the 2018 ACM International Symposium on Symbolic and Algebraic Computation (pp. 17-22).

2016 Govindarajan, N., Arbabi, H., Van Blargian, L., Matchen, T., & Tegling, E. (2016, December). An operator-theoretic viewpoint to non-smooth dynamical systems: Koopman analysis of a hybrid pendulum. In 2016 IEEE 55th Conference on Decision and Control (CDC) (pp. 6477-6484). IEEE.

Preprints & Tech reports

2024 Govindarajan, N., Chandrasekaran, S., Dewilde, P. (2024). Tree quasi-separable matrices: a simultaneous generalization of sequentially and hierarchically semi-separable representations. arXiv preprint arXiv:2402.13381 [math.NA].

2019 Chandrasekaran, S., Epperly, E. N., Govindarajan, N. (2019). Graph-induced rank structures and their representations. arXiv preprint arXiv:1911.05858 [math.NA].

Selected talks

2024 "Macaulay matrices, low displacement rank, and the efficient computation of null spaces", Back to the roots seminar, Leuven.

2023 "A tensor-based approach to solving systems of multivariate polynomials", CAM23, Selva di Fasano.

2023 "Efficient Computation of Macaulay Matrix Null Spaces Through Exploiting Shift-Invariant Structures", SIAM AG23, Eindhoven.

2021 "$(L_r, L_r, 1)$-decompositions, Sparse Component Analysis, and the Blind Separation of Sums
2018 of Exponentials", SeLMA meeting, Leuven. "Spline-based separable expansions for approximation, regression and classification", IPAM Workshop I: Tensor Methods and their Applications in the Physical and Data Sciences, UCLA (online)

2017 "A toolbox for computing spectral properties of dynamical systems", SIAM DS17, Snowbird.

2016 "An operator-theoretic viewpoint to non-smooth dynamical systems: Koopman analysis of a hybrid pendulum", IEEE CDC 16, Las Vegas.

Teaching

Lead instructor & course organizor

Semester 1 2019/2020 Numerical mathematics, Amsterdam University College

Co-instructor

March 2022 Fast algorithms for dense structured matrices, KU Leuven
Semester 2 2021/2022 Numerieke modellering & benadering, KU Leuven
Semester 2 2019/2020 Numerieke modellering & benadering, KU Leuven

Teaching assistant

Semester 1 2021/2022 Numerieke wiskunde, KU Leuven
Semester 1 2020/2021 Numerieke wiskunde, KU Leuven
Semester 1 2019/2020 Numerieke wiskunde, KU Leuven
Spring 2018 Control theory, UCSB
Winter 2017 Electrical circuits Lab, UCSB
Fall 2017 Intro to programming in Matlab, UCSB
Summer 2017 Dynamics, UCSB
Summer 2017 Physics Lab: intro to classical mechanics for non-engineers, UCSB
Spring 2017 Dynamics, UCSB
Spring 2015 Dynamics, UCSB
Winter 2015 Vibrations, UCSB
Fall 2014 Statics, UCSB

Extra-curricular

Software skills

Matlab, Python, Julia, Mathematica (basic), C++ (basic), Latex, Git.

Languages

English, Dutch, Tamil (basic).

Last updated: October 22, 2024