Hildeberto Jardón Kojakhmetov

Curriculum Vitae

last updated: January 29, 2026

Personal information

Name	Hildeberto Jardón Kojakhmetov
Address	University of Groningen
	Faculty of Science and Engineering
	Dynamical Systems, Geometry & Mathematical Physics - Bernoulli Institute
	Nijenborgh 9
	9747 AG Groningen
	The Netherlands
E-mail address	h.jardon.kojakhmetov@rug.nl
Personal webpage	https://hildejk.xyz

Employment

05/2020 -	*Assistant Professor* (tenured since 2024)
	Dynamical Systems, Geometry, and Mathematical Physics
	Bernoulli Institute, University of Groningen
03/2019 - 04/2020	*Alexander von Humboldt fellow*
	Technical University of Munich
	Host: Prof. Dr. Christian Kuehn
	Research topic: Multiple time scale dynamical and control systems
03/2018 - 02/2019	*Technical University Foundation fellow*
	Technical University of Munich
	Host: Prof. Dr. Christian Kuehn
	Research topic: Slow-fast consensus networks
07/2017 - 02/2018	*Postdoctoral researcher*
	University of Groningen
	Supervisor: Prof. Dr. Bert Poolman
	Research topic: Mathematical and computational models for a synthetic cell
07/2015 - 06/2017	*Postdoctoral researcher*
	University of Groningen
	Supervisor: Prof. Dr. ir. Jacquelien M.A. Scherpen
	Research topic: Stabilization of slow-fast systems at non-hyperbolic points
09/2009 - 07/2011	*Lecturer* at the National Polytechnic Institute,
	Mexico City, Mexico.

Education

PhD	08/2011 - 06/2015	Mathematics, University of Groningen, The Netherlands. **Promotors**: Prof. Dr. Henk W. Broer and Prof. Dr. Gert Vegter.
MSc	08/2008 - 10/2010	Automatic Control, CINVESTAV, Mexico. **Supervisor**: Prof. Dr. Joaquín Collado.
BSc	08/2002 - 07/2007	Mechatronic Engineering, National Polytechnic Institute, Mexico.

Publications

Journals:

30. S. Cui, F. Liu, L. Liang, H. Jardón-Kojakhmetov, and M. Cao, "An sis diffusion process with direct and indirect spreading on a hypergraph," *Automatica*, vol. 177, p. 112319, 2025

29. S. Cui, Q. Zhao, G. Zhang, H. Jardon-Kojakhmetov, and M. Cao, "Analysis of higher-order lotka-volterra models: Application of s-tensors and the polynomial complementarity problem," *IEEE Transactions on Automatic Control*, 2025

28. S. Cui, G. Zhang, H. Jardón-Kojakhmetov, and M. Cao, "On metzler positive systems on hypergraphs," *IEEE Transactions on Control of Network Systems*, 2025

27. R. Albarran-García, M. Alvarez-Ramírez, and H. Jardón-Kojakhmetov, "Singular bifurcations in a slow-fast modified leslie-gower model," *Results in Applied Mathematics*, vol. 26, p. 100558, 2025

26. L. G. Venegas-Pineda, H. Jardón-Kojakhmetov, and M. Cao, "Co-evolutionary control of a class of coupled mixed-feedback systems," *Chaos: An Interdisciplinary Journal of Nonlinear Science*, vol. 35, no. 3, 2025

25. R. Huzak, H. Jardón-Kojakhmetov, and C. Kuehn, "Ergodicity in planar slow-fast systems through slow relation functions," *SIAM journal of Applied Dynamical Systems*, 2025

24. S. Cui, G. Zhang, H. Jardón-Kojakhmetov, and M. Cao, "On discrete-time polynomial dynamical systems on hypergraphs," *IEEE Control Systems Letters*, 2024

23. H. Jardón-Kojakhmetov, C. Kuehn, and M. Steinert, "The hyperbolic umbilic singularity in fast-slow systems," *Nonlinearity*, 2024

22. R. Bonetto and H. Jardón-Kojakhmetov, "Nonlinear diffusion on networks: Perturbations and consensus dynamics," *Networks and Heterogeneous Media*, vol. 19, no. 3, pp. 1344–1380, 2024

21. H. Jardón-Kojakhmetov, C. Kuehn, and I. P. Longo, "Persistent synchronization of heterogeneous networks with time-dependent linear diffusive coupling," *accepted, SIAM Journal of Applied Dynamical Systems*, 2024

20. L. G. Venegas-Pineda, H. Jardón-Kojakhmetov, and M. Cao, "Stable chimera states: A geometric singular perturbation approach," *Chaos*, 2023

19. S. Cui, F. Liu, H. Jardón-Kojakhmetov, and M. Cao, "Discrete-time layered-network epidemics model with time-varying transition rates and multiple resources," *Automatica*, 2023

18. L. Mantovanelli, D. Linnik, M. Punter, H. Jardón-Kojakhmetov, W. Smigiel, and B. Poolman, "Simulation-based reconstructed diffusion unveils the effect of aging on protein diffusion in escherichia coli," *PLOS Computational Biology*, 2023

17. R. Huzak and H. Jardón-Kojakhmetov, "Slow-fast torus knots," *Bulletin of the Belgian Mathematical Society - Simon Stevin*, vol. 29, no. 3, pp. 371 – 388, 2022

16. H. Jardón-Kojakhmetov, C. Kuehn, A. Puggliese, and M. Sensi, "A Geometric study of the SIR epidemiological model on a homogeneous network," *Journal of Theoretical Biology*, 2021

15. H. Jardón-Kojakhmetov and C. Kuehn, "Controlling canard cycles," *Journal of Dynamical and Control Systems*, 2021

14. H. Jardón-Kojakhmetov, C. Kuehn, A. Puggliese, and M. Sensi, "A Geometric study of the SIR and SIRWS epidemiological models," *Nonlinear Analysis: Real World Applications*, 2021

13. H. Taghvafard, H. Jardón-Kojakhmetov, P. Szmolyan, and M. Cao, "Geometric analysis of oscillations in the frzilator model," *Journal of Mathematical Analysis and Applications*, 2021

12. M. Engel and H. Jardón-Kojakhmetov, "Extended and symmetric loss of stability for canards in planar fast-slow maps," *SIAM Journal on Applied Dynamical Systems*, 2020

11. H. Jardón-Kojakhmetov and C. Kuehn, "On fast-slow consensus networks with a dynamic weight," *Journal of Nonlinear Science*, 2020

10. H. Jardón-Kojakhmetov, J. M. A. Scherpen, and D. del Puerto-Flores, "Stabilization of a class of slow–fast control systems at non-hyperbolic points," *Automatica*, vol. 99, pp. 13–21, 2019.

9. H. Jardón-Kojakhmetov and J. M. A. Scherpen, "Improving the region of attraction of a non-hyperbolic point in slow-fast systems with one fast variable," *IEEE Control Systems Letters*, vol. 2, no. 2, pp. 403–408, 2018[1].

8. H. Taghvafard, H. Jardón-Kojakhmetov, and M. Cao, "Parameter-robustness analysis for a biochemical oscillator model describing the social-behaviour transition phase of myxobacteria," *Proceedings of the Royal Society of London A: Mathematical, Physical and Engineering Sciences*, vol. 474, no. 2209, 2018.

7. H. Jardón-Kojakhmetov and J. M. A. Scherpen, "Model order reduction and composite control for a class of slow-fast systems around a non-hyperbolic point," *IEEE Control Systems Letters*, vol. 1, no. 1, pp. 68–73, 2017[2].

6. P. Ramazi, H. Jardón-Kojakhmetov, and M. Cao, "Limit sets within curves where trajectories converge to," *Applied Mathematics Letters*, vol. 68, pp. 94 – 100, 2017.

5. H. Jardón-Kojakhmetov, H. W. Broer, and R. Roussarie, "Analysis of a slow–fast system near a cusp singularity," *Journal of Differential Equations*, vol. 260, no. 4, pp. 3785–3843, 2016.

4. J. Collado and H. Jardón-Kojakhmetov, "Vibrational Stabilization by Reshaping Arnold Tongues: A Numerical Approach," *Applied Mathematics*, vol. 7, pp. 2005 – 2020, 2016.

3. H. Jardón-Kojakhmetov, "Formal normal form of Ak slow–fast systems," *Comptes Rendus Mathematique*, vol. 353, no. 9, pp. 795–800, 2015.

2. X. Liu and H. Jardón-Kojakhmetov, "Bifurcations of a non-gravitational interaction problem," *Applied Mathematics and Computation*, vol. 251, pp. 253–257, 2015.

1. H. Jardón-Kojakhmetov and H. W. Broer, "Polynomial normal forms of constrained differential equations with three parameters," *Journal of Differential Equations*, vol. 257, no. 4, pp. 1012–1055, 2014.

Proceedings:

8. S. Cui, G. Zhang, H. Jardon-Kojakhmetov, and M. Cao, "On tensor-based polynomial hamiltonian systems," *CDC*, 2025

7. S. Cui, Q. Zhao, H. Jardón-Kojakhmetov, and M. Cao, "Species Coexistence and Extinction Resulting from Higher-order Lotka-Volterra Two-Faction Competition," *CDC*, 2023

6. R. Bonetto and H. Jardón-Kojakhmetov, "A topological perspective on singular canards for critical sets with transverse intersections," in *Workshop on Topics in Multiple Time Scale Dynamics, 2022*, pp. 1–14, American Mathematical Society, 2024

5. H. Jardón-Kojakhmetov and C. Kuehn, "A survey on the blow-up method for fast-slow systems," *Mexican Mathematicians in the World*, 2021

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[1] The contents of this paper were also selected by CDC 57 (2018) Program Committee for presentation at the Conference
[2] The contents of this paper were also selected by CDC 56 (2017) Program Committee for presentation at the Conference

4. H. Jardón-Kojakhmetov, J. M. A. Scherpen, and D. del Puerto-Flores, "Nonlinear adaptive stabilization of a class of planar slow-fast systems at a non-hyperbolic point," in *2017 American Control Conference (ACC)*, pp. 2441–2446, May 2017.

3. H. Jardón-Kojakhmetov and J. M. A. Scherpen, "Stabilization of a planar slow-fast system at a non-hyperbolic point," in *22nd International Symposium on Mathematical Theory of Networks and Systems*, pp. 602 – 607, June 2016.

2. H. Jardón-Kojakhmetov, M. Muñoz-Arias, and J. M. A. Scherpen, "Model reduction of a flexible-joint robot: a port-Hamiltonian approach," *IFAC-PapersOnLine*, vol. 49, no. 18, pp. 832 – 837, 2016. 10th IFAC Symposium on Nonlinear Control Systems NOLCOS 2016.

1. R. Martínez-Martínez, H. Jardón-Kojakhmetov, J. A. Leon, and G. Fernández-Anaya, "Estabilización de Redes Complejas Fraccionarias de Sistemas de Lorenz y Sistemas de Chen," 2009.

Abstracts:

4. Hadi Taghvafard, H. Jardón-Kojakhmetov and Ming Cao. Analysis of a biochemical oscillator model describing the developmental stage of myxobacteria, Benelux Meeting, 2017.

3. H. Jardón-Kojakhmetov, M. Muñoz-Arias and Jacquelien M.A. Scherpen, *Slow-fast Port-Hamiltonian mechanical systems*, Benelux meeting 2017.

2. H. Jardón-Kojakhmetov and Jacquelien M.A. Scherpen, *Stabilization of planar slow-fast systems at a non-hyperbolic point*, Benelux meeting 2016.

1. H. Jardón-Kojakhmetov, M. Muñoz-Arias and Jacquelien M.A. Scherpen, *Control of a flexible-joint manipulator with only position measurements: a port-Hamiltonian approach*, Benelux meeting 2016.

Preprints and works in progress:

7. S. Yanchuk, S. Wieczorek, H. Jardón-Kojakhmetov, and H. Alkhayuon, "Singular basins in multiscale systems," 2026

6. M. P. García-Rivera, M. Álvarez-Ramírez, and H. Jardón-Kojakhmetov, "Oscillations in a slow-fast paleoclimate model for glacial cycles," *arXiv preprint arXiv:2508.15206*, 2025

5. S. Cui, C. Zhang, B. Jiang, H. Jardón-Kojakhmetov, and M. Cao, "Higher-order laplacian dynamics on hypergraphs with cooperative and antagonistic interactions," *arXiv preprint arXiv:2502.08276*, 2025

4. R. Bonetto and H. J. Kojakhmetov, "On the eigenvalues of graphs with mixed algebraic structure," *arXiv preprint arXiv:2408.00487*, 2024

3. R. Bonetto, H. Jardón-Kojakhmetov, and C. Kuehn, "Networks of pendula with diffusive interactions," *arXiv preprint arXiv:2408.02352*, 2024

2. L. G. Venegas-Pineda, H. Jardón-Kojakhmetov, M. Engel, J. Heitzig, M. C. Eser, and M. Cao, "Strategic control for a boltzmann like decision-making model," *arXiv preprint arXiv:2405.10915*, 2024

1. H. Jardón-Kojakhmetov and C. Kuehn, "On network dynamical systems with a nilpotent singularity," *arXiv preprint arXiv:2310.08947*, 2023

Talks

- Invited:

  22. *On nilpotent singularities of Network Dynamics*, ENOC2024, Delft, The Netherlands on July 22-26, 2024.

  21. *Blowing Up Adaptive Networks*, Applied Math Seminar, Utrecht, March 14, 2024.

  20. *On Singularities of Network Dynamics*, Mathematical Sciences Seminar Series 2023-24, University College Cork, 2024.

19. *On singularities of slowly adaptive networks*, International Workshop: Dynamics in Coupled Network Systems November 20 - 22, 2023 Berlin, 2023

18. *Stable chimera states*, SIAM-DS, Portland, Oregon, 2023

17. *Introducción a la teoría geométrica de perturbaciones singulares*, UAM-Iztapalapa, Mexico, January 2023.

16. *Slow-fast dynamical systems*, PhD Days, 2022

15. *Controlling Canard Cycles*, Leiden / VU Amsterdam / Delft Joint Seminar, 2021.

14. *Delayed loss of stability in slow-fast systems.* NDNS+ Twente (omline) Workshop 2020, June 2020.

13. *On the geometric theory of dynamical systems with multiple time scales: challenges and perspectives..* University of Groningen, November 2019.

12. *Dynamic consensus networks with two time scales.* 16th International Workshop on Complex Systems and Networks, TU Berlin, September 2019.

11. *Dynamic consensus networks with two time scales.* University of Groningen, September 2019.

10. *Some applications of geometric singular perturbation theory to control theory.* Equadiff 2019.

9. *Ecuaciones diferenciales ordinarias singularmente perturbadas.* Seminario de investigación UPIITA-IPN, Mexico City, Mexico, June 2019.

8. *The blow-up method for fast-slow systems.* AG Mathematische Physik, Friedrich-Alexander-Universität Erlangen-Nürnberg, February 2019.

7. *Control of slow-fast systems at non-hyperbolic points.* Regelungstechnisches Seminar, Technical University of Munich, November 2018.

6. *Slow-fast systems beyond normal hyperbolicity.* University of Groningen Seminar, University of Groningen, October 2018.

5. *Control of slow-fast systems.* Metropolitan Autonomous University, Mexico City, Mexico, June 2018.

4. *Slow-fast systems beyond normal hyperbolicity.* Mexican Mathematicians in the World: Perspectives and Recent Contributions, BIRS-Oaxaca, June 2018.

3. *Normal forms of slow-fast systems.* Oberseminar, Technical University of Munich, April 2018.

2. *Slow-fast systems and constrained differential equations.* Metropolitan Autonomous University, Mexico City, Mexico, July 2016.

1. *Slow-fast systems and constrained differential equations.* TU Wien, Austria, April 2016.

- Contributed:

    5. *Controlling canard cycles.* 10th European Nonlinear Dynamics Conference (ENOC 2022).

    4. *Dynamic networks with two time scales.* SIAM Conference on Applications of Dynamical Systems, 2019.

    3. *Control of slow-fast systems at non-hyperbolic points.* 13th International Young Researchers Workshop on Geometry, Mechanics and Control, University of Coimbra, December 2018.

    2. *On A_k slow-fast systems.* "Advances in Qualitative Theory of Differential Equations", Universitat Rovira i Virgili, Spain, 2015.

    1. *Normal forms of constrained differential equations with 3 parameters.* Floris Takens seminar, Nov. 2013, University of Groningen.

Grants and fellowships

- As PI or main grantee:

2024	CogniGron Crossdisciplinary grant (funded by Ubbo Emmius-University of Groningen)
2019	DAAD Travel Grant to attend SIAM-DS 2019
05/2019 – 05/2021	Alexander von Humboldt Postdoctoral Fellowship
2018	Marie-Curie EuroTechPostodoc *Declined to accept the Alexander von Humboldt Postdoctoral Fellowship
03/2018 – 02/2019	Technical University Foundation Fellowship (TUFF, TUM)
03/2017	Research Opportunities Week (ROW, TUM)
2011 – 2015	CONACyT grant for PhD studies.
2008 – 2010	CONACyT grant for M.Sc studies.

- As co-PI, host, or collaborator:

2021	CSC-RUG PhD scholarship grant, Chinese Scholarship Council and University of Groningen <u>Awardee:</u> Shaoxuan Cui
2020	DSSC-PhD scholarship grant, University of Groningen <u>Awardee:</u> Luis Guillermo Venegas Pineda

(co-)Supervision & Mentoring

PhD:

(A * denotes that the student has graduated)

- Ahída Ortíz, Autonomous Metropolitan University, UAM, Mexico, 2025- (with M. Alvarez)

- Floor Schipper, University of Groningen, 2024- (with M. Cao)

- Henrieke Krijgsheld, University of Groningen, 2024- (with M.Cao)

- Tangwei Cao, University of Groningen, 2025-2029 (with M. Cao)

- Shaouxuan Cui, University of Groningen, 2022-2026 (with H. Waalkens and M. Cao)

- *Riccardo Bonetto, University of Groningen, 2021-2025 (with H. Waalkens and H. Jaeger)

- *Luis Venegas, University of Groningen, 2020-2024 (with M. Cao)

- Maximilian Steinert, Technical University of Munich, 2020- (with C. Kuehn)

Master:

- Naomi Wijnia. "Building bridges between high school and university: Adapting the Dutch vwo Wiskunde B curriculum to make students better prepared for linear algebra at Dutch universities", RUG, 2025.

- Ramsay Duff. "Bifurcations in the two-node and three-node cases of the Nonlocal Hopping Model", RUG, 2024.

- Milou Aukes. "On bifurcations of coupled pendula", RUG, 2024

- Albert Silvans. "Complex Dynamics of Magnetic Billiards in a 2-Torus", RUG, 2023 (Main supervisor: Marcello Seri).

- Harsha Kumar. "Bifurcations on and Symmetrization of Digraphs", TUM, 2019. (with C. Kuehn)

- Tomoyuki van Ouwendorp. "Passivity analysis of a bursting neuron", RUG, 2016. (with J. M. A. Scherpen)

Bachelor:

- Aimilia Kokkinofta. "Coupling Mechanisms in Central Pattern Generators: A Two-Neuron FitzHughNagumo Model", RUG, 2025.

- Anirudh Ranganatha. "Analysis on Phase-Locking in Interacting Theta Neurons", RUG, 2025.

- Ivet Stanislavova. "Analysis of an adaptive theta-neuron model", RUG, 2025.

- Naomi Wijnia. Old Institutions with Old Habits, Research into Teaching University Mathematics, Including Lecture Notes on Holomorphic Differential Equations based on the Findings of 21st Century Researchers on Education. RUG, 2023.

- Timo Hilverts, The Kuramoto model on homogeneous ring networks for conformists and contrarians, RUG, 2022.

- Milou Aukes. The Kuramoto model on ring networks of homogeneous phase-oscillators, RUG, 2022

- Sharon Verhoeff. "Numerical methods for parametric resonance", 2017. (with B. Jayawardhana)

- Casper Stork. "Model and simulation of a cantilever under parametric resonance", 2017. (with B. Jayawardhana)

- Jorick Wold. "Finite Element Analysis of a piezoelectric cantilever under parametric resonance", 2017. (with B. Jayawardhana)

- Martijn Kamphuis. "A port-Hamiltonian approach to Gas Metal Arc Welding", 2017. (with M. Muñoz Arias)

- Vincent Samallo. "Camera integration on a robotic system", 2016. (with J. M. A. Scherpen)

- Thomas Wesselink. "Controlling a flexible-joint robot", 2016. (with J. M. A. Scherpen)

- Renate Bijker. "Improvement of a wind farm operation strategy", 2016. (with J. M. A. Scherpen and J. Barradas)

Teaching

At the University of Groningen

- Multivariable Analysis (Bachelor Course, 2022/2023, 2023/2024, 2024/2025, 2025/2026)

- Singularity Theory (Master Course, 2025)

- Perturbation Theory (Master Course, 2022, 2024)

- Hamiltonian Mechanics (Master Course, 2023)

- Calculus 1 (Bachelor Course, 2020, 2021)

- Caput Dynamical Systems and Chaos (Master Course, 2020, 2021)

- Project Chaos Theory (Bachelor Course, 2020/2021, 2021/2022)

- Mechatronics (Bachelor Course, 2015/2016, 2016/2017 and 2017/2018)

- Modeling and Control of Complex Nonlinear Engineering Systems (as TA, Master Course, 2016)

At the National Polytechnic Institute (2009-2011, UPIITA-IPN, Mexico)

- Electric Machines (Bachelor Course, 1 term)

- Control of electric machines (Bachelor Course, 2 terms)

- Robotics 1 (Bachelor Course, 3 terms)

- Robotics 2 (Bachelor Course, 3 terms)

Services to the Community

Review:

Regular and Chaotic Dynamics • Nonlinear Dynamics • Nonlinearity • Mathematical Reviews of the AMS • Applied Mathematics and Computation • International Journal of Robust and Nonlinear Control • European Journal of Control • Journal of Dynamical and Control Systems • Conference on Decision and Control • Control Systems Letters (L-CSS) • Automatica • Systems & Control Letters • Nonlinear Analysis: Hybrid Systems • SIAM Journal on Applied Dynamical Systems • Journal of Nonlinear Science

(co-)Organizer:

- Summer school on "Multiscale Modeling and its Applications", RUG, 2025

- Summer school on "Multiscale Modeling and its Applications", RUG, 2023

- SIAM-DS mini-symposium "Methods for Large but Finite-Size Dynamic Networks", 2023.

- BIRS-Workshop "Topics in multiple time scale dynamics", BIRS-Banff, 2022.

- Mini-symposium "Multiple time scale dynamics and applications", Dynamic Days Europe, 2021.

- SIAM-DS mini-symposium "New Directions in Multiple Time Scale Dynamics", 2019.

PhD defense committee:

- Dijs de Neeling, *Keplerian black holes and gravitating goldstones.* Promotors: Diederik Roest (RUG), Holger Waalkens (RUG), and Marcello Seri (RUG). University of Groningen, 2024.

- Federico Zadra, *Topics in contact Hamiltonian systems.* Promotors: Holger Waalkens (RUG), and Marcello Seri (RUG). University of Groningen, 2023.

- Thomas Zacharis, *Geometric singular perturbation theory for reaction-diffusion systems.* Promotors: Nikola Popovic (Edinburg), and Mariya Ptashnyk (Herriot-Watt). University of Edinburgh, 2023.

- Yiorgos Patsios, *Geometry of jump-induced mixed-mode oscillations and topological horseshoes in three-dimensional slow-fast systems.* Promotors: Renato Huzak (Hasselt), Peter de Maesschalck (Hasselt), and Nikola Popovic (Edinburgh). Hasselt University, 2022.

- Luke Gong, *Emergent Dynamic Behaviors in Complex Social and Ecological Systems: A Co-Evolutionary Game-Theoretic Approach.* Promotors: M. Cao (RUG), and B. Jayawardhana (RUG), University of Groningen, 2022.

- Rodolfo Reyes-Baez. *Virtual contraction and passivity based control of nonlinear mechanical systems.* Promotors: prof. dr. Arjan van der Schaft and prof. dr. ir. Bayu Jayawardhana, University of Groningen, 2019.