

Hildeberto Jardón Kojakhmetov

Curriculum Vitae

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
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Employment

05/2020 -	<i>Assistant Professor</i> (tenure-track) Dynamical Systems, Geometry, and Mathematical Physics Bernoulli Institute, University of Groningen
03/2019 - 04/2020	<i>Alexander von Humboldt fellow</i> Technical University of Munich <i>Host:</i> Prof. Dr. Christian Kuehn <i>Research topic:</i> Multiple time scale dynamical and control systems
03/2018 - 02/2019	<i>Technical University Foundation fellow</i> Technical University of Munich <i>Host:</i> Prof. Dr. Christian Kuehn <i>Research topic:</i> Slow-fast consensus networks
07/2017 - 02/2018	<i>Postdoctoral researcher</i> University of Groningen <i>Supervisor:</i> Prof. Dr. Bert Poolman <i>Research topic:</i> Mathematical and computational models for a synthetic cell
07/2015 - 06/2017	<i>Postdoctoral researcher</i> University of Groningen <i>Supervisor:</i> Prof. Dr. ir. Jacquelin M.A. Scherpen <i>Research topic:</i> Stabilization of slow-fast systems at non-hyperbolic points
09/2009 - 07/2011	<i>Lecturer</i> at the National Polytechnic Institute, Mexico City, Mexico.
09/2007 - 07/2008	<i>Designer</i> at NISSAN Mexicana, Toluca, Mexico.
11/2006 - 02/2007	<i>Designer</i> at Bosch-Rexroth, 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:

16. H. Jardón-Kojakhmetov and C. Kuehn, “Controlling canard cycles,” *Journal of Dynamical and Control Systems*, 2021
15. H. Jardón-Kojakhmetov, C. Kuehn, A. Pugliese, and M. Sensi, “A Geometric study of the SIR and SIRWS epidemiological models,” *Nonlinear Analysis: Real World Applications*, 2021
14. H. Taghvafard, H. Jardón-Kojakhmetov, P. Szmolyan, and M. Cao, “Geometric analysis of oscillations in the frzillator model,” *Journal of Mathematical Analysis and Applications*, 2021
13. 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
12. H. Jardón-Kojakhmetov and C. Kuehn, “On fast-slow consensus networks with a dynamic weight,” *Journal of Nonlinear Science*, 2020
11. H. Jardón-Kojakhmetov and C. Kuehn, “A survey on the blow-up method for fast-slow systems,” *Accepted/to appear in AMS - Contemporary Mathematics*, 2019
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, 2018¹.
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, 2017².
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 Mathématique*, vol. 353, no. 9, pp. 795–800, 2015.

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

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

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.

Conference Proceedings:

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 Jacquelin M.A. Scherpen, *Slow-fast Port-Hamiltonian mechanical systems*, Benelux meeting 2017.
2. H. Jardón-Kojakhmetov and Jacquelin 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 Jacquelin 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:

2. R. Huzak and H. Jardón-Kojakhmetov, “The slow divergence integral and torus knots,” *under review*, 2021
1. H. Jardón-Kojakhmetov, C. Kuehn, A. Puggliese, and M. Sensi, “A Geometric study of the SIR epidemiological model on a homogeneous network,” *under review*, 2021

Talks

• Invited:

15. *Controlling Canard Cycles*, Leiden / VU Amsterdam / Delft Joint Seminar, 2021.
14. *Delayed loss of stability in slow-fast systems*. NDNS+ Twente (online) 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:

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:

- Shaouxuan Cui, University of Groningen, 2021-2025 (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, 2020-2023 (with C. Kuehn)

Master:

- Harsha Kumar. “Bifurcations on and Symmetrization of Digraphs”, Technical University of Munich, 2019. (with C. Kuehn)
- Tomoyuki van Ouwendorp. “Passivity analysis of a bursting neuron”, University of Groningen, 2016. (with J. M. A. Scherpen)

Bachelor:

- 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

- 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 & Referee:

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

(co-)Organizer:

- 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:

- 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.