# Renato Huzak

**Address**
Department of Mathematics and Statistics
Hasselt University, Belgium, email: renato.huzak@uhasselt.be

## Education

- Ph.D.: Jan 2010-Oct 2013, Dept of Math, Hasselt University, Belgium
- Master: Oct 2003-Feb 2008, Dept of Math, University of Zagreb, Croatia

## Professional Experience

- 2021-: Associate Professor, Dept of Math, Hasselt University, Belgium
- 2016-2021: Assistant Professor, Dept of Math, Hasselt University, Belgium
- 2015-2016: Postdoctoral Researcher, Dept of Math, York University, Toronto, Canada
- 2014-2015: Postdoctoral Researcher, Dept of Math, Hasselt University, Belgium

## Short Term Visits

University of Zagreb, Croatia; York University, Toronto, Canada; Plymouth University, England; Institute of Mathematics, Hanoi, Vietnam; TU Dresden, Germany; School of Mathematics and Maxwell Institute of Mathematical Sciences, University of Edinburgh, United Kingdom

## Publications

1. R. Huzak, P. De Maesschalck, F. Dumortier, *Limit cycles in slow-fast codimension 3 saddle and elliptic bifurcations*, J. Differential Equations, 255(11):4012-4051, 2013.
2. R. Huzak, P. De Maesschalck, F. Dumortier, *Primary birth of canard cycles in slow-fast codimension 3 elliptic bifurcations*, Communications on Pure and Applied Analysis, 11(6), 2641-2673, 2014.
3. P. De Maesschalck, R.Huzak. *Slow divergence integrals in classical Liénard equations near centers*, Journal of Dynamics and Differential Equations, Volume 27, Issue 1 (2015), 177-185.
4. R. Huzak, P. De Maesschalck. *Slow divergence integrals in generalized Liénard equations near centers*, Electron. J. Qual. Theory Differ. Equ. 2014, No. 66, 1-10.
5. R. Huzak, *Cyclicity of the origin in slow-fast codimension 3 saddle and elliptic bifurcations*, Discrete Contin. Dyn. Syst., 36(1), 171–215, 2016, doi:10.3934/dcds.2016.36.171.
6. R. Huzak, *Normal forms of Liénard type for analytic unfoldings of nilpotent singularities.* Proc. Am. Math. Soc. 145(10), 4325–4336 (2017).
7. R. Huzak, *Regular and slow-fast codimension 4 saddle-node bifurcations*, J. Differential Equations, 262(2):1119–1154, 2017.
8. R. Huzak, *Cyclicity of degenerate graphic DF2a of Dumortier-Roussarie-Rousseau program*, Communications on Pure and Applied Analysis, Volume 17(3)(2018), 1305–1316.
9. R. Huzak, *Box dimension and cyclicity of canard cycles.* Qual. Theory Dyn. Syst., 17 (2018), 475–493.
10. R. Huzak, *Canard Explosion Near Non-Liénard Type Slow-Fast Hopf Point*, J Dyn Diff Equat(2018), https://doi.org/10.1007/s10884-018-9645-3.
11. R. Huzak, *Predator-prey systems with small predator's death rate*, Electron. J. Qual. Theory Differ. Equ., 2018, No. 86, 1-16. ( https://doi.org/10.14232/ejqtde.2018.1.86)
12. R. Huzak, D. Vlah. *Fractal analysis of canard cycles with two breaking parameters and applications.* Communications on Pure and Applied Analysis, 2019, 18 (2) : 959–975. doi: 10.3934/cpaa.2019047
13. R. Huzak, *The slow divergence integral on a Möbius band*, J. Differential Equations (2018), https://doi.org/10.1016/j.jde.2018.11.002
14. R. Huzak, *Quartic Liénard equations with linear damping*, Qual. Theory Dyn. Syst. (2018). https://doi.org/10.1007/s12346-018-0302-3
15. R. Huzak, *Finite cyclicity of the contact point in slow-fast integrable systems of Darboux type*, Electronic Journal of Differential Equations, Vol. 2020 (2020), No. 90, pp. 1–15.

16. V. Crnkovic, R. Huzak, D. Vlah, *Fractal dimensions and two-dimensional slow-fast systems*, Journal of Mathematical Analysis and Applications, 501(2), 125212 - September 2021.
17. R.Huzak, D. Rojas, *Period function of planar turning points*, Electron. J. Qual. Theory Differ. Equ. 2021, No. 16, 1-21.
18. L. Horvat Dmitrovic, R. Huzak, D. Vlah, V. Zupanovic, *Fractal analysis of planar nilpotent singularities and numerical applications*, J. of Differential Equations 293(2021)1–22.
19. P. De Maesschalck, R. Huzak, Y. Patsios, N. Popovic, *Jump-induced mixed-mode oscillations through piecewise-affine maps*, J. Math. Anal. Appl., 505, No. 1, Article ID 125641, 29 p. (2022).
20. R. Huzak, *Cyclicity of canard cycles with hyperbolic saddles located away from the critical curve*, J. of Differential Equations 320 (2022), 479–509.
21. Huzak, R., Rojas, D. *Abelian Integrals and Non-generic Turning Points.* Qual. Theory Dyn. Syst. 21, 77 (2022). https://doi.org/10.1007/s12346-022-00609-7
22. R. Huzak, H. J. Kojakhmetov, *Slow-fast torus knots*, accepted in Bulletin of the Belgian Mathematical Society–Simon Stevin, 2022
23. Jinhui Yao, R. Huzak, *Cyclicity of the limit periodic sets for a singularly perturbed Leslie-Gower predator-prey model with prey harvesting*, preprint
24. K. Uldall Kristiansen, R. Huzak, *The number of limit cycles for regularized piecewise polynomial systems is unbounded*, preprint
25. R. Huzak, D. Vlah, D. Zubrinic, V. Zupanovic, *The box dimension of degenerate spiral trajectories of a class of ordinary differential equations*, preprint
26. P. De Maesschalck, R. Huzak, A. Janssens, G. Radunović, *Fractal codimension of nilpotent contact points in two-dimensional slow-fast systems*, preprint

**Talks**

1. *Detection of the first nonzero Lyapunov quantity in degenerate slow-fast Hopf bifurcations from fractality of planar contact points*, Talk, ICDEA 2022, 18–22 July 2022, Paris-Saclay, France
2. *Predator-prey slow-fast cycles and Hilbert's 16th problem*, Talk, EQUADIFF, 11–15 July 2022, Brno, Czech Republic
3. *Fractal analysis of slow-fast systems*, Talk, Bifurcations of dynamical systems, Workshop, 9th–12th February, 2022, Zagreb, Croatia.
4. *Fractal dimensions and 2-dimensional slow-fast systems*, Talk, DynamicsDays2021, Nice, France, August 2021.
5. *Period function near planar turning points*, Talk, NoLineal 20-21 Online, Madrid, Spain, June 30-July 2, 2021.
6. *Period function near planar turning points*, Talk, SIAM Conference on Applications of Dynamical Systems (DS21), held virtually May 23-27, 2021.
7. *Slow-fast systems in dimensions 2 and 3*, Talk (Zoom platform), organized by Maja Resman, 4.11.2020, University of Zagreb, Croatia, http://degiorgi.math.hr/kolokvij/view.php?id=172
8. *Cyclicity of canard cycles with hyperbolic saddles located away from the slow curve*, Seminar, University of Edinburgh, UK, December 3-5, 2019
9. *Slow-fast Darboux systems*, Dynamics, Equations and Applications (DEA 2019), Invited speaker, Kraków, Poland, 16th to 20th September 2019
10. *Cyclicity of canard cycles with hyperbolic saddles located away from the slow curve*, Invited speaker, Advances in Qualitative Theory of Differential Equations, Castro Urdiales, Spain, June 17-21, 2019
11. *Slow-fast systems on a Möbius band*, Invited speaker, SIAM Conference on Applications of Dynamical Systems (DS19), Snowbird, Utah, May 19 - 23, 2019.
12. *The slow divergence integral on a Mobius band*, invited speaker, "Workshop on Algebraic and Analytical Methods for Dynamical Systems with Applications to Reaction Networks" organized by Sebastian Walcher, Aachen University, Germany, April 30, 2019.

13. *The slow divergence integral on a Mobius band* and *Quartic Lienard equations with linear damping*, Invited speaker, ZAGREB DYNAMICAL SYSTEMS WORKSHOP 2018, October 22–26, Zagreb, Croatia
14. *Slow-fast bifurcations and Hilbert's 16th problem*, Invited speaker, SPT 2018, Cagliary, Italy, June 2018
15. *Box dimension and cyclicity of canard cycles*, University of Zagreb, Croatia, April 2018
16. *Normal forms of Liénard type, slow-fast bifurcations and fractal geometry of canard cycles*, Hasselt University, Belgium, November, 2017
17. *Normal forms of Liénard type, slow-fast bifurcations and fractal geometry of canard cycles*, University of Toulouse, France, November, 2017
18. *Regular and slow-fast codimension 4 saddle-node bifurcations*, EquaDiff 2017
19. *Regular and slow-fast codimension 4 saddle-node bifurcations*, University of Zagreb, Croatia, April 2017
20. *Slow-fast predator-prey systems*, Talk given at The Annual Meeting of the Canadian Society of Applied and Industrial Mathematics (CAIMS 2016), Edmonton, Alberta, Canada, June 26–30, 2016
21. *Codimension 4 saddle-node bifurcations*, Talk given at York University, November 15 – 28, 2015, Toronto, Canada
22. *Geometric singular perturbation theory and planar slow-fast systems*, Talk given at Institute of Mathematics, Hanoi, Vietnam, September 7–19, 2015
23. *Limit cycles in Liénard equations and blow-up techniques*, Talks given at Plymouth University, April 12 – May 1, 2015, Plymouth, England
24. *Slow-fast codimension 3 bifurcations*, Talk given at Fourth PhD-Day: Royal Academy, September 9, 2013, Brussel, Belgium
25. *Cyclicity of the origin in slow-fast codimension 3 bifurcations*, Talk given at Workshop on Slow-Fast Dynamics: Theory, Numerics, Application to Life and Earth Sciences, June 3 – June 7, 2013, Barcelona, Spain
26. *Limit cycles in slow-fast codimension 3 saddle and elliptic bifurcations*, Talk given at The 9th AIMS Conference on Dynamical Systems, Differential Equations and Applications, July 1 – 5, 2012, Orlando, Florida, USA
27. Poster with P. De Maesschalck and F. Dumortier on *Limit cycles in slow-fast codimension 3 saddle and elliptic bifurcations*, September 12 – 16, 2011, Castro Urdiales, Spain