Ian Lizarraga

Contact Information

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Academic Positions

2018–2023 Postdoctoral Fellow
University of Sydney School of Mathematics and Statistics
Supervisors: Robert Marangell & Martin Wechselberger

2017–2018 Visiting Assistant Professor
Cornell University Math Department

Education

2011–2017 PhD in Applied Mathematics
Cornell Center for Applied Mathematics
Advisors: John Guckenheimer & Steven Strogatz

2008–2011 BA in Mathematics and Honors Physics
Northwestern University
Thesis advisor: Frederic Rasio

Research Interests

Geometric singular perturbation theory beyond the standard form, geometric stability theory for nonlinear waves, model reduction of coupled oscillator models

Publications and Projects

(Preprints and drafts are available on https://ianlizarraga.github.io/)

- T. Kaper, **I.L.**, R. Marangell, and T. Vo, *Geometric construction of trigger waves in reaction-diffusion systems*, in progress (2022)
- **I.L.** and M. Wechselberger, *Delayed and singular Hopf bifurcations in nonstandard slow-fast systems*, in progress (2022),
- **I.L.** and R. Marangell *Nonlinear stability of shock-fronted travelling waves under nonlocal regularization*, submitted, [draft on website] (2022), 24 pages
- **I.L.** and R. Marangell *Spectral stability of shock-fronted travelling waves under viscous relaxation*, submitted, arXiv:2208.10064 (2022), 70 pages
- B. Bradshaw-Hajek, **I.L.**, R. Marangell, and M. Wechselberger, *A geometric singular perturbation analysis of regularised reaction-nonlinear diffusion models including shocks*, Proceedings of 47th Sapporo Symposium on Partial Differential Equations (2022), pp. 53–64.
- **I.L.**, B. Rink, and M. Wechselberger, *Parametrisation method for multiple-timescale dynamical systems*, Nonlinearity 34 (2021)
- **I.L.**, R. Marangell, and M. Wechselberger, *Slow Unfoldings of Contact Singularities in Singularly Perturbed Systems Beyond the Standard Form*, J. Nonlinear Sci. (2020)
- **I.L.** and M. Wechselberger, *Computational singular perturbation method for nonstandard slow-fast systems*, SIADS 19-2 (2020)
- **I.L.**, *Modeling mixed-mode oscillations near a tangency of slow manifolds*, preprint available on homepage, accepted to Chaos (2019)

- J. Guckenheimer and **I.L.**, *Shilnikov homoclinic bifurcation of mixed-mode oscillations*, SIAM J. Appl. Dyn. Syst. 14-2 (2015)
- I. Kloumann, **I.L.**, and S. Strogatz, *Phase diagram for the Kuramoto model with van Hemmen interactions*, Physical Review E 89, 012904 (2014)
- J. Teyssandier, S. Naoz, **I.L.**, and F. Rasio, *Extreme orbital evolution from hierarchical secular coupling of two giant planets*, The Astrophysical Journal 779 166 (2013)

Theses

- *Complex Mixed-Mode Oscillations and a Search for Oscillator Glass*, Cornell University Ph.D. Thesis (2017)
- *Secular Dynamics of Three-Body Systems and the Origins of Retrograde Hot Jupiters*, Northwestern University Senior Thesis (2011)

Talks

2023 May	SIAM Conference on Dynamical Systems, Portland, Oregon, USA†
2022 Nov	Dynamical Systems in NZ, Waiuku, New Zealand†
2022 Aug	SIAM Conference on Nonlinear Waves and Coherent Structures, Bremen, Germany†
2022 Apr	Dynamics Seminar, Boston University, USA†
2021 May	SIAM Conference on Dynamical Systems, Online
2021 May	Applied Maths Seminar, UNSW, Australia†
2020 Dec	AustMS Online Conference, 2020
2020 Mar	VIC-Anziam Lecture, University of Melbourne, Australia† (postponed due to COVID-19 pandemic)
2020 Mar	Applied Maths Seminar, Monash University, Australia† (postponed due to COVID-19 pandemic)
2020 Feb	ANZIAM, Hunter Valley, NSW, Australia
2019 Dec	Applied Maths Seminar, UNSW, Australia†
2019 Nov	SDG Conference, Margaret River, WA, Australia
2019 July	Equadiff, Universiteit Leiden, Netherlands†
2019 July	Edinburgh Slow-Fast-Ival Workshop, Edinburgh, UK
2019 May	SIAM Conference on Dynamical Systems, Snowbird, UT, USA
2019 Feb	ANZIAM, Nelson, New Zealand
2018 Nov	SDG Conference, Blackheath, NSW, Australia
2018 Oct	Sydney Dynamics Group Seminar†, Sydney, NSW
2017 Aug	Cornell University Applied Math Talk, Ithaca, NY, USA
2015 May	SIAM Conference on Dynamical Systems†, Snowbird, UT, USA
2015 Mar	Cornell Dynamical Systems Seminar, Ithaca, NY, USA
2014 Jul	SIAM Annual Meeting, Chicago, IL, USA
2013 Nov	Cornell SCAN Seminar, Ithaca, NY, USA†
2012 Dec	Cornell Topics in PDEs Seminar, Ithaca, NY, USA

[† invited talks]

Honors and Awards

2019	Robert Bartnik Visiting Fellowship, Monash University
2019	Accommodation Funding, TU Munich, Germany Dynamics & Geometry Summer School
2014	SIAM Student Travel Award
2011	Cornell University Graduate Research Fellowship
2011	Magna cum laude, Phi Beta Kappa, Sigma Pi Sigma
2011	Rhodes Scholarship finalist
2011	CIERA Summer Research Funding (PI: Fred Rasio)
2010	Belize Ministry of Education Senior Fellowship (USD 20,000)
2010	Northwestern University Summer Research Grant
2010	Oak Ridge National Laboratory Summer Biophysics Grant
2009	NSF Summer Research Funding (PI: Adilson Motter)
2008	Belize Ministry of Education CAPE First Prize (USD 40,000)

Teaching

Instructorships

2021 Sem 2	Math 3888: Projects in Mathematics
2020 Sem 1	Math 3063: Differential Equations with Applications to Biology (120 students)
2019 Sem 1	Math 3063: Differential Equations with Applications to Biology (120 students)
2018 Sp	Math 1110: Calculus I (60 students)
2017 Fa	Math 1120: Calculus II (60 students)

TA: Teaching Assistantship; GA: Grading Assistantship

2020 S2	TA	Math 3888: Projects in Mathematics (Project Advisor)
2017 Sp	TA	Math 2210: Multivariable Calculus
2016 Fa	TA	Math 2940: Linear Algebra for Engineers (Head TA for 15 sections and ∼450 students)
2016 Su	GA	Math 1110: Calculus I
2016 Sp	TA	Math 1106: Calculus for the Life and Social Sciences
2015 Fa	TA	Math 2210: Linear Algebra
2015 Sp	TA	Math 2940: Linear Algebra for Engineers
2014 Fa	GA	Math 4200: Diff Eqs. and Dynamical Systems
2013 Sp	GA	MAE 5780: Nonlinear Dynamics and Chaos
2012 Fa	TA	Math 1910: Single Variable Calculus

Journal refereeing

- Nonlinearity
- CHAOS
- DCDS-B
- Physica D
- SIADS

Service

2022–2023	Organizer, Matrix Institute Workshop on Multiple-Timescale Dynamical Systems, Creswick, Victoria, Australia
2021	Organizer, SIAM DS21 (8 speakers total)
2019 – 2021	Organizer, USyd Applied Mathematics Seminar
2019	Organizer, SIAM DS19 (two minisymposia, 11 speakers total)
2012 – 2015	President, Cornell SIAM Student Chapter
2012 – 2013	Member, CAM Minority Student Forum
2010 – 2011	Service Chair, Alpha Phi Omega Service Fraternity

Computing Languages

MATLAB, Mathematica, FORTRAN, C

References

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Robert Marangell, Senior Lecturer in Mathematics
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John Guckenheimer, Abram R. Bullis Professor Emeritus of Mathematics
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Math Department, Cornell University
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Steven Strogatz, Jacob Gould Schurman Professor of Applied Mathematics
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