

Jorge Arroyo-Esquivel, PhD

PERSONAL DATA

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BROAD RESEARCH INTERESTS

- Use of mathematical modelling to analyze ecological management strategies.
- Use of mathematical modelling to improve forecasting in ecology.

WORK EXPERIENCE

JANUARY 2023-CURRENT	Carnegie Institution for Science Postdoctoral Fellow in Ecoinformatics
JANUARY 2020-DECEMBER 2022	University of California Davis Graduate Student Researcher
SEPTEMBER 2018-JUNE 2021	University of California Davis Teaching Assistant
AUGUST 2019-SEPTEMBER 2019	University of California Davis Associate Instructor
JANUARY 2018-AUGUST 2018	Western Union Sr. Spec/Anlyst Rep & Analysis
APRIL 2014-DECEMBER 2017	Universidad de Costa Rica Research Assistant

EDUCATION

SEPTEMBER 2018-DECEMBER 2022	University of California, Davis Doctor of Philosophy Major: Applied Mathematics Advisor: Alan Hastings
SEPTEMBER 2018-JUNE 2021	University of California, Davis Master of Science Major: Applied Mathematics
MARCH 2013-DECEMBER 2017	Universidad de Costa Rica Bachelor of Science with Honorific Graduation Major: Mathematics

GRANTS AND AWARDS

- 2023 NSF Collaborative Research
Model Enabled Machine Learning (MnML) For Predicting Ecosystem Regime Shifts.
Co-PI
- 2022 9th Heidelberg Laureate Forum
Alumni
- 2022 ESA Theory Section
Honorable Mention to Best Paper Award
- 2022 California Sea Grant Undergraduate Research Experience (CA-SURE)
Graduate Student Mentor
- 2021 6th Ocean Hackathon-San Francisco Edition
Third place
- 2017 Ship for World Youth Leaders
Alumni

PUBLICATIONS

- **Arroyo-Esquivel J**, Watson J. Predicting regime shifts in ecological time series using universal differential equations. *In prep.*
- **Arroyo-Esquivel J**, Adams R, Gravem S, ..., Baskett M. Multiple resilience metrics reveal the complementary roles of different restoration interventions on long-term system persistence. *In review.*
- **Arroyo-Esquivel J**, Klausmeier CA, Litchman E. Using neural ordinary differential equations to predict complex ecological dynamics from population density data. *In review.*
- **Arroyo-Esquivel J**, Hastings A, Baskett M. Local interactions affect spread of prey in a predator-prey system with group defense. *Theoretical Ecology, In press.*
- **Arroyo-Esquivel J**, Baskett M, McPherson M, Hastings A. How far to build it? Analyzing the impact of the Field of Dreams hypothesis in bull kelp restoration. *Ecological Applications*, 2023, 33 (4).
- Sanchez F, **Arroyo-Esquivel J**, Calvo JG. A mathematical model with nonlinear recidivism: conditions for a forward-backward bifurcation. *Journal of Biological Dynamics*, 2023, 17 (1).
- **Arroyo-Esquivel J**, Hastings A, Baskett M. Characterizing long transients in consumer-resource systems with group defense and nonreproductive stages. *Bulletin of Mathematical Biology*, 2022, 84.
- Herrera C, Corrales R, **Arroyo-Esquivel J**, Calvo JG. A numerical implementation for the high-order 2D Virtual Element Method in MATLAB. *Numerical Algorithms*, 2022.
- Reimer JR, **Arroyo-Esquivel J**, Jiang J, Scharf HR, Wolkovich EM, Zhu K, and Boettiger C. Noise can create or erase long transient dynamics. *Theoretical Ecology*, 2021.
- **Arroyo-Esquivel J**, Marculis NG, Hastings A. The effect of colonization dynamics in competition for space in metacommunities. *Theoretical Ecology*, 2021.
- Marculis NG, **Arroyo-Esquivel J**, Hastings A. The Role of Between-Patch Dynamics in a Metapopulation: A Discrete-Time Modelling Approach. *Theoretical Ecology*, 2021, 14, 161–172.
- **Arroyo-Esquivel J**, Hastings A. Spatial dynamics and spread of ecosystem engineers: Two patch analysis. *Bulletin on Mathematical Biology*, 2020, 82.

- Sanchez F, **Arroyo-Esquivel J**, Vasquez P. Hospitalization in the transmission of dengue dynamics: The impact on public health policies. *Revista de Matemática: Teoría y Aplicaciones*, 2019, 27, 241-266.
- **Arroyo-Esquivel J**, Sanchez F, Barboza L. Infection model for analyzing biological control of coffee rust using bacterial anti-fungal compounds. *Mathematical BioSciences*, 2019, 307, 13-24.

POSTERS & TALKS

- 2023 ESA Annual Meeting
 Portland, Oregon, USA.
 SIAM Conference on Applications of Dynamical Systems
 Portland, Oregon, USA.
 Global Pervasive Computational Epidemiology Journal Club
 University of Virginia, Virginia, USA.
- 2022 103rd Western Society of Naturalists Annual Meeting.
 Oxnard, California, USA.
 9th Heidelberg Laureate Forum.
 University of Heidelberg, Heidelberg, Germany.
 23rd International Symposium on Mathematical Methods Applied to the Sciences.
- 2021 106th Ecological Society of America Annual Meeting.
 Virtual Society for Mathematical Biology Annual Meeting.
- 2020 101st Western Society of Naturalists Annual Meeting.
 Monterey, California, USA.
 Electronic Society for Mathematical Biology Annual Meeting.
 105th Ecological Society of America Annual Meeting
 Salt Lake City, Utah, USA.
- 2018 21st International Symposium on Mathematical Methods Applied to Sciences
 Universidad de Costa Rica, San Jose, Costa Rica.
- 2017 19th Fall School of Mathematical Biology
 Universidad de Colima, Colima, Mexico.

PROFESSIONAL SERVICE

Mentoring in: Cientifico Latino.
Foothill College Summer Internship Program.
Project SHORT.
Association for Women in Science, Sacramento Chapter.

Reviewer in: Bulletin of Mathematical Biology.
Chaos, Solitons and Fractals.
Functional Ecology.
International Journal of Biometeorology.
Mathematical Biosciences.
Mathematics and Computers in Simulation.
PLOS ONE.
Theoretical Ecology.
Theoretical Population Biology.
Revista de Matemática: Teoría y Aplicaciones.

Other: 2020-2022 Vice-President in UC Davis Mathematics
Graduate Students Organization.

LANGUAGES

SPANISH: Native
ENGLISH: Fluent
JAPANESE: Conversational
FRENCH: Conversational

COMPUTER SKILLS

PROGRAMMING LANGUAGES: R, Julia, Matlab, SQL, Git, Python, C#
MACHINE LEARNING TOOLS: Lux, Flux, DeepXDE, PyTorch
BUSINESS INTELLIGENCE: Microsoft Office, Alteryx, Tableau

REFERENCES

Alan Hastings Distinguished Professor Emeritus
Department of Environmental Science and Policy, UC Davis
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Marissa Baskett Professor
Department of Environmental Science and Policy, UC Davis
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Elena Litchman Senior Staff Scientist
Department of Global Ecology, Carnegie Institution for Science
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James Watson Associate Professor
College of Earth, Ocean, and Atmospheric Sciences, Oregon State University
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