

Michael D. Catchen

✉ mdcatchen@gmail.com | [in michael-catchen](#) | [gottacatchenall](#) | [gottacatchenall.github.io](#)

SUMMARY

Ecological data scientist with expertise in species distribution modeling, ecological forecasting, and biodiversity monitoring. Experienced in machine learning, Bayesian inference, scientific programming, working with remote sensing data, and communicating science to diverse audiences.

EXPERIENCE

IVADO Postdoctoral Fellow

September 2024 - present

Université de Montréal · Poisot Computational Ecology Research Group · Montréal, QC, CA

- Applied modern tools from computer vision to species distribution modeling (SDMs).
- Built software for optimal spatial design of biodiversity monitoring programs, particularly for detecting species range shifts.
- Developed open-source code for ecological monitoring and fitting, validating, and forecasting SDMs in the Julia language

Research Software Developer

December 2021 - March 2024

Group on Earth Observations Biodiversity Observation Network (GEO-BON) · Montréal, QC, CA

- Worked on both front and back-end components for a web application for analysis of large-scale geospatial environmental data and planning optimal biodiversity-observation-networks (BONs), as part of a partnership between GEO-BON and Microsoft
- Designed tools for optimizing spatial data sampling design, as well scripts for producing species distribution models using gradient-boosting methods.
- Technologies used: Node.js, React.js, Docker, Julia, PostgreSQL, STAC Catalogues

Flight Software Engineering Intern

Summer 2017

NASA Jet Propulsion Laboratory · Pasadena, CA, USA

- Developed flight software for two small satellites (*LunarFlashlight* & *NEAScout*) as part of a medium-sized team
- Wrote code and tests for the interface between the motherboard and inertial-measurement-unit (IMU) of each satellite
- Gained skills in embedded systems programming, unit and integration testing, and software development practices in larger teams

Systems Engineering Intern

Summer 2015, Summer 2016

NASA Jet Propulsion Laboratory · Pasadena, CA, USA

- Developed a content management system for documentation of various software components used to uplink commands to spacecraft as part of a medium-sized team

EDUCATION

Ph.D. in Biology

2020 - 2024

McGill University · Montréal, Québec, Canada

- Thesis: *Improving monitoring and prediction of ecological dynamics using simulation and machine learning*
- Supervisor: Dr. Andrew Gonzalez
- Relevant coursework: Network Science, Probabilistic Programming

M.A. in Ecology and Evolutionary Biology

2018 - 2020

University of Colorado Boulder · Boulder, Colorado, USA

- Thesis: *Phase transitions in landscape connectivity*
- Supervisor: Dr. Samuel M. Flaxman
- Relevant coursework: Stochastic Processes, Genomics, Evolutionary Ecology, Network Science

B.A. in Ecology and Evolutionary Biology

2015 - 2020

University of Colorado Boulder · Boulder, Colorado, USA

- Relevant coursework: Algorithms, Data Structures, Applied Probability, Differential Equations, Linear Algebra, Remote Sensing
- GPA: 3.92

PUBLICATIONS

Biodiversity science and biosurveillance are fellow travelers

2025

BioScience · [10.1093/biosci/biaf091](#)

T. Poisot, D. Becker, **Michael D. Catchen**, R. Gibb, P. Shimabukuro, C. Carlson

A Julia toolkit for species distribution data

2025

PCJ Ecology · [10.32942/X2405R](#)

T. Poisot, A. Bussi eres-Fournel, G. Dansereau, **Michael D. Catchen**

Deciphering Probabilistic Species Interaction Networks

2025

Ecology Letters · [10.1111/ele.70161](#)

F. Banville, T. Strydom, P. Blyth, C. Brimacombe, **Michael D. Catchen**, G. Dansereau, G. Higino, T. Malpas, H. Mayall, K. Norman, D. Gravel, T. Poisot

BON in a Box: An Open and Collaborative Platform for Biodiversity Monitoring, Indicator Calculation, 2024 and Reporting

Preprint (EcoEvorxiv) · [10.32942/X2M320](#)

J. Griffith, J. Lord, **Michael D. Catchen**, M. Arce-Plata, M. Galvez Bohorquez, M. Chandramohan, M. Diaz-Corzo, D. Gravel, L. Urbina Gonzalez, C. Guti rrez, I. Helfenstein, S. Hoban, J. Kass, G. Laroque, L. Laikre, D. Leigh, B. Leung, A. Mastretta-Yanes, K. Millette, D. Moreno, M. Molina-Berbero, K. Norman, V. Rinc n-Parra, S. Pahls, P. Peres-Neto, K. Perreira, T. Poisot, L. Pollock, M. Olaya Rodr guez, C. R  sli, F. Rousseu, L. S nchez-Clavijo, M. Schuman, O. Selmoni, J. Da Silva, T. Surasinghe, E. Turak, E. Valencia, S. Valentin, N. Wightman, J. Zuloaga, M. Londo o Murcia, A. Gonzalez

Improving monitoring and prediction of ecological dynamics with simulation and machine learning 2024

Doctoral Thesis

Michael D. Catchen

The missing link: discerning true from false negatives when sampling species interaction networks 2023

Preprint (EcoEvorxiv) · [10.32942/X2DW22](#)

Michael D. Catchen, T. Poisot, L. Pollock, A. Gonzalez

Improving ecological connectivity assessments with transfer learning and function approximation 2023

International Conference on Representation Learning (ICLR) 2025 - Machine Learning for Remote Sensing · [10.32942/X2259C](#)

Michael D. Catchen, M. Lin, T. Poisot, D. Rolnick, A. Gonzalez

A global biodiversity observing system to unite monitoring and guide action

2023

Nature Ecology & Evolution · [10.1038/s41559-023-02171-0](#)

A. Gonzalez, P. Vihervaara, P. Balvanera, A. Bates, E. Bayraktarov, P. Bellingham, A. Bruder, J. Campbell, **Michael D. Catchen**, J. Cavender-Bares, J. Chase, N. Coops, M. Costello, B. Cz  cz, A. Delavaud, M. Dornelas, G. Dubois, E. Duffy, H. Eggermont, M. Fernandez, N. Fernandez, S. Ferrier, G. Geller, M. Gill, D. Gravel, C. Guerra, R. Guralnick, M. Harfoot, T. Hirsch, S. Hoban, A. Hughes, W. Hugo, M. Hunter, F. Isbell, W. Jetz, N. Juergens, W. Kissling, C. Krug, P. Kullberg, Y. Le Bras, B. Leung, M. Londo o-Murcia, J. Lord, M. Loreau, A. Luers, K. Ma, A. MacDonald, J. Maes, M. McGeoch, J. Mihoub, K. Millette, Z. Molnar, E. Montes, A. Mori, F. Muller-Karger, H. Muraoka, M. Nakaoka, L. Navarro, T. Newbold, A. Niamir, D. Obura, M. O'Connor, M. Paganini, D. Pelletier, H. Pereira, T. Poisot, L. Pollock, A. Purvis, A. Radulovici, D. Rocchini, C. Roeoesli, M. Schaepman, G. Schaepman-Strub, D. Schmeller, U. Schmiedel, F. Schneider, M. Shakya, A. Skidmore, A. Skowno, Y. Takeuchi, M. Tuanmu, E. Turak, W. Turner, M. Urban, N. Urbina-Cardona, R. Valbuena, A. Van de Putte, B. Havre, V. Wingate, E. Wright, C. Torrel o

A roadmap towards predicting species interaction networks (across space and time)

2021

Philosophical Transactions of the Royal Society B: Biological Sciences · [10.1098/rstb.2021.0063](#)

T. Strydom, **Michael D. Catchen**, F. Banville, D. Caron, G. Dansereau, P. Desjardins-Proulx, N. Forero-Mu oz, G. Higino, B. Mercier, A. Gonzalez, D. Gravel, L. Pollock, T. Poisot

Phase Transitions in Landscape Connectivity

2020

Masters Thesis

Michael D. Catchen

PRESENTATIONS

Benchmarking forecasting methods with digital twins of metacommunity dynamics

May 2025

Contributed Talk

Ecological Forecasting Initiative Conference · Blacksburg, Virginia, USA

Forecasting Species Range Shifts with Interpretable Machine Learning

May 2025

Contributed Poster

Ecological Forecasting Initiative Conference · Blacksburg, Virginia, USA

Towards a theory of optimal biodiversity monitoring

February 2025

Contributed Talk

Québec Center for Biodiversity Science Colloquium · Longueuil, Québec, Canada

Predicting the shifting biogeography of species interactions with machine learning

February 2025

Invited Seminar

University of Illinois Urbana-Champaign · Urbana, Illinois, USA

False negatives in ecological networks

August 2023

Invited Seminar

VERENA Consortium · Washington D.C., USA (virtual)

Toward a virtual ecology: Simulating ecosystems to optimize spatial sampling of species interactions

August 2022

Invited Talk

Ecological Society of America / Canadian Society for Ecology and Evolution Joint Meeting · Montréal, QC, CA

TEACHING

Workshop Leader — Interpretable Machine Learning for Species Distribution Models

July 2025

Canadian Society for Ecology and Evolution 2025 · Sherbrooke, Québec, Canada

- Led a 3 hour workshop on fundamentals of species distribution modeling, machine learning, and making “black box” machine learning model interpretable using a variety of techniques, including SHAP values and conformal prediction.

Teaching Assistant — General Biology Lab II

Spring 2020

University of Colorado Boulder · Boulder, Colorado, USA

- Taught three sections of 18–20 students in a laboratory environment. Covered basics of statistical analysis in R, evolutionary biology, phylogenetics, physiology, anatomy, and ecology.

Teaching Assistant — General Biology Lab I

Fall 2019

University of Colorado Boulder · Boulder, CO, USA

- Taught three sections of 18–20 students in a laboratory environment. Covered basics of statistical analysis in R, molecular and cellular biology, experimental design, and hypothesis testing

Learning Assistant — Calculus I, II, and III for Engineers

Spring 2016 – Fall 2017

University of Colorado Boulder · Boulder, CO, USA

- Tutored students in small groups, graded exams.

SOFTWARE DEVELOPMENT

BiodiversityObservationNetworks.jl · Lead developer ·

2022 – present

- Lead developer of a Julia package for optimizing the spatial design of biodiversity monitoring programs.

NeutralLandscapes.jl · Lead developer ·

2021 – present

- Maintains a Julia package that provides a wide variety of methods for generating landscapes with prescribed statistical properties. Developed novel methods for spatiotemporally autocorrelated change in landscapes, and discrete patch generation.

SpeciesDistributionToolkit.jl · Contributing developer ·

2022 – present

- Contributed methods to a Julia package for species distribution modeling, including multivariate transforms of data, performance optimization of pseudoabsence algorithms, and building interfaces to other Julia packages for ecology. Led development of the SimpleSDMPolygons.jl subpackage for handling geospatial vector data.

MetacommunityDynamics.jl · Lead developer ·

2021 – present

- Developed and maintains a Julia package for simulation of reaction–diffusion population and community dynamics on heterogeneous spatial graphs
- Developed interfaces to external Julia packages for Bayesian inference of dynamical systems (using *Turing.jl*) and scientific machine–learning (SciML) with the *DifferentialEquations.jl* and Julia SciML ecosystem.

SKILLS

Statistical Modeling

Hierarchical Bayesian Inference (STAN, spOccupancy), Generalized Additive Models (mgcv), Forecasting, Gaussian Processes, Simulation, Numerical Optimization

Machine Learning	Deep Learning (PyTorch, HuggingFace), Computer Vision, Explainable ML, XGBoost, scikit-learn
Geospatial & Remote Sensing	Google Earth Engine, QGIS, Spatial Statistics, terra, geopandas, rasterio
Cloud and DevOps	AWS, Docker, Slurm, Apache Arrow, Hadoop
Languages	Python, R, Julia, SQL, STAN, Bash, C++
Visualization and Communication	ggplot2, matplotlib, Shiny, LaTeX, Quarto, Jupyter, RMarkdown

REFERENCES

Dr. Andrew Gonzalez

Full Professor
 McGill University
 Department of Biology
andrew.gonzalez@mcgill.ca

Dr. Timothée Poisot

Full Professor
 Université de Montréal
 Département de sciences biologiques
timothee.poisot@umontreal.ca

Dr. Laura Pollock

Assistant Professor
 McGill University
 Department of Biology
laura.pollock@mcgill.ca