ERIK AMÉZQUITA

Topological Data Analysis (TDA) and shape quantification meet plant biology

🎓 CAREER AND EDUCATION

present
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2023

Preparing Future Faculty for Inclusive Excellence Postdoctoral Fellow
University of Missouri   📍 Columbia, MO

· Division of Plant Science & Technology (80%)
· Department of Mathematics (20%)

2023
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2018

PhD, Computational Mathematics, Science & Engineering
Michigan State University   📍 East Lansing, MI

· Advisors: Elizabeth Munch and Dan Chitwood
· Defended: March 2023
· Dissertation: Exploring the Mathematical Shape of Plants

2018
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2013

Lic. Mathematics (B.S.)
Universidad de Guanajuato   📍 Guanajuato, Gto.

· Advisor: Antonio Rieser (CONACYT-CIMAT)
· Defended: May 2018
· Thesis: Efficient Object Classification using the Euler Characteristic

📖 PEER–REVIEWED WORK

2024

Decoding the coiling patterns of *Cuscuta campestris* with automated image processing
M. Bentelspacher, **E.J. Amézquita**, S. Adhikari, J. Barros, S.Y. Park
· *Plant Cell Reports*. Accepted. Preprint DOI: 10.1101/10.1101/2024.02.29.582789

2024

Allometry and volumes in a nutshell: Analyzing walnut morphology using three–dimensional X–ray computed tomography
E.J. Amézquita, M.Y. Quigley, P.J. Brown, E. Munch, D.H. Chitwood
· *The Plant Phenome Journal* 7: e20095. DOI: 10.1002/ppj2.20095

2023

Genomics data analysis via spectral shape and topology
E.J. Amézquita, F. Nasrin, K.M. Storey, M. Yoshizawa
· *PLoS ONE* 18(4): 30284820. DOI: 10.1371/journal.pone.0284820

2023

A critical analysis of plant science literature reveals ongoing inequities
R.A. Marks, **E.J. Amézquita**, S. Percival, A. Rougon-Cardoso, C. Chibici-Revneanu, S.M. Tebele, J.M. Farrant, R. VanBuren, D.H. Chitwood
· *PNAS* 120(10): e2217564120. DOI: 10.1073/pnas.2217564120

2023

The shape of aroma: measuring and modeling citrus oil gland distribution
E.J. Amézquita, M.Y. Quigley, T. Ophelders, D. Seymour, E. Munch, D. H. Chitwood
· *Plants, People, Planet* 5(5): 698-711. DOI: 10.1002/ppp3.10333

View this CV online at
ejamezquita.github.io/cv

CONTACT

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⭕ ejamezquita
in erik-amezquita

SKILLS

Programming: Python, R, C/C++, bash/unix

Technologies: $\LaTeX$, RMarkdown, jupyter, vim, html/css

Languages: Spanish (native), English (fluent), French (elementary)

Made with the R package pagedown.

Last updated on 2024-10-02.

2022 ● **Teaching Tools in Plant Biology. Plants and Python, Coding from Scratch in the Plant Sciences**
R. VanBuren, A. Rougon-Cardoso, **E.J. Amézquita**, E. Coss-Navarrete, A. Espinosa-Jaime, O. Gonzalez-Iturbe, A. Luckie-Duque, E. Mendoza-Galindo, J. Pardo, G. Rodríguez-Guerrero, P. Rosiles-Loeza, M. Vásquez-Cruz, S. Fernandez-Valverde, T. Hernandez-Hernandez, S. Palande, and D.H. Chitwood

- *The Plant Cell* 34(7): e1. DOI: 10.1093/plcell/koac187

2021 ● **Measuring hidden phenotype: Quantifying the shape of barley seeds using the Euler Characteristic Transform**
E.J. Amézquita, M.Y. Quigley, T. Ophelders, J.B. Landis, D. Koenig, E. Munch, D. H. Chitwood

- *in Silico Plants* 4(1): diab033. DOI: 10.1093/insilicoplants/diab033

2020 ● **The shape of things to come: Topological data analysis and biology, from molecules to organisms**
E.J. Amézquita, M.Y. Quigley, T. Ophelders, E. Munch, D.H. Chitwood

- *Developmental Dynamics* 249(7): 816-833. DOI: 10.1002/dvdy.175

📖 WORK UNDER REVIEW

2024 ● **Tabula Glycine: The whole-soybean single-cell resolution transcriptome atlas**
S.A. Cervantes-Pérez, S. Thibivilliers, S. Amini, J.M. Pelletier, I. Meyer, H. Xu, S. Tennant, P. Ma, C. Sprueil, A.D. Farmer, J.E. Coate, H. Nelissen, Q. Yao, O. Martin, **E.J. Amézquita**, R.B. Goldberg, J.J. Harada, M. Libault

2024 ● **From hand measurements to high throughput phenotyping: understanding maize canopy structure and predicting yield**
Z. Ji, **E.J. Amézquita**, L. Newton, D.H. Chitwood, A.M. Thompson

👓 STUDENTS MENTORED

present | 2024 ● **Searcy Thomas and Jake Parmentier (Undergraduate)**
TDA to model spatial cell distributions. Dept. of Mathematics. Univ. of Missouri

present | 2024 ● **Ethan Lenhardt (Undergraduate)**
Mathematical network analysis of academic collaboration. Dept. of Mathematics. Univ. of Missouri.

🖥 TEACHING EXPERIENCE

2021 ● **At other institutions**
TA for Code In Place. Stanford University. Remote. Summer 2021

2019 ● **At Michigan State University**
TA for CMSE 201: Computational Modelling and Data Analysis I. Fall 2019

2016 | 2018 ● **At CIMAT/Universidad de Guanajuato**
TA for Precalculus and analytic geometry. Spring 2018
TA for Topology I (Intro to point-set topology). Fall 2017
TA for 14th Calculus Problem-solving Workshop. Summer 2017
TA for Introduction to C++ and data structures (Online). Summer 2017
TA for Introduction to probability. Fall 2016

🎤 INVITED AND RECENT TALKS

2024 ● **Topological Data Analysis to characterize transcriptomic spatial distributions**
SIAM-CSS24. SIAM Central States Section. Kansas City, MO

2024 • Characterizing spatial patterns and distributions with Topological Data Analysis (TDA)
NAPPN AI/ML Affinity Group. North American Plant Phenotyping Network. Virtual

2024 • The early dodder gets the host
MW-ASPB 2024. ASPB Midwest Section. West Lafayette, IN

2023 • The wal(nut)zing nutcracker: linking morphological and commercial traits in walnuts
IPG Plant Talks. Interdisciplinary Plant Group. University of Missouri. Columbia, MO

2023 • Mapper and the topological shape of genomic analysis
MU-GNU International Symposium in Plant Biotechnology. Bond LSC. Columbia, MO

2023 • A primer on Topological Data Analysis
Geometry and Topology Seminar. Department of Mathematics. University of Missouri. Columbia, MO

2023 • Exploring the mathematical shape of plants
CS Colloquium. Department of Computer Science. Saint Louis University. St. Louis, MO

2023 • When topology meets plant morphology
USTARS 2023. Underrepresented Students in Topology and Algebra Research Symposium, Seattle

2023 • The mathematical shape of plants
Plant Sciences Seminar. Department of Botany and Plant Sciences. University of California, Riverside

2023 • Directional statistics to describe the distribution of citrus oil glands
JMM 2023. Joint Mathematics Meeting. American Mathematical Society. Boston, MA.

2022 • The mathematical shape of plants
Plant Science Seminar. Division of Plant Science and Technology. University of Missouri, Columbia

2022 • Using applied topology in plant science
Stochastic Topology seminar. Max Planck Institute for Mathematics in the Sciences (MiS). Virtual.

2022 • TDA to harness plant morphology
Multicellular dynamics seminar. Max Planck Institute for Plant Breeding Research (MPIPZ). Virtual

2022 • Using the Euler characteristic to quantify the shape of barley seeds
OU Topology and Data Science Seminar. Department of Math. University of Oklahoma. Virtual

2022 • Bridging applied topology and plant biology
JMM 2022. Joint Mathematics Meeting. American Mathematical Society

2022 • Measuring the shape of plants with the Euler Characteristic Transform
UFTDA 2022. University of Florida Topological Data Analysis Conference. Gainesville, FL

2021 • Analyzing maize leaf angles and modeling leaf curvature
2021 NAPPN. North American Plant Phenotyping Network. Virtual

2018 • TDA to bridge mathematics and archaeology
16th School on Probability and Statistics. CIMAT. Guanajuato. Gto.

2017 • Efficient object classification using the Euler characteristic
II Coloquio de Desarrollo Tecnológico al Servicio del Patrimonio Cultural. Guanajuato. Gto.

🔧 WORKSHOPS LEAD

2022 The shape of things: Measuring the shape of plants with Topological Data Analysis
2022 NAPPN. North American Plant Phenotyping Network. Athens, GA. Check material.

2021 Using the Euler characteristic to quantify the shape in biology
2021 AATRN Tutorial-a-thon. Applied Algebraic Topology Research Network. Watch video.

2021 Measuring the shape of plants with Topological Data Analysis
2021 NAPPN. North American Plant Phenotyping Network. Check material.

⚡ SELECT FLASH TALKS (WITH POSTERS)

2024 Topological Data Analysis to characterize transcriptomic spatial distributions
CAFNR Research Symposium. College of Ag., Food, and Nat. Resources. University of Missouri

2024 The shape and size of shells, kernels, and cracks, in a nutshell
NAPPN 2024. North American Plant Phenotyping Network. West Lafayette, IN

2023 Modeling the shape of citrus and their oil gland distribution
NAPPN 2023. North American Plant Phenotyping Network. St. Louis, MO

2022 Using topology to analyze the shape of plants
IPPS2022. International Plant Phenotyping Symposium. Wageningen, The Netherlands

2020 Quantifying barley morphology
TDA@NeurIPS. Neural Information Processing Systems. Online.

2020 Using Euler Characteristic Curves to model barley shape
YRF@SoCG. Young Researcher Forum @ CG Week, Symposium on Computational Geometry. Virtual

💡 SELECT WORKSHOPS AND HACKATHONS ATTENDED

2023 Graduate Wellness and Mental Health Ambassador Program.
The Graduate School. Michigan State University, East Lansing, MI

2022 NatSci Cultural Competency. Workshop Semester Series
DEI Office. College of Natural Science. Michigan State University. East Lansing, MI

2022 Beyond Abstract Measures: geometry and computation
Organized by the Lorentz Center, Leiden, The Netherlands

2021 Datathon4Justice
D4J@QSIDE. Institute for Quantitative Study of Inclusion, Diversity, and Equity. Virtual

2021 Immersive Visualization Institute
IVI2021. Abrams Planetarium, MSU Libraries, and MSU Museum. East Lansing. MI

2021 MSU Dialogues: Race. Semester I
Office for Institutional Diversity and Inclusion. Michigan State University. Virtual

2019 Applied Mathematical Modeling with Topological Techniques.
ICERM. Institute for Computational and Experimental Research in Mathematics. Providence, RI

OUTREACH

2023 — If life gives you lemons, analyze the shape of their aroma
Science on Tap. International Tap House. Columbia, MO

2023 — Un matemático y un botánico van por una limonada
¡Science on Wheels en Español! SACNAS Mizzou. Columbia, MO

2023 — Mental Health in Mathematics and Computer Science
Panel organizer and moderator. SGI23. Massachussets Institute of Technology. Virtual

2022 — Webinar de Solicitudes al Doctorado en Estados Unidos
Panelist. Organized by the Coloquio de Exestudiantes CIMAT/DEMAT. Virtual

2022 — Mental Health in Mathematics and Computer Science
Panel organizer and moderator. SGI22. Massachussets Institute of Technology. Virtual

2021 — A topologist and a plant biologist go for a newly shaped beer
Hispanics in STEM celebration. WaMPS. Michigan State University. East Lansing, MI

2021 — Demeter y Euler van por una cerveza
Seminario Junior de Estudiantes. Departamento de Matemáticas. Universidad de Guanajuato. Virtual.

2020 — Cuantificando la forma de la cebada con ATD
Seminario de Matemáticas y Estadística. Instituto Politécnico Nacional. Virtual

2020 — Using topology to quantify the shape of barley
Summer Math Academy. Math Department. University of Toronto. Virtual

2020 — Wrangling and Presenting Data with Pandas and Seaborn in Python
Social Science Data Analytics Initiative. Michigan State University. Virtual

2020 — Narrating our data with RMarkdown
Social Science Data Analytics Initiative. Michigan State University. Virtual

2018 — La maldición de la dimensión y aprendizaje de máquina
Ciencia es Cultura. Dirección de Extensión Cultural. UGto. San Luis, Gto.

2017 — Un matemático y un psicólogo se hallan en Hanoi
Ciencia es Cultura. Dirección de Extensión Cultural. UGto. Guanajuato, Gto.

2016 — Infinitos grandes e infinitos pequeños
Ciencia es Cultura. Dirección de Extensión Cultural. UGto. San Miguel Allende, Gto.

SELECT SERVICE

present | 2023 — Mentor for BIPS: Bioinformatics in Plant Science
Division of Plant Science and Technology. University of Missouri
· Lead weekly workshops on good coding practices. Geared toward plant science undergraduate students.

2024 — Faculty Search Committee (Data Science Instructor)
Division of Plant Science and Technology. University of Missouri

2023
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2021

Mentor for SGI REU: Summer Geometry Initiative
Geometric Data Processing Group. Massachussets Institute of Technology. Remote

· General technical support. Organized panels on Mental Health for the 2022 and 2023 editions.

2023
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2022

CMSE Chair Search Committee
Department of Computational Mathematics, Science, and Engineering. Michigan State University.

2022

Mentor for the ACRES REU: Advanced Computational Research Experience
Institute for Cyber-enabled Research. Michigan State University.

· Conducted weekly professional development workshops, such as CV and academic poster design.

2022
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2021

President of the CMSE Graduate Student Organization
Council of Graduate Students. Michigan State University

· Lead department-wide events, committees, and inquiries to attend graduate students' needs

2017
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2016

Student Representative
College of Natural and Exact Sciences Council. Universidad de Guanajuato.

· Logged each session minutes, such as budget or policy, and shared them with the math students.

2016
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2015

High School Mathematics Seminar Co-Organizer
Escuela de Nivel Medio Superior, Guanajuato. Guanajuato.

· Organized lectures on college-level math topics, such as combinatorics or group theory.

⚜ SELECT AND RECENT AWARDS

2024

Travel Grant (US$250)
SIAM-CSS24. SIAM Central States Section. Kansas City, MO.

2024

Travel Grant (US$650)
SIAM-MDS24. Early Career Award. SIAM-Mathematics of Data Science. Atlanta, GA

2024

Travel Grant (US$350)
MW-ASPB 2024. ASPB Midwest Section. West Lafayette, IN

2024

Best Flash Talk (1st place out of 52 talks)
2024 NAPPN. North American Plant Phenotyping Network. West Lafayette, IN

2023

Distinguished Graduate Student. Travel Grant (US$700)
USTARS 2023. Underrepresented Students in Topology and Algebra Research Symposium.

2022

Best Poster Award. 3rd place out of 173 posters.
IPPS2022. International Plant Phenotyping Symposium. Wageningen, The Netherlands

2022

Travel Grant (EUR 2000)
IPPS2022. International Plant Phenotyping Symposium. Wageningen, The Netherlands

2022

Fitch H. Beach Award (2nd place)
College of Engineering. Michigan State University. Most outstanding graduate research.

2022

Travel Grant (US$800)
2022 NAPPN. North American Plant Phenotyping Network. Athens, GA

2019 ● **Travel Grant (US$800)**
Applied Mathematical Modeling with Topological Techniques. ICERM. Providence, RI

2019 ● **IMPACTS Fellowship**
Awarded jointly by Michigan State University and the NRT-NSF program (NSF DGE-1828149).

2018 ● **Sotero Prieto Medal**
Sociedad Mexicana de Matemáticas. Best undergrad math thesis produced in Mexico

2018 ● **Francisco Aranda Ordaz Award (3rd place)**
Asociación Mexicana de Estadística. Best undergrad statistics thesis produced in Mexico.

2018 ● **Raymond P. and Marie M. Ginther Graduate Fellowship**
Awarded by CMSE to outstanding incoming graduate students.

2018
|
2013 ● **CIMAT Academic Excellence Scholarship**
Merit-based scholarship for math undergraduates.

2017 ● **Best Undergraduate Mathematics, Physics and Earth Sciences Research Project (3rd place).**
4to Congreso Interinstitucional de Jóvenes Investigadores.

2017 ● **Best Undergraduate Engineering Research Project (1st place)**
5to Encuentro de Jóvenes Investigadores. Universidad de Guanajuato.