ERIK AMÉZQUITA

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

🎓 CAREER AND EDUCATION

present | 2023

PFFIE Postdoctoral Future Faculty Fellow
University of Missouri 📍 Columbia, MO

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

2023 | 2018

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

· Advisors: Elizabeth Munch and Dan Chitwood
· Defended: March 2023

2018 | 2013

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

· Advisor: Antonio Rieser (CONACYT-CIMAT)
· Defended: May 2018

📖 PEER–REVIEWED WORK

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

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

CONTACT

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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 2024-08-16.

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

· *Submitted*

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

· *Submitted*

2024

Decoding the coiling patterns of *Cuscuta campestris* with automated image processing

M. Bentelspacher, E.J. Amézquita, S. Adhikari, J. Barros, S.Y. Park

· *Submitted*. Preprint available. DOI: [10.1101/10.1101/2024.02.29.582789](10.1101/10.1101/2024.02.29.582789)

👨‍🏫 TEACHING AND MENTORING EXPERIENCE

2023 | present

At University of Missouri

· Undegraduate research mentor for Ethan Lenhardt. Mathematical network analysis of academic collaboration. Department of Mathematics. Spring 2024 - present.
· Undegraduate research mentor for Gibson Tschappler. Topological Data Analysis of spatial data. Division of Plant Science & Technology. Summer 2024.
· Mentor for BIPS. Lead weekly professional development workshops. Fall 2023 - present.

Leading projects at the intersection of mathematics, computer science, and plant biology

2022 | 2019

At Michigan State University

· Mentor for the ACRES REU. Conducted weekly professional development workshops. Summer 2022.
· TA for CMSE 201: Computational Modelling and Data Analysis I. Fall 2019

Audience was mainly undergraduate students with no prior coding experience

2018 | 2016

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

Some courses involved leading tutorials on C++ or R

2023 | 2021 **At other institutions**
· Mentor for SGI 2023. Summer Geometry Initiative REU. Massachusetts Institute of Technology.
· Mentor for SGI 2022. Summer Geometry Initiative REU. Massachusetts Institute of Technology.
· Mentor for SGI 2021. Summer Geometry Institute REU. Massachusetts Institute of Technology.
· TA fo Code In Place. Stanford University.

All of the above were conducted virtually

🎤 INVITED TALKS

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

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 **Measuring the shape of plants and nuts using topological data analysis**
JMM 2023. Joint Mathematics Meeting. American Mathematical Society. Boston, MA.

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

👤+ 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

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

2022 | 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 | 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 | 2015 High School Mathematics Seminar Co-Organizer
Escuela de Nivel Medio Superior, Guanajuato. Guanajuato.
· Delivered lectures on college-level math topics, such as combinatorics or group theory.

🏅 AWARDS

2024 Travel Grant (US$650)
SIAM-MDS24. Early Career Award. 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
College of Engineering. Michigan State University

· 2nd place. Most outstanding graduate research within the College of Engineering.

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 during the 2017-18 academic year.

2018 ● Francisco Aranda Ordaz Award
Asociación Mexicana de Estadística

· 3rd place. Best undergrad statistics theses produced in Mexico during the 2016-18 academic years.

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

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

2017 ● Best Undergraduate Mathematics, Physics and Earth Sciences Innovation Research Project.
4to Congreso Interinstitucional de Jóvenes Investigadores. 3rd Place. Nationwide event.

2017 ● Best Undergraduate Engineering Research Project
5to Encuentro de Jóvenes Investigadores. 1st Place. Statewide event