

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 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

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](#)



View this CV online at
[ejamezquita.github.io/cv](#)

CONTACT

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in [erik-amezquita](#)

SKILLS

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

Technologies: *L^AT_EX*,
RMarkdown, jupyter, vim,
html/css

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

Made with the R package
[pagedown](#).

Last updated on 2024-08-21.

- 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](https://doi.org/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](https://doi.org/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](https://doi.org/10.1101/10.1101/2024.02.29.582789)



STUDENTS MENTORED

- 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 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](#). Massachusetts 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](#). Massachusetts 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

- 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.
- 2023 | 2021 ● **Mentor for [SGI](#) REU: Summer Geometry Initiative**
Geometric Data Processing Group. Massachusetts Institute of Technology. Remote
• General technical support. Organized panels on Mental Health for the 2022 and 2023 editions.
- 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 | 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.
• Organized 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 (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.