

# Cashous W. Bortner

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## EMPLOYMENT

Assistant Professor of Mathematics  
California State University, Stanislaus

August 2022 - Present

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## RESEARCH INTERESTS

Algebraic, combinatoric, and graph theoretic approaches to problems in biological and physical systems; parameter identifiability; algebraic statistics.

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## EDUCATION

Ph.D. in Mathematics, North Carolina State University

May 2022

Thesis: “Identifiability Analysis of Two Families of ODE Models” advised by Seth Sullivant

M.S. in Mathematics, North Carolina State University

May 2019

B.S. in Mathematics, University of Nebraska-Lincoln

May 2017

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## PUBLICATIONS

1. **Bortner, C.** & Meshkat, N. Graph-Based Sufficient Conditions for the Indistinguishability of Linear Compartmental Models. *SIAM Journal on Applied Dynamical Systems* **23**, 2179–2207. <https://doi.org/10.1137/23M1614663> (2024).
2. **Bortner, C.**, Gross, E., Meshkat, N., Shiu, A. & Sullivant, S. Identifiability of Linear Compartmental Tree Models and a General Formula for the Input-Output Equations. *Advances in Applied Mathematics* **146**. <https://doi.org/10.1016/j.aam.2023.102490> (May 2023).
3. **Bortner, C.** & Sullivant, S. Structural Identifiability of Series-Parallel LCR Systems. *Journal of Symbolic Computation*. **112**, 79–104. <https://doi.org/10.1016/j.jsc.2022.01.002> (Sept. 2022).
4. **Bortner, C.** & Meshkat, N. Identifiable Paths and Cycles in Linear Compartmental Models. *Bulletin of Mathematical Biology*. **84**, 53. <https://doi.org/10.1007/s11538-022-01007-5> (Mar. 2022).
5. Bernstein, P., **Bortner, C.**, Coskey, S., Li, S. & Simpson, C. The Set Splittability Problem. *The Australasian Journal of Combinatorics* **75**, 190–209. [https://ajc.maths.uq.edu.au/pdf/75/ajc\\_v75\\_p190.pdf](https://ajc.maths.uq.edu.au/pdf/75/ajc_v75_p190.pdf) (Oct. 2019).

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## IN PREPARATION

1. **Bortner, C.**, Campos, P., De Silva, J. & Venable, J. Maximum Stars in the Corona of Ladder Graphs. (Expected Submission Fall 2024)
2. **Bortner, C.**, Garbett, J., Gross, E., Krawzik, N., McClain, C., & Young, D. The Maximum Likelihood Degree of  $\beta$ -Stochastic Blockmodels. (Expected Submission Fall 2024)
3. **Bortner, C.**, Gilliana, J., Patel, D., & Tamras, Z. Graph Theoretic Proofs of Linear Compartmental Model Indistinguishability. (Expected Submission Fall 2024)

## UNDERGRADUATE RESEARCH ADVISOR

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**Global Identifiability Testing of Linear Compartmental Tree Models** Fall 2024-Present  
California State University, Stanislaus  
Tana Randolph (Mathematics) and Omar Rios Cruz (Computer Science)

**Indistinguishability of Skeletal Path Linear Compartmental Models Using Graphs** Spring 2024 - Present  
California State University, Stanislaus  
John Gilliana (Mathematics/Economics), Dev Patel (Mathematics), and Zaia Tamras (Mathematics)  
Outcomes: The project resulted in an article in progress that we plan to submit for publication in an undergraduate research journal soon.

**Indistinguishability of Linear Compartmental Cycle Models** Fall 2023  
California State University, Stanislaus  
Dev Patel (Mathematics) and Jennifer Ayson (Mathematics)

**Erdős-Ko-Rado Theorem on Graphs** Spring 2023 - Present  
California State University, Stanislaus  
Co-Advised with Jessica De Silva (CSU Stanislaus)  
Paola Campos (Mathematics) and Jeffrey Venable (Mathematics)  
Outcomes: This project resulted in one poster presentation given by both students at the 2024 Joint Mathematics Meetings, as well as a poster presentation given by Paola Campos at the Nebraska Conference for Undergraduate Women in Mathematics Conference. We also have an article in progress that we plan to submit for publication in an undergraduate research journal soon.

## INVITED PRESENTATIONS

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**The Maximum Likelihood Degree of  $\beta$ -Stochastic Block Models** January 8-11, 2025  
AMS Joint Mathematics Meeting  
Seattle, Washington

**Identifiability of Linear Compartmental Models Using Graphs** September 14-15, 2024  
University of Texas, San Antonio  
AMS Central Sectional Meeting

**Identifiability of Linear Compartmental Models** July 20-22, 2024  
North Carolina State University  
Workshop on Differential Algebra and Modeling

**Graph-Theoretic Conditions for Identifiability of Linear Compartmental Tree Models** May 4-5, 2024  
San Francisco State University  
AMS Western Sectional Meeting

**Graph-Based Sufficient Conditions for Indistinguishability of Linear Compartmental Models** (prepared but cancelled) January 3-6, 2024  
San Francisco, CA  
AMS Joint Mathematics Meeting

**Graph-Based Sufficient Conditions for Indistinguishability of Linear Compartmental Models** October 7-8, 2023  
Creighton University  
AMS Central Sectional Meeting

**Structural Identifiability of Series-Parallel LCR Systems** July 10-14, 2023  
SIAM Conference on Applied Algebraic Geometry Eindhoven University of Technology (virt.), Netherlands

## Identifiable Linear Compartmental Tree Models

Differential Algebra and Related Topics XI

June 5-9, 2023

Queen Mary University London, United Kingdom

## Identifiable Linear Compartmental Tree Models

Algebraic Statistics 2022

May 16-20, 2022

University of Hawai'i at Manoa

## COLLOQUIA AND NON-RESEARCH PRESENTATIONS

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### The Complementary Functions of Instructors and Career and Professional Development Centers in Colleges

California College Personnel Association (CCPA)'s 2024 Fall Institute

October 26, 2024

Merced, CA

### Using Math and Trees to Solve Problems from Biology

Algebra-Geometry-Combinatorics Seminar

October 16, 2024

San Francisco State University

### Using Math and Trees to Solve Problems from Biology

M\*A\*T\*H Colloquium

September 4, 2024

Sonoma State University

### The Complementary Functions of Instructors and Career and Professional Development Centers in Colleges

All-Faculty Convocation State Center Community College District

August 7, 2024

Fresno, CA

### Using Math and Trees to Solve Problems from Biology

Department of Operations Research Colloquium

May 28, 2024

Naval Postgraduate School

### Using Math and Trees to Solve Problems from Biology

Math Department Colloquium

April 11, 2024

California State University, East Bay

### Using Math and Trees to Solve Problems from Biology

MATH Matters Speakers Series

February 2, 2024

Bakersfield College

### Using Math and Trees to Solve Problems from Biology

Math Department Colloquium

April 21, 2023

California State University, Long Beach (virt.)

### Using Math and Trees to Solve Problems from Biology

Math Department Colloquium

April 14, 2023

Morehead State University (virt.)

### Using Math and Trees to Solve Problems from Biology

Math and Computer Science Department Colloquium

October 11, 2022

Santa Clara University

### Using Math and Trees to Solve Problems from Biology

The Speaker Series for the Quantitatively Curious

September 23, 2022

California State University, Stanislaus

## ORGANIZING AND FACILITATING

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### Career and Professional Development Faculty Learning Community

Fall 2024

A Faculty Learning Community (FLC) related to career and professional development (supported by the University) to facilitate curricular innovation and a connection of faculty, students, and their coursework.

### New Faculty Orientation

August 14-15, 2024

A two-day workshop introducing new faculty to campus resources and requirements, along with information on inclusive pedagogical techniques.

## **How to Find Success In College English/Math/Science**

July 24-26, 2024

Three, 1.5 hour presentations on being successful in collegiate mathematics through the Health Careers Opportunity Pipeline Program with approximately 40 high school and community college students interested in pursuing health-related careers.

## **Strategies for Student Engagement in the College of Science:**

May 9, 2024

### **An Open Exchange of Ideas**

Faculty development workshop funded by the Faculty Development Committee aimed at bringing together faculty to discuss inclusive strategies to increase student engagement in the classroom.

## **Career and Professional Development Faculty Learning Community**

Spring 2024

A Faculty Learning Community (FLC) related to career and professional development (supported by the University) to facilitate curricular innovation and a connection of faculty, students, and their coursework.

## **Algebraic Approaches to Mathematical Biology**

January 3-6, 2024

An American Mathematical Society Special Session at the Joint Mathematics Meetings with invited speakers from across the country who specialize in applications of algebra and combinatorics to problems in biology.

## **Stan State Summer Research Week**

November 27 - December 1, 2023

Co-facilitated presentations including information about summer research programs and the application process as well as guided Q&A sessions with five undergraduate students discussing their summer research programs.

## **The Speaker Series for the Quantitatively Curious**

Fall 2023 - Present

Co-facilitated biweekly presentations including faculty, members of the community, and students discussing the use of mathematics in their respective disciplines.

## **WORKSHOPS AND TRAININGS**

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### **CSUBIOTECH Planning Meeting**

August 5, 2024

Faculty Consensus Group Representative

Sacramento State University

### **Gallo Future Leaders Symposium**

May 15, 2024

E. & J. Gallo Winery

Modesto, CA

### **Transforming Student Experience & Success in Gateway STEM Courses**

Spring 2024

Faculty Learning Community with weekly meetings

California State University, Stanislaus

### **CSU Symposium on Wellbeing-Informed Teaching**

March 15, 2024

California State University Chancellor's Office

Virtual

### **Faculty Successful Grant Writing and Hands-on Workshop**

October 16-17, 2023

CSUBIOTECH

California State University, Stanislaus

### **Transforming Hispanic Serving Institutions Workshop**

October 13, 2023

Warrior Cross Cultural Center

California State University, Stanislaus

### **Research Experience for Undergraduate Faculty (REUF) Workshop**

August 7-11, 2023

Institute for Computational and Experimental Research in Mathematics (ICERM)

Brown University

### **CSUBIOTECH Planning Meeting**

July 31, 2023

Faculty Consensus Group Representative

California State University, Long Beach

**Social Justice in the Math Classroom - Putting Theory into Practice** July 15, 17, 19, 21, 2023  
Central California Math Project Summer Institute California State University, Stanislaus

**CSU Student Success Dashboard Workshop** April 26, 2023  
Faculty Center for Excellence in Teaching and Learning California State University, Stanislaus (virt.)

**Critical Issues in Mathematical Education: Mentoring for Equity Workshop** March 22-24, 2023  
Simons Laufer Mathematical Sciences Institute (formerly MSRI) Berkeley, CA

**Becoming More Than the Sum of Our Parts Conference** March 16-17, 2023  
STEM-NET California State Polytechnic University, Pomona

**Measures of Teaching Effectiveness Workshop** October 27, 2022  
Faculty Center for Excellence in Teaching and Learning California State University, Stanislaus

**S-STEM Grant Planning Meeting** October 11-12, 2022  
Funded grant planning meeting California State University, Stanislaus

**Using Inquiry to Teach Mathematics and Thinking** September 29, 2022  
Mathematical Association of America Workshop Virtual

**MathFest/Project NExT Workshops** August, 2022

- Active Learning with Active Calculus Mini-course (4 hours) Philadelphia, PA
- Teaching with Inquiry: Growing our Practice Together
- How to Create Safe and Community Responsive Outreach Programs
- Teaching and Leading Towards Institutional Change
- Making Teaching Matter More: Active-learning Strategies and Barriers to Implementation
- Townhall on Latinx Mathematicians
- The Role of Culturally Relevant Pedagogy and Identity Development in the Teaching and Learning of Math

## MENTORSHIP AND ADVISING

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**Robert Noyce Teaching Scholarship Program** Fall 2023-Present  
Mentoring two pre-service K-12 teachers with biweekly meetings discussing organization and class preparation, pedagogical philosophy, and the credential program.

**Cal-Bridge** Fall 2023-Present  
Co-mentoring one Cal-Bridge student with Dr. Subir Ghosh (UC Riverside) with biweekly meetings discussing course selection, summer research experiences, and graduate school applications.

**Math Club Faculty Advisor** Fall 2023-Present  
Co-advising the California State University, Stanislaus Math Club.

**Math Major Advisor** Fall 2023-Present  
Advising California State University, Stanislaus math majors in course work and career preparation every semester (roughly 11-12 students per semester).

**New Student Orientation** July 2023  
Orientation advisor for four sessions of new student orientation, helping students choose classes and welcoming them to the university and the department.

## Faculty Mentor Program

Fall 2022-Present

Mentoring first generation undergraduate students from a variety of majors. Through this program I have had four mentees so far.

## GRANTS AND FUNDING

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### American Institute of Mathematics SQuaREs/REUF Continuation Grant 2024 Summer 2024

Title: *Maximum Likelihood Degrees of Stochastic Block Models*

Overview: Our research team of six faculty from different, mostly primarily undergraduate institutions received full funding to spend one week at the American Institute of Mathematics (AIM) in Pasadena, California to work on a project that started at the 2023 Research Experience for Undergraduate Faculty (REUF) at the Institute for Computational and Experimental Research in Mathematics (ICERM).

Budget:  $\approx$ \$12,000

### CSU Stanislaus Faculty Development Committee Workshop Proposal

Spring 2024

Title: *Strategies for Student Engagement in the COS: An Open Exchange of Ideas*

Overview: In this round table discussion-style workshop, we discussed strategies for student engagement in STEM-related fields, including topics such as active learning, alternative grading and assessment strategies.

Budget: \$1,250

### CSU Stanislaus Research, Scholarship, and Creative Activity Grant

June 2024-June 2025

Title: *Standards-Based Grading Assessment Generating Application*

Overview: This internal research, scholarship, and creative activity grant is supporting PI Bortner's efforts to develop a web-based, artificial intelligence integrated application to generate exams using the Standards-Based Grading assessment technique. Support for this project comes in the form of 3 units of course release in the Fall 2024 semester, as well as the hiring of a software developer as a special consultant.

Budget: \$10,000

### CSU LSAMP Undergraduate Research Assistant Funding

Fall 2023

Title: *Indistinguishability of Linear Compartmental Cycle Models*

Overview: Funded by the Louis Stokes Alliance for Minority Participation (LSAMP), this funding allowed one student to be paid for participating in a research project related to the indistinguishability of linear compartmental models.

Budget: \$1,800

### CSU Stanislaus College of Science Faculty Development Travel Grant

- Fall 2023 - Joint Mathematics Meetings, 2024 \$2,000
- Spring 2023 - Simons Laufer Mathematical Sciences Institute Critical Issues in Math Education, \$995
- Fall 2022 - Joint Mathematics Meetings 2023, \$2,000

## FELLOWSHIPS

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### Career and Professional Development Center Faculty Fellow

Fall 2023-Present

Faculty Fellowship with the Stanislaus State Career and Professional Development Center (CPDC) consulting with the Executive Director of the CPDC to develop an annual work plan that meets institutional needs, takes advantage of individual faculty strengths and interests, and sustains a manageable workload given the level of assigned time allotted to the position. Also, advising students for four hours per week on career readiness with an emphasis on graduate school.



**CSUBIOTECH Faculty Consensus Group Representative** Summer 2023-Present  
One of four Stanislaus State CSUBIOTECH Faculty Consensus group representatives serving as a point-of-contact and mentor for campus grant applications, a reviewer for CSUBIOTECH grants and awards, committee member for program activities, and advisor on program priorities, policy, and governance.

**California State University, Stanislaus Grant Writing Cohort** Spring 2023-Fall 2023  
Weekly professional development meetings focused on all phases of grant application and implementation, with the ultimate goal of submitting an external grant application.

**Mathematics Faculty Fellow: Catalyzing Ideas for the San Joaquin Valley: Innovating Mathematics and Chemistry Curriculum** 2022-2023  
Biweekly meetings focused on improving course outcomes in lower-division chemistry courses.

**Mathematical Association of America Project NExT Fellow** 2022-2023  
Professional development program for new or recent Ph.D.s in the mathematical sciences addressing all aspects of an academic career: improving the teaching and learning of mathematics, engaging in research and scholarship, finding exciting and interesting service opportunities, and participating in professional activities. The program also provides the participants with a network of peers and mentors as they assume these responsibilities.

## PROFESSIONAL MEMBERSHIPS

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- American Mathematical Society (AMS), 2022-Present
- Mathematical Association of America (MAA), 2019-Present
- Society for Industrial and Applied Mathematics (SIAM), 2019-Present

## REVIEWING AND JUDGING

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- CSUBIOTECH 2025 Symposium Undergraduate Poster Abstract Reviewer
- Stanislaus State ASPIRE Hackathon Judge, April 26-28, 2024
- Stanislaus State 38th Annual Undergraduate Research Competition Judge, March 8, 2024
- CSUBIOTECH 2024 Presidents' Commission Scholars Program Reviewer
- 2022 & 2023 CSU Mathematics Conference Session Reviewer
- Reviewer for *Mathematics* Journal

## TEACHING EXPERIENCE (CALIFORNIA STATE UNIVERSITY, STANISLAUS)

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MATH 3400: Set Theory and Logic	Fall 2024 (21 students)
MATH 1422: Calculus II Lab	Fall 2024 (10 students)
MATH 1070: College Algebra	Fall 2024 (33 students)
MATH 4980: Independent Study on Machine Learning with Graphs	Spring 2024 (7 students)
MATH 3600: Theory of Numbers	Spring 2024 (25 students)
MATH 2460: Introduction to Differential Equations	Spring 2024 (27 students)
MATH 3400: Set Theory and Logic	Fall 2023 (19 students)
MATH 3400: Set Theory and Logic	Spring 2023 (21 students)
MATH 2300: Discrete Structures	Spring 2023 (27 students)
MATH 1070: College Algebra	Spring 2023 (33 students)
MATH 1420: Calculus II	Fall 2022 (16 students)
MATH 1410: Calculus I	Fall 2022 (24 students)

## COMMITTEES

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- Faculty Development Committee (co-chair), 2024-Present [University]
- College of Science Curriculum Committee, 2024-Present [College]
- Committee on Committees, 2024-Present [Department]
- Colloquium Committee, 2023-Present [Department]
- Math/SIAM/PME Club Advisor, 2023-Present [Department]
- Math Major Revamp Committee (chair), 2023-Present [Department]
- Major Advising Committee, 2023-Present [Department]
- Graduate Approval Form Committee, 2023-Present [Department]
- Math Competition Planning Committee, 2023-Present [Department]

## ACADEMIC HONORS AND AWARDS

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- Nominated for the Elizabeth Anne B. Papageorge Award, 2023-2024
- North Carolina State University Franke Norris Griggs Award for Service, 2022
- University of Nebraska-Lincoln Chair's Prize for Outstanding Graduating Undergraduate, 2017
- University of Nebraska-Lincoln Parents' Recognition Award for Outstanding Faculty and Staff, 2017