ALUMNI NEWSLETTER

The latest news and updates from the CSUF Mathematics Department

AN AERIAL PHOTO OF MCCARTHY HALL. CIRCA 1970S.

IN THIS ISSUE

Recap: 1st Annual (Virtual) Alumni Night

The COVID-19 pandemic could not stop the Mathematics Department from hosting its 1st Annual (Virtual) Alumni Night on Friday, April 9.

Over 80 alumni, faculty, students, and staff were in attendance. Attendees had the opportunity to learn about student research, college and department updates and changes, and celebrate Alumni Spotlights.

Several Department Chairs came out to speak including Dr. Paul DeLand, Dr. Marty Bonsangue, Dr. Jim Friel, and Dr. Al Agnew.

Attendees even got to see a music video of our very own Dr. Agnew from his band "The Professor and the Madman".

If you were unable to make it out to the event, you can watch a Zoom video recording **here**. We hope you can make it to our next Alumni event in 2022.

Teaching During a Pandemic: How the Department Makes it Work

At the conclusion of the Fall 2020 term, average grades at CSUF rose slightly for undergraduates compared to average grades in the Fall 2019 term. This trend was seen in various groups like first generation, Hispanic, and Pell-eligible students.

Martin "Marty" Bonsangue, mathematics professor at CSUF, and Jennifer Clinkenbeard, assistant professor of mathematics and statistics at CSU, Monterey Bay, surveyed 81 CSUF Mathematics faculty members and 2800 students who attended a math course in Fall 2020 to determine what teaching practices work in an online environment and what should be kept around.

DR. MARTY BONSANGUE

DR. JENNIFER CLINKENBEARD

After reviewing responses, Marty and Jennifer were able to get a clearer understanding as to why students across all demographics categories were succeeding better in online math classes than previously in in-person classes.

They learned that instructors made significant effort into professional development by learning online teaching tools and strategies. Over 60 percent of faculty members attended trainings to prepare them to teach online in the Fall, and over 80 percent reported that they spent more time preparing for their courses than in previous years.

Faculty members also reported that the use of polling, break-out rooms, and synchronous class times was an effective teaching tool for both them and their students with more than 80 percent indicating that they would adopt these tools after pandemic teaching ends. Other things faculty reported to want to keep around include recorded video lessons, virtual office hours, and more frequent assessments.

In turn, students reported that they noticed and appreciated the effort of Mathematics faculty to prepare their classes for online teaching. They reported that they appreciated being able to connect with their professors in an online environment and with their fellow students through online discussion boards. Some students reported feeling more comfortable in virtual platforms which helps to explain why faculty members reported seeing more students in their virtual office hours compared to in-person office hours.

Although the professors do not diminish the challenges involved with online learning and the equity issues for students to have reliable technology or suitable learning environments, their research shows that effective teaching practices and strategies can thwart some of the challenges of remote learning.

Award Winning Research: Statistical Modeling of COVID-19 Data

Mathematics student, Gwendolyn Lind, was selected as a recipient of the 2021 Outstanding Undergraduate Student Scholarly Creative Activities and Research (SCAR) Award from the College of Natural Sciences & Mathematics for her research titled "Statistical modeling for discovery: How movements across counties affect the spread of COVID-19. Her research was was overseen by Mathematics faculty member, Dr. Sam Behseta, and she was assisted in her work by fellow undergraduate students, Caleb Pena and Seth Arreola.

GWENDOLYN LIND WITH COLLEAGUES SETH ARREOLOA, CALEB PENA, AND DR. SAM BEHSETA

In their work, Lind and colleagues demonstrate how statistical modeling can be utilized to capture the patterns of spread of COVID-19 among counties, more specifically focusing on seven SoCal counties. By incorporating original code to extract publicly available mobility data, they created a highly accurate prediction model using a technique called Generalized Linear Auto Regressive Moving Average or GLARMA. Their models also reveal the patterns of the growth of the disease change significantly, from low income to high income counties.

Lind was also selected as one of the finalists from CSUF for the 35th Annual CSU Student Research Competition for her research. The 35th Annual CSU Student Research Competition was hosted virtually by California State University Polytechnic, Pomona. She joined other CSUF students from across the campus who presented video recordings of their rigorous, interesting, and innovative projects that were reviewed by faculty judges.
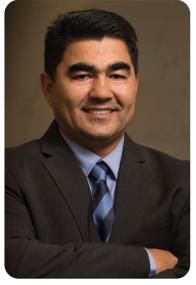

BREANNA MCBEAN '20

Alumni Video Spotlight: Breanna McBean '20

Mathematics alumna, Breanna McBean '20, explains how her undergrad degree in Mathematics and minor in Computer Science has propelled her into the Genetics and Genomics Ph.D. program at Michigan State University. McBean also details what made her decide to switch to a major in Math, the opportunities she was involved in as a student, and gives advice to current students on how to get the most out of their time at CSUF. Play video [here](#).

From CSUF to Uzbekistan: How one Math Professor is Advancing Research

Mathematics Professor, Zair Ibragimov, Ph.D. has been recognized by the American Mathematical Society (AMS) for his efforts to advance mathematical research in his native country of Uzbekistan. Dr. Ibragimov's work with the MathSciNet for Developing Countries, an AMS initiative to reduce global disparities in access to mathematical literature, has led for mathematicians in Uzbekistan to gain access to a vast bibliographic database of mathematical literature.

Dr. Ibragimov has also organized three separate USA-Uzbekistan Conferences on Analysis and Mathematics since 2014, and he has formed collaborations with the Institute of Mathematics in Uzbekistan to create an International Research Experience for Students Program in which American undergraduates have conducted research and published articles in peer-reviewed journals.

DR. ZAIR IBRAGIMOV

Math Professor Awarded $6000 MAA Tensor SUMMA Grant

Mathematics Assistant Professor, Dr. Bridget Druken, recently received a $6000 grant from the Mathematical Association of America (MAA) Tensor SUMMA (Strengthening Underrepresented Minority Mathematics Achievement) Grant Program. The awards are given to projects designed to encourage the pursuit and enjoyment of mathematics by students who are members of groups historically underrepresented in the field of mathematics. These include students who are African-American, Native American, Hispanic, or Pacific Islander.

The grant will support four future K-12 teachers of math in attending monthly workshops facilitated by CSUF math and education faculty, and piloting math tasks online that use technologies and focus on teaching math for social justice with our local community.

DR. BRIDGET DRUKEN

California State University, Fullerton | College of Natural Sciences & Mathematics | Department of Mathematics
Mathematics Summer Research Program

Quotients of Matrix Spaces

Meet the Researchers

Student Researcher
William Terry '20, Applied Mathematics

How has your participation in the program impacted your college studies?

"My research has both used material that I've learned in classes and prepared me to learn new material. I have used linear algebra, group theory, topology, physics, and more, to prove and understand different parts of this project. In doing so, I gained a better understanding of each of these areas, which helped me understand the material in my courses."

What new skills and ideas have you learned.

"Far too many to list, but I'll identify a few. This program has given me more experience in problem solving and pattern recognition, which I've been able to apply in other math classes, classes in general, and beyond. It's also built up my confidence as a mathematician and motivated me to continue working through problems no matter how tough they are. One of the more exciting, but scary, parts of math research is that the questions you're asking don't have answers yet. So it's your job to find the answers and make sure they're correct, which is way different from classwork where the solutions are already known. Solving problems this way has helped me learn the importance of thoroughly checking to make sure everything makes sense."

What are your career and/or graduate school plans?

"Currently, I am attending grad school at UC Riverside, starting my journey to get a PhD in Mathematics. I'm convinced that this was only an option for me because of everything I gained doing research and all the guidance from Dr. Rathbun and Dr. Agnew. I'm not sure yet what I want to do after grad school, but I do know that whatever I do, I want to continue doing research."

Faculty Supervisor
Matthew Rathbun, Ph.D., Associate Professor

Dr. Rathbun's research interests are in low dimensional topology, particularly 3-manifolds, knot theory and applications to DNA topology.

How important is the MSRP program for faculty and students?

"Student research is one of the most important things we do, engaging students in full intellectual exploration, contextualizing and extending what they learn in class, and providing direct mentorship.

Many students discover a true passion for mathematics and decide to pursue graduate degrees after doing research projects with faculty, Without the MSRP, many students would not have the financial freedom to have this experience."

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Mathematics Summer Research Program

Quotients of Matrix Spaces

Research Overview

In mathematics, a quotient is a way of grouping together parts of a space and considering each group as a single point, in much the same way as sorting multi-colored plastic balls from a ball pit into cardboard boxes results in a space where the boxes become the points. In our research, we assign different rules for these groupings and investigate the resulting spaces, which by the previous analogy, one can think of as sorting the balls by color, by age, or by damage level. Specifically, we begin with complex 2x2 matrix space and take quotients by various subgroups, which gives interesting topological results.

Research Objectives

The overall purpose of this research was to understand the quotient spaces themselves and their relation to twistor theory and other physics. In particular, we aimed to apply the processes Dr. Agnew had with the GL(2, C) quotient and the twistor correspondence.

Methodology

We started this project by learning about the GL(2, C) quotient, a known result by Dr. Agnew [1], which detailed the quotient space and its topology. After studying this result, we decided to look at other subgroups and see what their quotients would produce. The special linear, orthogonal, and special orthogonal subgroups over the real and complex numbers are natural and specific choices. These subgroups are well-known and are widely important objects in other areas of mathematics and physics.

We began by choosing a subgroup, which determines the rule with which we define the quotient. Then, we took the quotient and studied the resulting topology. We used both the invertible and non-invertible cases, which gave spaces with interesting behavior.

Results

From the known result that the GL(2, C) quotient gives a sphere with a dense point, we found that the SL(2, C) quotient gives a punctured plane with a sphere at the puncture, the O(2, C) quotient gives a light cone in real Minkowski space with its interior, and the SO(2, C) quotient gives a light cone in real Minkowski space with its interior along with circles attached to each point in the interior. The real cases are similar, with reduced dimensionality. The GL and SL quotients have non-Hausdorff topologies, while the O and SO quotients have Hausdorff topologies. We also found that the GL quotient is compact, the O and SO quotients are metrizable, and each of the quotients is path-connected.

Conclusions

Ultimately, there seems to be an interesting story playing out about how shrinking the subgroup we use in the quotient eventually makes the quotient spaces Hausdorff. We plan to see if there is a connection between the SL(2, C) quotient and twistor theory in a similar way that Dr. Agnew was able to show with the GL(2, C) quotient [1] [2]. We see a strong connection between the O(2, C) quotient and the positive real time- and light-like Minkowski spacetime vectors, which opens the door to relativity, spinors, and twistors. Such a connection could yield a wealth of new perspectives in our understanding of physics and provide new ways of thinking about spacetime since, as far as we know, these quotient spaces are entirely new.

References/Acknowledgements

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DONATE NOW

Donor Spotlight: Cheryl and Carl Carrera

We'd like to recognize alumna Cheryl Carrera '93, '02, and her husband, Carl, whose endowment at CSUF that created the Cheryl and Carl Carrera Mathematics Scholarship has awarded scholarship funds to Mathematics students for almost a decade. Each year a continuing or returning student may apply to the scholarship to win an award of $1000. The funds are awarded to a student who is majoring in mathematics and who also faces unique personal and/or academic challenges.

The criteria for students to win the scholarship was inspired by her own challenges she had to overcome while she was a student at CSUF. Carrera skipped her senior year in high school and started her undergrad at CSUF in 1976. However, she was diagnosed with Hodgkin's disease and had to undergo radiation treatments during her Freshmen year. She faced more challenges as a student including working full-time and raising a family but persevered and received her degree 17 years later. Carrera continued her education and received two graduate degrees, one in education and another in mathematics, as well as a doctorate. After serving 17 years as a professor at Santa Ana College, Carrera is now an emeritus faculty with their Mathematics Department.

Contribute to the Department

There are many different opportunities to support the Mathematics Department and its students. Use the links below to learn more about donating to various funds associated with the Mathematics Department:

- 70302 (Department of Mathematics): To support the greatest needs in the Mathematics Department
- 70303 (DeLand Mathematics Fellowship): To support the DeLand Mathematics Fellowships
- 70314 (Stiel Prize for Excellence in Mathematics Endowment): To support an annual scholarship to an exceptional math student as selected by Mathematics faculty.
- 70340 (Math Scholarship Account): Funds provide scholarships, awards, and gift for scholars in the Math Department.
- 70347 (Mathematical Circle): To support research and testing activities in in Mathematics.
- 70348 (Gerald Gannon Fund): To support a graduate scholarship for a student enrolled in the Master of Arts in Teaching program in the Department of Mathematics.
- 70300 (Project MISS): For discretionary use by Project MISS (Mathematics Intensive Summer Session.

Planned Gifts

Planned and Estate giving provides another avenue for supporting the Department, often with beneficial tax implications. If you're interested in learn more, please visit the CSUF Planned Giving site or reach out to us to have a conversation.