Kassie Archer — Curriculum Vitae

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EDUCATION

Ph.D. in Mathematics, Dartmouth College — 2014
Advisor: Sergi Elizalde
Dissertation: *Permutations realized by signed shifts*

A.M. in Mathematics, Dartmouth College — 2011

B.S. in Mathematics, College of William & Mary — 2009

APPOINTMENTS

Assistant Professor, United States Naval Academy	2023–Present
Associate Professor, University of Texas at Tyler	2021–2023
Assistant Professor, University of Texas at Tyler	2016–2021
Visiting Assistant Professor, University of Texas at Tyler	2015–2016
Adjunct Professor, University of Texas at Tyler	2014–2015
Adjunct Professor, Tyler Junior College	2014–2015

RESEARCH INTERESTS

Enumerative combinatorics; algebraic combinatorics; arithmetical structures; discrete dynamical systems; permutation patterns and their applications

PUBLICATIONS

* indicates an undergraduate student co-author and ** indicates a graduate student co-author.

JOURNAL PUBLICATIONS

1. Critical groups of arithmetical structures on star graphs and complete graphs
   Joint with Alexander Diaz-Lopez, Darren Glass, and Joel Louwsma. Accepted to *Electronic Journal of Combinatorics.* 2023.
2. Involutions and the Gelfand character
   Joint with Virginia Germany**, C. Marin King*, and L.-K. Lauderdale. *Journal of Algebraic Combinatorics.* 57 (2023), 811–828.
3. A new statistic on Dyck paths for counting 3-dimensional Catalan words
   Joint with Christina Graves. *Discrete Mathematics.* 346(3) (2023). 113247.
4. Enumerating two permutation classes by number of cycles
   Discrete Mathematics and Theoretical Computer Science. Special Issue: Permutation Patterns 2019. 22(2) (2022).
5. Pattern-restricted permutations composed of 3-cycles
   Joint with Christina Graves. *Discrete Mathematics*, 345(7) (2022). 112895.
6. Vertex-minimal planar graphs with cyclic 2-group symmetry
   Joint with Rebecca Darby**, L.-K. Lauderdale, Asa Linson*, Mariah K. Maxfield*, Charles Schmidt*, and Phung Tran**. *Journal of Algebraic Combinatorics*, 54 (2021). 1–15.

7. Counting acyclic and strong digraphs by descents
   Joint with Xuming Evans*, Ira Gessel, and Christina Graves. *Discrete Mathematics*, 343(11) (2020).
8. Arithmetical structures on bidents
   Joint with Abigail C. Bishop, Alexander Diaz-Lopez, Luis D. García Puente, Darren Glass, and Joel Louwsma. *Discrete Mathematics*, 343(7) (2020), 111850.
9. Enumeration of cyclic permutations in vector grid classes
   Joint with L.-K. Lauderdale. *Journal of Combinatorics*, 11(1) (2020), 203–230.
10. Classes of uniformly most reliable graphs for all-terminal reliability
    Joint with Christina Graves and David Milan. *Discrete Applied Mathematics*, 267 (2019), 12–29.
11. Pattern-restricted quasi-Stirling permutations
    Joint with Adam Gregory*, Bryan Pennington*, and Stephanie Slayden*. *Australasian Journal of Combinatorics*, 74(3) (2019), 389–407.
12. Rooted forests that avoid sets of permutations
    Joint with Katie Anders. *European Journal of Combinatorics*, 77 (2019), 1–16.
13. Unimodal permutations and almost-increasing cycles
    Joint with L.-K. Lauderdale. *Electronic Journal of Combinatorics*, 24(3) (2017), #P3.36.
14. Allowed patterns of symmetric tent maps via commuter functions
    Joint with Scott M. LaLonde. *SIAM Journal of Discrete Mathematics*, 31(1) (2017), 317–334.
15. Characterization of the allowed patterns of signed shifts
    Discrete Applied Mathematics, 217(2) (2017), 97–109.
16. Descents of λ-unimodal cycles in a character formula
    Discrete Mathematics, 339 (2016), 2399–2409.
17. Cyclic permutations realized by signed shifts
    Joint with Sergi Elizalde. *Journal of Combinatorics*, 5 (2014), 1–30.

REFEREED CONFERENCE PROCEEDINGS

17. On the number of λ-unimodal involutions (Extended Abstract)
    Joint with Angela M. Gay**, Virginia Germany**, C. Marin King*, L.-K. Lauderdale, Thomas Lupo*, and F. L. Rossi*. *Séminaire Lotharingien de Combinatoire*, 80B.66 (2018), 12 pp.
18. Patterns of negative shifts and signed shifts
    Joint with Sergi Elizalde and Katherine Moore**. *Séminaire Lotharingien de Combinatoire*, 78B.49 (2017), 12 pp.
19. Descents of λ-unimodal cyclic permutations (Extended Abstract)
    Discrete Mathematics and Theoretical Computer Science proceedings AS, (2014), 417–428.
20. Periodic patterns of signed shifts (Extended Abstract)
    Joint with Sergi Elizalde. *Discrete Mathematics and Theoretical Computer Science proceedings AS*, (2013), 873–884.

HONORS AND AWARDS

Academic Innovation Award, University of Texas at Tyler 2019–2020

Featured in *Forward*, UT Tyler's Research Magazine 2020

Teaching & Learning Award, University of Texas at Tyler 2017–2018

Texas Project NExT Fellow, Texas Section of the MAA 2016–2018

Phi Theta Kappa Star Professor (Teaching Award), Tyler Junior College 2015

GAANN Fellowship, Dartmouth College 2012–2013

GRANTS

Collaborate@ICERM Travel Grant 2022

With A. Diaz-Lopez, D. Glass, J. Louwsma

UT Tyler New Faculty Research Grant 2018–2019

Association for Women in Mathematics (AWM) Travel Grant 2018

Research Experience for Undergraduate Faculty Continuation Travel Grant 2018

With A. Bishop, A. Diaz-Lopez, L. D. García Puente, J. Louwsma

NSF Research Experience for Undergraduates (Senior Personnel) 2017–2020, 2022–2024

With D. Milan (PI), C. Graves (Co-PI), and four other senior personnel.

SELECTED PRESENTATIONS

† indicates an invited talk.

CONFERENCE TALKS

Arithmetical structures on star graphs 2023

CombinaTexas, Texas A& M University

Catalan words and 321-avoiding permutations 2022

AMS Southeastern Sectional Meeting, Chattanooga, TN

A new statistic on Dyck paths 2022

Joint Mathematics Meetings (virtual)

†*Patterns realized by dynamical systems* 2022

CombinaTexas, Texas A&M University

Involutions and the Gelfand character 2020

Joint Mathematics Meetings in Denver, CO

†*Pattern-restricted permutations composed of only 3-cycles* 2019

AMS Southeastern Sectional Meeting, University of Florida, FL

†*Pattern avoidance, cycle type, and characters of the symmetric group* 2019

AWM Research Symposium, Rice University, TX

Pattern avoidance and cycle type 2019

CombinaTexas, Texas A&M University, TX

Statistics on rooted trees 2019

Joint Mathematics Meetings, Baltimore, MD

On the number of λ-unimodal involutions (poster) 2018

Formal Power Series and Algebraic Combinatorics, Dartmouth College, NH

Pattern avoidance in rooted forests 2018

Permutation Patterns, Dartmouth College, NH

Pattern avoidance in rooted trees 2018
CombinaTexas, Texas A&M University, TX

Pattern-avoiding cycles 2017
Joint Mathematics Meetings, Atlanta, GA

Cyclic permutations in the 3×1 *grid classes* 2016
CombinaTexas, Texas A&M University, TX

Descents of λ*-unimodal cyclic permutations* (poster) 2014
Formal Power Series and Algebraic Combinatorics, Chicago, IL

Cyclic permutations realized by the signed shift (AWM poster session) 2014
Joint Mathematics Meetings, Baltimore, MD

SEMINAR TALKS

†*Permutations, patterns, and cycles* 2023
Colloquium, US Naval Academy

†*Patterns, cycles, and permutations* 2022
REU Seminar, Towson University

†*Cycle structure of pattern-avoiding permutations* 2021
Algebra and Combinatorics Seminar, Texas A&M University

†*Variations of the Stirling permutations* 2021
Number Theory and Combinatorics Seminar, University of Texas at Tyler

†*Pattern avoidance and its applications* 2019
Math Department Colloquium, Towson University

†*Pattern avoidance and cycle type* 2018
Math Department Colloquium, Sam Houston State University

†*Permutations realized by signed shifts and combinatorial corollaries* 2016
Math Department Colloquium, College of William & Mary

†*Descents of* λ*-unimodal permutations and periodic patterns of signed shifts* 2014
Math Department Colloquium, Dartmouth College

†*Permutations and signed shifts* 2013
Algebra and Combinatorics Seminar, DePaul University

†*Descents in unimodal cyclic permutations* 2013
Combinatorics Seminar, Brandeis University

STUDENT-ORIENTED AND TEACHING TALKS

Math Club, University of Texas at Tyler, TX
The mathematics of fairness 2021
Mathematical games and the strategies to win them 2020
The story of the Catalan numbers 2016
The mathematics of Penrose tilings 2015

Joint Mathematics Meetings, Baltimore, MD 2019
Student research in the algebra classroom

Celebration of Innovation Showcase, University of Texas at Tyler, TX
Undergraduate research in the classroom 2018

University of Texas at Tyler REU
Introduction to LaTeX 2017

PROFESSIONAL DEVELOPMENT AND WORKSHOPS

UT Tyler Center for Excellence in Teaching and Learning Workshops	2016–2023
UT Tyler Professional Learning Community for Student Research	2018–2023
BIRS Workshop: "Analytic and Probabilistic Combinatorics"	2022
Research Experience for Undergraduate Faculty at ICERM	2017, 2018
Texas Project NExT Fellow (4 workshops)	2016–2018
Writing and Designing NSF Proposals Workshop	2016
UT Tyler Center for Teaching Excellence and Innovation (4 workshops)	2015–2016
AWM Workshop for Graduate Students and Recent PhDs at JMM	2014
Active Learning Institute at Dartmouth College	2013
Institute for Advanced Study Program for Women and Mathematics	2013
Dartmouth Center for the Advancement of Learning (5 workshops)	2012–2013
Dartmouth College Teaching Seminar	2011
TopMath Summer School in Computational Homology at Technical University of Munich	2009

SERVICE TO THE PROFESSION

Journal Referee

Discrete Mathematics • *Combinatorial Theory, Series A* • *Advances in Applied Mathematics* • *The American Mathematical Monthly* • *Discrete Mathematics & Theoretical Computer Science* • *Discrete Applied Mathematics*

Textbook Reviewer

ELSEVIER Education • *Taylor & Francis/CRC Press*

Reviewer/panel member for NSF	2021
Member, AWM Government Advocacy Committee	2019–2021
Member, Program Committee for *Permutation Patterns*	2018–2019
Member, MAA Texas Section Nominating Committee	2018–2019

Conference Volunteer

Moderator and Registration, Texas Undergraduate Mathematics Conference	2015, 2017, 2018
Moderator and Panelist, Women in Mathematics in New England Conference	2012, 2013

Acting Department Liason, MAA Texas Section Meeting 2016

SERVICE AT USNA

Member, Colloquium Committee 2023–Present

SERVICE AT UT TYLER

Faculty Liaison, Student Research Faculty Learning Community	2019–2023
Member, Dean's Faculty Council	2019–2021
Member, University Research Council	2018–2021
Panelist, Student Research Discussion Panel	2019
Member, Department Graduate Committee	Biennially
Member, Department Curriculum Committee	Biennially
Member, Student Research Faculty Learning Community	2017–2018
Member, Department Ph.D. Cooperative Committee	2018–Present
Chair, Strategic Planning Work Group for New Academic Programs	2017
Member, Department Honors Committee	2015

SERVICE TO STUDENTS AT UT TYLER

Club Advisor

Math Club Advisor — 2017–2019, 2021-Present
Pi Mu Epsilon Petitioner and Chapter Advisor — 2016–2021
COMAP Competition Advisor — 2016–2020

Awards and Funding

University of Texas at Tyler Co-Curricular Awards
Awarded annually for student conference travel — 2016, 2018, 2019, 2020
Pi Mu Epsilon Prize Grant
Awarded for hosting UT Tyler Integration Bee — 2017, 2018, 2019, 2022
Pi Mu Epsilon Conference Grant
Awarded for hosting the Texas Undergraduate Mathematics Conference — 2019

Co-organizer, UT Tyler Lyceum Student Research Showcase — 2020–Present
Student Presentation/Poster Judge, UT Tyler Lyceum Student Research Showcase — 2017–Present
Department of Mathematics Student Advisor, University of Texas at Tyler — 2016–Present

STUDENT RESEARCH MENTORING

Master's Thesis Advisor

Fariha Mahfuz, *Applications of Markov Chains* — 2019–2021
Humberto Bautista, *Maximal subgroups and the Frattini subgroup* — 2018–2019

Master's Thesis Committee Member

Ali Chick, *Behavior of Petrie lines in certain edge-transitive infinite graphs* — 2017

Senior Capstone Project Mentor

Rebecca McGough, *Sabermetrics and Predicting the Playoffs* — 2021
Halle Smith, *Markov Chains and their Applications* — 2020
Milos Pavlovic, *Descents of quasi-Stirling permutations* — 2019
Marin King, *On λ-unimodal permutations* — 2018
Bryan Pennington, *Quasi-Stirling permutations* — 2018
Hunter Barr, *Arithmetical structures* — 2017

Student Research Mentor (Graduate students are marked with *.)

Ethan Borsh, Jensen Bridges, Millie Jeske (UT Tyler REU) — Summer 2023
Enumerating permutations avoiding patterns in both one-line and cycles forms
Ben Burns, Martha Du Preez, James Lynn*, Haley Melton*, and Madison Taylor — Spring 2023
Enumerating pattern-avoiding permutations by number of cycles
Milos Pavlovic, *Statistics in trees and quasi-Stirling permutations* — 2018–2019
Jarob Gilliam, *Forbidden patterns in dynamical systems* — 2018
Angela Gay*, Virginia Germany*, Marin King, Thomas Lupo, and Francesca Rossi — 2017–2018
On λ-unimodal permutations
Humberto Bautista*, Kayla Cook*, Yansy Perez, and Vincent Villalobos — 2017–2018
Intersections of maximal subgroups
Rebecca Darby*, Asa Linson, Mariah Maxfield, Charles Schmidt, and Phung Tran* — 2017
Vertex-minimal planar graphs with prescribed automorphism groups
Maria Arce, Paul Difouta Mboula*, Paulson Elekuru*, Leina Green, and Randall Sadler — 2017
Fixing sets of dicyclic groups
Hunter Barr, Humberto Bautista*, Dusty Johnson, Amer Khalousi, and Fletcher Larkin* — 2017
On critical groups of arithmetical structures
Adam Gregory, Bryan Pennington, and Stephanie Slayden (UT Tyler REU) — 2017
Pattern avoidance of quasi-Stirling permutations

EDUCATIONAL OUTREACH

STEM Like a Girl, Discovery Science Center, Tyler, TX
- Instructor and Project Designer, *Exploring the Fibonacci Sequence* 2023
- Instructor and Project Designer, *Map Coloring: How Many Colors Are Enough?* 2019
- Instructor and Project Designer, *The Mathematics of Origami* 2018
- Instructor and Project Designer, *Fun with Fractals!* 2017

Girl Scout Badge Camp, Discovery Science Place, Tyler, TX
- Volunteer, *Think Like a Programmer* (Daisies, Brownies, and Juniors) 2018
- Volunteer, *What Robots Do* (Daisies) and *Programming and Designing Robots* (Brownies) 2017

Guest Lecture Day, Owens Elementary School, Tyler, TX
- Guest Lecturer, *Edible 3D Shapes* (K), *Dice Probabilities* (2^{nd}), & *Bouncing Ball Heights* (3^{rd}) 2017

Odyssey Series, Center for Talented Youth, Dartmouth College
- Workshop Leader and Instructor, *The Magic and Mystery of Hexaflexagons* 2013
- Instructor, *Escher, Bees, and Soccer: The World of Tessellation* 2013

Science Day, Graduate Women in Science and Engineering, Dartmouth College
- Organizer and Instructor, *Pascal's Triangle* and *Möbius strips* 2013

Sonia Kovalevsky Math Day, Dartmouth College
- Workshop Leader and Instructor, *Unravelling the Mysteries of the Möbius Strip* 2012
- Instructor, *SET Magic Tricks* 2011

Exploring Math, Week-long Math Camp at Dartmouth College
- Instructor and Course Designer, *Number Theory* 2011
- Instructor and Course Designer, *Math and Games* 2011

COURSES TAUGHT

United States Naval Academy

Calculus I

University of Texas at Tyler

Undergraduate classes: Mathematics for Business and Economics • Statistics I • Statistics II • Precalculus • Calculus I • Honors Calculus I • Calculus II • Honors Calculus II • Multivariate Calculus • Honors Multivariate Calculus • Foundations of Mathematics • Honors Differential Equations • Linear Algebra • Matrix Methods in Science and Engineering • Probability and Statistics for Engineers and Scientists • Geometric Systems • Abstract Algebra II • Combinatorics • Senior Seminar I & II

Graduate classes: Algebra • Algebra II • Topics in Combinatorics

Tyler Junior College

College Algebra • Statistics

Dartmouth College

Calculus with Algebra • Discrete Probability • Differential Equations • Graduate Ethics