

Alex McDonough | Curriculum Vitae

Brown University – Department of Mathematics – Providence, RI

✉ amcd@math.brown.edu

Education

- **Brown University** **Providence, RI**
PhD in Pure Mathematics *Fall 2016 – Spring 2021 (expected)*
- **University of Chicago** **Chicago, IL**
Honors BS in Mathematics, BA in Statistics *Fall 2012 – Spring 2016*

Research

Papers.....

- **"A Combinatorial Mapping for the Higher-Dimensional Matrix-Tree Theorem"**
arXiv:2007.09501 2020
- **"Matching Complexes of Trees and Applications of the Matching Tree Algorithm"**
with Helen Jenne, Marija Jelić Milutinović, and Julianne Vega, arXiv:1905.10560 2019
- **"Determining Genus from Sandpile Torsor Algorithms"**
Abstract Accepted to the FPSAC Conference, arXiv:1804.07807 2018
- **"Combinatorial and Asymptotic Aspects of the Neighborhood Grid Data Structure"**
with Martin Skrodzki and Ulrich Reitebuch, arXiv:1710.03435 2019

Workshops.....

- **Graduate Research Workshop in Combinatorics** **Ames, IA**
2 week Workshop with other Graduate Students at Iowa State *Summer 2018*
- **Positivity Results in Geometric Combinatorics Workshop** **Berkeley, CA**
2 week Workshop with other Graduate Students at the MSRI *Summer 2017*

Industry.....

- **Xcitex Video Capture and Motion Analysis** **Woburn, MA**
Intern, Research and Software *2013–2015*

Teaching

Classes.....

- **TA for Calculus III (Math 180)** **Providence, RI**
Ran weekly Mandatory Recitations and Graded Exams (partly virtually) *Spring 2020*
- **Instructor for Calculus III (Math 180)** **Providence, RI**
Gave lectures and graded exams *Fall 2019*
- **Instructor for Probability and its Applications** **Providence, RI**
Part of the Summer Pre-College Program. Taught and designed the curriculum *Summer 2019*
- **Instructor for Calculus II (Math 100)** **Providence, RI**
Gave lectures and graded exams *Spring 2019*
- **Instructor for Calculus I (Math 90)** **Providence, RI**
Gave lectures and graded exams *Fall 2018*
- **TA for Spy Training 101** **Providence, RI**
Part of the Stem I Program. Taught Cryptography to Middle School students *Summer 2018*
- **TA for Million Dollar Math** **Providence, RI**
Part of the Stem II Program. Taught Research Math to High School students *Summer 2018*
- **TA for Calculus II (Math 100)** **Providence, RI**
Ran weekly Mandatory Recitations and Graded Exams *Spring 2018*
- **TA for Calculus I (Math 90)** **Providence, RI**
Ran weekly Mandatory Recitations and Graded Exams *Fall 2017*
- **TA for Spy Training 101** **Providence, RI**
Part of the Stem I Program. Taught Cryptography to Middle School students *Summer 2017*

Training.....

- **Sheridan Center Certificate 1** **Providence, RI**
Biweekly Workshops and Online Assignments *Fall 2017*
- **Effective Performance Workshop** **Providence, RI**
Workshops hosted by The Graduate School and Trinity Repertory Theater *Spring 2017*

Students Mentored Through Brown Undergraduate Mathematics Projects.....

- **Alexander Brown** **Virtual**
Random Walks *Summer 2020*
- **Eddie Li** **Virtual**
Random Walks *Summer 2020*

Students Mentored Through the Directed Reading Program at Brown University.....

- **Jeremy Wang** **Providence, RI**
Representation Theory *Fall 2020*
- **Dominick Joo** **Providence, RI**
Representation Theory *Fall 2020*
- **Jerry Chu** **Providence, RI**
Advanced Topics in Chip-Firing *Fall 2019*
- **Josiah Lim** **Providence, RI**
Chip-Firing Linear Algebra *Fall 2019*
- **Keith Richie** **Providence, RI**
Coxeter Groups *Spring 2019*
- **Nathaniel Zaldivar** **Providence, RI**
Matroids *Fall 2018*
- **Emmanuel Peters** **Providence, RI**
Chip-Firing and the Sandpile Group *Spring 2018*
- **Kenneth Berglund** **Providence, RI**
Spectral Graph Theory *Spring 2018*
- **Shivam Nadimpalli** **Providence, RI**
Geometric Combinatorics *Fall 2017*

Students Mentored Through the Math Department Mentoring Program at Brown University

- **Rahul Krishnan** **Providence, RI**
General Guidance *Fall 2019*
- **Tej Stead** **Providence, RI**
General Guidance *Fall 2019*

Other.....

- **Math Circle Leader (BVP Middle School)** **Cumberland, RI**
Guided Middle School Students Through Math Exercises *Fall 2019*
- **Math Resource Center Tutor** **Providence, RI**
Helped Undergraduate Students with Math Homework *Fall 2017-Spring 2018*
- **Guest Speaker (Muraco Elementary School)** **Winchester, MA**
Designed and Presented Five Enrichment Lessons For Fourth Grade Students *Winter 2017*

Professional Activities

- **Graduate Online Combinatorics Colloquium Founder and Organizer** **Online**
A weekly online combinatorics seminar geared towards graduate students *Spring 2020-Present*

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| <ul style="list-style-type: none"> ○ Math Resource Center Coordinator
<i>A tutoring center to help undergrads with math questions</i> | Providence, RI
<i>Fall 2018-Present</i> |
| <ul style="list-style-type: none"> ○ Grad Student Seminar Organizer
<i>A weekly seminar featuring Brown's math grad students</i> | Providence, RI
<i>Fall 2018-Spring 2020</i> |
| <ul style="list-style-type: none"> ○ Horizons Seminar Co-organizer
<i>A seminar promoting the work of under-represented mathematicians</i> | Providence, RI
<i>Fall 2017-2019</i> |

Presentations

Talks.....

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| <ul style="list-style-type: none"> ○ "The Higher-Dimensional Matrix-Tree Theorem"
<i>Georgia Tech Algebra Seminar</i> | Virtual
<i>September 2020</i> |
| <ul style="list-style-type: none"> ○ "The Higher-Dimensional Matrix-Tree Theorem"
<i>AMS Sectional Meeting</i> | Virtual
<i>September 2020</i> |
| <ul style="list-style-type: none"> ○ "The Higher-Dimensional Matrix-Tree Theorem"
<i>Junior Mathematician Research Archive</i> | Virtual
<i>September 2020</i> |
| <ul style="list-style-type: none"> ○ "Chip-firing on Cell Complexes and Matroids"
<i>Graduate Online Combinatorics Colloquium</i> | Virtual
<i>May 2020</i> |
| <ul style="list-style-type: none"> ○ "Discrete Morse Theory and the Matching Tree Algorithm"
<i>Brown Graduate Student Seminar</i> | Providence, RI
<i>October 2019</i> |
| <ul style="list-style-type: none"> ○ "What is Chip-Firing?"
<i>Brown DUG Seminar</i> | Providence, RI
<i>October 2019</i> |
| <ul style="list-style-type: none"> ○ "Chip-Firing on Cell Complexes and Matroids"
<i>Summer Combo</i> | Burlington, VT
<i>July 2019</i> |
| <ul style="list-style-type: none"> ○ "What is Chip-Firing"
<i>Brown Math Slam</i> | Providence, RI
<i>April 2019</i> |
| <ul style="list-style-type: none"> ○ "What is a Coxeter Group?"
<i>Brown Graduate Student Seminar</i> | Providence, RI
<i>April 2019</i> |
| <ul style="list-style-type: none"> ○ "Chip Firing on Simplicial Complexes and Matroids"
<i>Binghamton Combinatorics Seminar</i> | Binghamton, NY
<i>April 2019</i> |
| <ul style="list-style-type: none"> ○ "Chip Firing on Simplicial Complexes and Matroids"
<i>KU Combinatorics Seminar</i> | Lawrence, KS
<i>April 2019</i> |
| <ul style="list-style-type: none"> ○ "Chip Firing on Simplicial Complexes and Matroids"
<i>AMS Sectional Meeting</i> | Hartford, CT
<i>April 2019</i> |

- **"Chip Firing on Simplicial Complexes and Matroids"** **New York City, NY**
NY Combinatorics Seminar *March 2019*
- **"Chip Firing on Simplicial Complexes and Matroids"** **Providence, RI**
Brown Discrete Math Seminar *March 2019*
- **"An Introduction to Matroids"** **Providence, RI**
Brown Graduate Student Seminar *December 2018*
- **"The Sandpile Group and Spanning Trees of a Graph"** **Dublin, Ireland**
Trinity College Dublin Maths Society *March 2018*
- **"A Potpourri of Fun Combinatorics Problems"** **Providence, RI**
Brown Graduate Student Seminar *March 2018*
- **"Sandpiles and Rotor Routing"** **Providence, RI**
Brown Graduate Student Seminar *February 2017*
- **"The Sandpile Group and Spanning Trees"** **Providence, RI**
Brown Graduate Student Seminar *November 2016*
- **"Martingale Applications in Probability"** **Chicago, IL**
UChicago Directed Reading Program *October 2015*
- **"Edward Nelson's Internal Set Theory"** **Chicago, IL**
UChicago Directed Reading Program *March 2014*
- Posters.....
- **"Chip-Firing on Cell Complexes and Matroids"** **Amherst, MA**
Discrete Math Day *April 2019*
- **"Genus From a Sandpile Torsor"** **Kingston, RI**
Discrete Math Day *September 2018*
- **"Genus From a Sandpile Torsor"** **Hanover, NH**
FPSAC Conference *July 2018*