Axel Brandt

Office: (216) 397-1948   *E-mail:* abrandt@jcu.edu   http://MathsDrAxel.github.io

ACADEMIC APPOINTMENTS		
Associate Professor, John Carroll University		2024-Present
Assistant Professor, John Carroll University		2022-2024
Assistant Professor, Northern Kentucky University		2018-2022
Teaching Postdoctoral Fellow, Davidson College		2016-2018

EDUCATION		
Ph.D. Applied Mathematics, University of Colorado Denver		May 2016
M.S. Mathematics, Miami University		Aug 2012
B.S. Mathematics, Ohio Northern University		May 2010

AWARDS AND FELLOWSHIPS

Henry L. Alder Award, Mathematical Association of America   2024
– For "distinguished teaching by a beginning college or university mathematics faculty member" to honor beginning faculty "whose teaching has been extra ordinarily successful and whose effectiveness in teaching undergraduate mathematics is shown to have influence beyond their own classrooms"

Project NExT Fellow, Mathematical Association of America   2017-2018
– An ongoing early-career teaching-oriented professional development program

RESEARCH PUBLICATIONS[1]

Antimagic Labelings of Weighted and Oriented Graphs (with Z. Berikkyzy, S. Jahanbekam, V. Larsen and D. Rorabaugh) Discrete Math. Theor. Comput. Sci, **23**(3), 2021.

Additive List Coloring of Planar Graphs with Given Girth (with J. Diemunsch and S. Jahanbekam) Discuss. Math. Graph Theory **40 3**, 855-873, 2020

Planar Graphs with Girth 20 are Additively 3-Choosable (with N. Tenpas and C. Yerger) Discrete Appl. Math. 277, 14-21, 2020.

An Alternative Approach for Bounding the Additive Choice Number of Planar Graphs (with N. Tenpas and C. Yerger), Congr. Numer. 231, 157-163, 2018.

A Robber Locating Strategy for Trees (with J. Diemunsch, C. Erbes, J. LeGrande and C. Moffatt), Discrete Appl. Math. **232C**, 99-106, 2017.

Stability and Turán numbers of a class of hypergraphs via Lagrangians (with D. Irwin and T. Jiang), Comb. Probab. Comp. **26**(3), 367-405, 2017.

I,F-partitions of Sparse Graphs (with M. Ferrara, M. Kumbhat, S. Loeb, D. Stolee and M. Yancee), European J. Combin. **57**, 1-12, 2016.

Local Gap Colorings from Edge Labelings (with B. Moran, K. Nepal, F. Pfender and D. Sigler), Australas. J. Combin. **65**(3), 200-211, 2016.

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[1]underline indicates co-author was an undergraduate student at time of research

ADDITIONAL DISSEMINATED SCHOLARSHIP

Learning through Giving: Philanthropy in the Classroom. Mathematical Association of America, MAA FOCUS, Oct/Nov 2022. https://www.maa.org/press/periodicals/maa-focus

Three Tips to Improve Accessibility. Mathematical Association of America, Math Values, Sept 22, 2022. https://www.mathvalues.org/masterblog/three-tips-to-improve-accessibility

Unexpected Directions. Mathematical Association of America, Kentucky Section Newsletter, Winter 2022. http://sections.maa.org/kentucky

The Value of Vaccines. Mathematical Association of America, Kentucky Section Newsletter, Fall 2021. http://sections.maa.org/kentucky

"Tic-Tac-Whoa!" In M. Capaldi, *Teaching Mathematics Through Games.* AMS/MAA Press Classroom Resource Materials, Vol 65, 1-7, 2021.

Mathematics for a Better World. Mathematical Association of America, Kentucky Section Newsletter, Winter 2021. http://sections.maa.org/kentucky

RESEARCH PROJECTS WITH UNDER-GRADUATE AND HIGH SCHOOL STUDENTS[1]

John Carroll University
– <u>Cavan Bruce</u>, <u>Lia Buzogany</u>, Chancellor Lam, <u>Olivia Lam</u>, Reilly Lewis, <u>Jay Sureau</u>, Viktoriya Taran, <u>Sophie Voudris</u>,   *Chasing a Runner on Graphs*   Summer 2024
– Matthew Walker, *Determining Optimal Strategy for a Variation of Tic-Tac-Toe* Fall 2023

Northern Kentucky University
– Rachael Lerch, Bijay Rimal, Jack Shannon, *Pursuit-Evasion on Graphs*   Summer 2020
– Kola Akinrele, Elizabeth Breen, Matthew Lee, Patrick O'Doherty, Weston Rainer, *Pursuit-Evasion Games on Graphs*   2019-2020
– Jacob Adkins, Elise Bezold, Abigail Leonard, Aryan Shrestha, *Coasters Done Quick*   Summer 2019
– Patrick O'Doherty, Weston Rainer, *Optimal Strategy in Combinatorial Games* Spring 2019

Davidson College
– Nathan Tenpas, *Additive 3-Choosability of Planar Graphs* (Senior Thesis)   2017-2018
– Savannah Williams, *Additive List Coloring Even Cycles*   Summer 2017
– Savannah Williams, *Mathematical Persistence in K-8 Students*   Summer 2017

University of Colorado Denver
– Brent Moran, *Local Gap Colorings from Edge Labelings*   2014
– Ben Hoffman, Matt Mowrey, Rudy Ybarra, *Math for Peace: Rule of Law*   Fall 2013

EXTERNAL FUNDING

The Math Movement Summer Camp, MAA Tensor SUMMA, AMS Young Scholars   2025
– pays high school teaching assistants to serve as mentors to middle school participants during a 4-week summer math camp (*$11,000 total*)

The Math Movement Summer Camp, MAA Neff Outreach   2024
– pays high school teaching assistants to serve as mentors to middle school participants during a 4-week summer math camp (*$6,000*)

OER Course Redesign Grant, OhioLINK   2022
– explored options an OER online homework system and pursued local hosting of WeBWorK

STEM Ready, Improving Undergraduate STEM Education, National Science Foundation 2019-2022

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[1]underline indicates high school student at time of research

– improving mathematics preparation for STEM students, PI Bethany Bowling (*$299,999*)

Minigrant, Center for Undergraduate Research in Mathematics   2019-2020
– Lead undergraduate research group for academic year working in coordination with similar research group at Hiram College *($16,700)*

INTERNAL FUNDING	

STEM Outreach Funds, Donnelly Grant   2024
– funds expansion of STEM outreach activities facilitated by JCU students for area K-12 students (*$2,500*)

Faculty Technology Fellowship, JCU Center for Teaching and Learning   2024
– Local installation of WeBWorK online homework system *($3,500)*

Student Summer Fellowship, NKU Institute for Student Research and Creative Activity   2020
– Support student summer research *($3,500)*

Scholarship and Engagement, NKU Scripps Howard Center for Civic Engagement   2019-2020
– Support expansion of mathematical outreach activities/programs *($2,000)*

Collaborative Faculty Student Project Award, College of Arts and Sciences, NKU   2020
– Funding for student in CURM project on "Pursuit-Evasion Games on Graphs" that included outreach component *($2,000)*

Equity, Diversity, and Inclusion Fellowship, College of Arts and Sciences   2019-2020
– Co-Lead year-long project working with students on "Student Access and Completion through Engaging Feedback in Online Homework," Co-PI Dan McGee *($11,004.35)*

Research Grant, Center for Integrative Natural Science and Mathematics   Spring 2019
– Lead semester-long research project with undergraduate students on "Optimal Strategy in Combinatorial Games" *($10,567.64)*

Curriculum Development Grant, Davidson College   Spring 2018
– Develop math-oriented street performance acts with students at local schools and community events *($1,700)*

Curriculum Development Grant, Davidson College   Summer 2017
– Develop mathematics enrichment activities for K-8 summer program through Center for Civic Engagement *($1,000)*

MATHEMATICAL CONSULTING	

University Hospitals Parma Pharmacy Residency Program   Jan 2024, 2025
– Contribute in optimizing the scheduling of residency candidate interviews

Buckeye Trail Association   Nov 2022
– Contribute in optimizing process of updating membership database

Kroger Corporation   Nov 2021
– Contribute in optimizing the design of a logic network used to validate user input on online forms

Neaton Auto Products Manufacturing   Aug 2019
– Provide conceptual framework for modeling assembly line process toward developing algorithm to minimize number of test parts

Lockheed Martin Space Systems Company   Apr 2017

– Contribute in optimizing the onboard flight computer calibration calcuations of NASA's Orion Spacecraft in an effort to maximize CPU performance

Pace   Aug 2016
– Model various apartment packing problems for a marketing infographic

<table>
<tr><td rowspan="6">Teaching with Full Course Responsibility</td><td>**John Carroll University**</td><td>2022-Present</td></tr>
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Teaching with Full Course Responsibility

John Carroll University   2022-Present
– Senior Seminar, Graph Theory & Combinatorics, Methods in Pure Mathematics, Linear Algebra, Calculus 1-3, Applied Calculus

Northern Kentucky University   2018-Present
– Graph Theory & Combinatorics, Discrete Mathematics, Introduction to Proofs, Calculus 1, 2, & 3, Precalculus, Mathematics for Liberal Arts

Davidson College   2018-Present
– Number Theory, Sets & Proofs, Linear Algebra, Calculus 1 & 3

University of Colorado Denver   2012-2013
– Problem Solving Tools (with MATLAB lab), Polynomial Calculus

Miami University   2011-2012
– Calculus 1, Precalculus

Scholarly Presentations

Invited Panelist

The Mentor Mosaic - Strategies for Advising Undergraduates   Project NExT, JMM, 2025

Secrets of the Surface   University of Indianapolis, Apr 2021

Assessment Online   CITE, Northern Kentucky University, Jul 2020

Invited Talks

Finding Order in Chaos   Franciscan University STEMinar, Sep 2025

Creativity Through Community   JMM AIM Special Session, Jan 2025

Making Meaningful Moments   MAA Mathfest Alder Award Session, Aug 2024

Research with First-Year Students   SIAM ED22, Jul 2022

Avoidable vs Unavoidable Conflicts   Kenyon, Mar 2022

Fixing Congressional Dysfunction Using Polynomials   S.F. Austin State, Oct 2020

Efficiently Binge Watching a Series   Ohio Wesleyan, Feb 2020

An Introduction to the Method of Flag Algebras   Vanderbilt, Mar 2019

Maths for Funsies (and learning)   Kentucky Wesleyan, Mar 2019

Mathematical Networks: an introduction to graph theory   Ohio Northern, Oct 2018

Entire Colorability for a Class of Planar Graphs   JMM AMS Special Session, Jan 2018

Purposeful Polynomials: Committee Scheduling and Non-Attacking Rooks   Winthrop, Nov 2017

Extremal Graph Theory with Flag Algebras   Discrete Seminar, USC Nov 2017

Flag Algebras: A Graph Theory/Computational Optimization Translator   Seminar, VCU Oct 2017

Optimization, Probability, and Modeling as a tool in Extremal Graph Theory Kennesaw State, Sep 2017

Additive Coloring of Some Planar Graphs AMS E Special Session, Sep 2017

I, F-Partitions of Sparse Graphs AMS SE Special Session, Nov 2016

Antimagic Labelings of Weighted and Oriented Graphs JMM AMS Special Session, Jan 2016

Short Cycles in Graphs Discrete Seminar, Nebraska-Lincoln, Dec 2015

Short Cycles in Graphs Discrete Seminar, Iowa State, Oct 2015

Combinatorial Nullstellensatz and Choosability Discrete Seminar, Miami (Ohio), Feb 2014

Contributed Talks

Recruitment and Retention Roundtable MAA Trisection, Apr 2025

Voting Better Ohio MAA, Nov 2024

Thriving Through Tumultuous Turnover MAA Mathfest, Aug 2024

A Pursuit-Evasion Game on Graphs Ohio MAA, Apr 2024

A Summer Bridge Program for STEM Student Success Ohio MAA, Oct 2023

Implementation of an Online Summer Bridge Program Designed to Accelerate Mathematics Preparation for STEM Programs KAS Annual Meeting, Nov 2020

Maths for Funsies: Playful Classroom Activities for Mathematical Exploration KCM, Mar 2020

Tic-Tac-Toe: A Mathematical Nostalgia KAS Annual Meeting, Nov 2019

Tic-Tac-Whoa! NKU Spotlight on Scholarship, Oct 2019

Winning in a Quantitative Literacy Course MAA MathFest, Aug 2019

Maths for Funsies (and Learning) KYMAA, Mar 2019

Polynomials for Peace: Avoiding Scheduling Conflicts KYMAA, Mar 2019

Additive 3-Choosability of Planar Graphs with Girth 20 KAS Annual, Nov 2018

Polynomial peacemakers: avoiding scheduling conflicts MAA Indy Section, Oct 2018

Avoiding Conflict through Zeros of Polynomials MathFest, Jul 2017

Entire Colorability for a Class of Planar Graphs Cumberland Conference, May 2017

Additive Coloring Planar Graphs with Girth at least 5 Cumberland Conference, May 2017

Fixing Congressional Dysfunction with Polynomials MAA SE Section, Mar 2017

Entire Colorability for a Class of Planar Graphs Boca Conference, Mar 2017

Posters

Facilitating Growth in a Summer Math Camp MAA MathFest, Aug 2025

The Math Movement MAA MathFest, Aug 2024

Taking Math to the Streets MAA MathFest, Aug 2018

Taking Math to the Streets MAA MathFest, Aug 2018

IBL Mathematics Enrichment with Middle School Students IBL Conference, Jul 2017

Mathematical Persistence in K-8 Summer Enrichment: A Preliminary Report   Mathfest, Jul 2017

COMMUNITY OUTREACH AND MATHEMATICAL ENRICHMENT	

Visits and Small Events

120 sessions in K-12 schools and community   2012-Present
- Mathematical modeling explored in "*Surface Area, Volume, and Mammalian Heartrates*" and "*Will the Zombie Virus get you?*" by predicting student resting heart rates and population growth rates
- Mathematical thinking analyzed through games including "*Finding Fifteen,*" "*Chomp,*" and "*Mastermind*"
- Mathematical skills reinforced in games (ex. "*Kakuro,*" "*Towers of Hanoi*") or advanced mathematical ideas introduced in puzzles (ex. "*Drawing on Donuts,*" "*Extreme Relationships*")

Programs and Large Events
- Roses Courses for 4-Week Summer Camp with The Math Movement   Summers 2023-Present
- STEM Fairs hosted by Northeast Ohio STEM Ecosystem   2022-Present
- 2-Week Data Science Course for Summer Program with Minds Matter Cleveland   July 2024
- Welcoming Address for Davidson College Hackathon   Feb 2017
- Leader for Freedom Schools Program Afternoon Activity Session   Summer 2017
    Implement mathematical enrichment activities for K-8 summer program
- Facilitator for Charlotte Math Club   2016-2018
    Facilitate competition preparation and mathematical enrichment at monthly meetings
- Co-organizer and Math Wrangle Director for Julia Robinson Math Festival   Sep 2015
    Facilitate, select problems, and train judges for 14-team tournament-style competition and assist with logistics for one-day event hosting over 300 middle school students

TEACHER PROFESSIONAL DEVELOPMENT	

Workshops

Mastery Learning   College of Arts & Sciences, John Carroll University, May 2024

Sessions

Gettin' Around   Crooked River Math Teacher Circle, May 2025

Student Accessibility Stories   MAA Ohio Section NExT, Apr 2023

Assessment Online   CITE SOFI, Northern Kentucky University, Jul 2020

OER in the Classroom   NKU Steely Library After School Specials, Jun 2020

Superpermuations   Western Massachusetts Math Circle, Apr 2019

The Blind Professor   Rocky Mountain Math Teacher Circle, Nov 2015

INSTITUTIONAL SERVICE	

John Carroll University
- Faculty Council   2024-2027
- CAS Curriculum Committee   2023-2026
- UCC   Spring 2023

Northern Kentucky University
- Dean's Planning and Advisory Committee   Fall 2019-Present
- Math/Stat Faculty Search Committee   Summer 2019

PROFESSIONAL
SERVICE

The Math Movement
- Board of Directors, Member   2024-Present

MAA
- OH Section Newsletter Editor   2025-Present
- OH Section NExT Committee *Co-Chair 2023-Present*   2022-Present
- KY Section Newsletter Editor   2021-2022
- Mentor for Great Talks for a General Audience   MathFest 2018, 2019
- Participant for MAA Focus Group on Instructional Practices Guide   JMM 2017

Conferences
- Session chair for MAA OH Section   2022, 2023, 2024, 2025
- Co-planner of student activities at Kentucky MAA Conference   Apr 2020
- Judge for student competition at Kentucky Academy of Science Conference   2018, 2019, 2021
- Coordinator for Project NExT Special Session at JMM   Jan 2018
- Co-Organizer of AMS Special Session at JMM   Jan 2018
- Session Chair for MAA SE Section   Mar 2017
- Member of Treasure Hunt Organizing Team for MAA SE Section   Spring 2017

Other
- Referee for the Journal of Discrete Mathematics, Journal of Discrete Applied Mathematics, Australasian Journal of Combinatorics, International Journal of Mathematics and Statistics, and the College Mathematics Journal
- Reviewer for AMS Mathematical Reviews
- Volunteer to pilot questions for AP Calculus Test

PROFESSIONAL
MEMBERSHIPS
- Mathematical Association of America
- Association for Women in Mathematics