

# Axel Brandt

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<http://MathsDrAxel.github.io>

ACADEMIC APPOINTMENTS	<b>Assistant Professor</b> , John Carroll University	2022-Present
	<b>Assistant Professor</b> , Northern Kentucky University	2018-2022
	<b>Teaching Postdoctoral Fellow</b> , Davidson College	2016-2018
EDUCATION	<b>University of Colorado Denver</b> , Denver, Colorado USA – Ph.D. Applied Mathematics, Advisor: Florian Pfender	May 2016
	<b>Miami University</b> , Oxford, Ohio USA – M.S. Mathematics, Advisor: Tao Jiang	Aug 2012
	<b>Ohio Northern University</b> , Ada, Ohio USA – B.S. Mathematics, Applied Statistics minor, Senior Capstone Advisor: Donald Hunt	May 2010
PUBLICATIONS	<i>Antimagic Labelings of Weighted and Oriented Graphs</i> (with Z. Berikkyzy, S. Jahanbekam, V. Larsen and D. Rorabaugh) <i>Discrete Math. Theor. Comput. Sci.</i> <b>23(3)</b> , 2021.	
	“Tic-Tac-Whoa!” In M. Capaldi, <i>Teaching Mathematics Through Games</i> . AMS/MAA Press Classroom Resource Materials, Vol 65, 1-7, 2021.	
	<i>Additive List Coloring of Planar Graphs with Given Girth</i> (with J. Diemunsch and S. Jahanbekam) <i>Discuss. Math. Graph Theory</i> <b>40 3</b> , 855-873, 2020	
	<i>Planar Graphs with Girth 20 are Additively 3-Choosable</i> (with <u>N. Tenpas</u> <sup>1</sup> and C. Yerger) <i>Discrete Appl. Math.</i> 277, 14-21, 2020.	
	<i>An Alternative Approach for Bounding the Additive Choice Number of Planar Graphs</i> (with <u>N. Tenpas</u> and C. Yerger), <i>Congr. Numer.</i> 231, 157-163, 2018.	
	<i>A Robber Locating Strategy for Trees</i> (with J. Diemunsch, C. Erbes, J. LeGrande and C. Mofatt), <i>Discrete Appl. Math.</i> <b>232C</b> , 99-106, 2017.	
	<i>Stability and Turán numbers of a class of hypergraphs via Lagrangians</i> (with D. Irwin and T. Jiang), <i>Comb. Probab. Comp.</i> <b>26(3)</b> , 367-405, 2017.	
	<i>I,F-partitions of Sparse Graphs</i> (with M. Ferrara, M. Kumbhat, S. Loeb, D. Stolee and M. Yancee), <i>European J. Combin.</i> <b>57</b> , 1-12, 2016.	
	<i>Local Gap Colorings from Edge Labelings</i> (with <u>B. Moran</u> , K. Nepal, F. Pfender and D. Sigler), <i>Australas. J. Combin.</i> <b>65(3)</b> , 200-211, 2016.	
TEACHING RELATED FELLOWSHIPS AND AWARDS	<b>CINSAM Awards</b> , Center for Integrative Natural Science and Mathematics, Northern Kentucky University – In recognition of extraordinary contributions to promote enthusiasm, excellence, and equity in education at P-16 levels by advancing and integrating teaching, learning, and scholarship in STEM disciplines	2022
	<b>Project NExT Fellow</b> , Mathematical Association of America – An ongoing early-career teaching-oriented professional development program	2017-2018

<sup>1</sup>indicates co-author was an undergraduate student at time of research

**NSF GK–12 Fellowship**, Grant DGE-0742434, University of Colorado Denver 2013–2014  
 – 1-year assistantships competitively awarded to CU Denver graduate students in STEM to develop communication skills through K-12 enrichment

RESEARCH PROJECTS WITH UNDER-GRADUATE STUDENTS

**Northern Kentucky University**

- Rachael Lerch, Bijay Rimal, Jack Shannon, *Pursuit-Evasion on Graphs* Summer 2020
- Kola Akinrele, 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

MATHEMATICAL CONSULTING

- 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 calculations of NASA’s Orion Spacecraft in an effort to maximize CPU performance
- Pace Aug 2016
  - Model various apartment packing problems for a marketing infographic

TEACHING WITH FULL COURSE RESPONSIBILITY

- John Carroll University** 2022-Present
  - Applied Calculus, Calculus 1, Linear Algebra
- 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

EXTERNAL  
FUNDING

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

- 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 2020  
 – Funding for student in CURM project on “Pursuit-Evasion Games on Graphs” that included outreach component (*\$2,000*)
- Faculty Summer Fellowship**, Academic Affairs 2020  
 – Funding to extend dissertation research (*\$6,000*)
- 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*)

SCHOLARLY  
PRESENTATIONS

- Invited Talks**
- 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

<i>Flag Algebras: A Graph Theory/Computational Optimization Translator</i>	Seminar, VCU Oct 2017
<i>Optimization, Probability, and Modeling as a tool in Extremal Graph Theory</i>	Kennesaw State, Sep 2017
<i>Additive Coloring of Some Planar Graphs</i>	AMS E Special Session, Sep 2017
<i>I, F-Partitions of Sparse Graphs</i>	AMS SE Special Session, Nov 2016
<i>Antimagic Labelings of Weighted and Oriented Graphs</i>	JMM AMS Special Session, Jan 2016
<i>Short Cycles in Graphs</i>	Discrete Seminar, Nebraska-Lincoln, Dec 2015
<i>Short Cycles in Graphs</i>	Discrete Seminar, Iowa State, Oct 2015
<i>Combinatorial Nullstellensatz and Choosability</i>	Discrete Seminar, Miami (Ohio), Feb 2014

**Contributed Talks**

<i>Implementation of an Online Summer Bridge Program Designed to Accelerate Mathematics Preparation for STEM Programs</i>	KAS Annual Meeting, Nov 2020
<i>Maths for Funsies: Playful Classroom Activities for Mathematical Exploration</i>	KCM, Mar 2020
<i>Tic-Tac-Toe: A Mathematical Nostalgia</i>	KAS Annual Meeting, Nov 2019
<i>Tic-Tac-Whoa!</i>	NKU Spotlight on Scholarship, Oct 2019
<i>Winning in a Quantitative Literacy Course</i>	MAA MathFest, Aug 2019
<i>Additive 3-Choosability of Planar Graphs with Girth 20</i>	KAS Annual, Nov 2018
<i>Polynomial peacemakers: avoiding scheduling conflicts</i>	MAA Indy Section, Oct 2018
<i>Taking Math to the Streets</i>	MathFest, Aug 2018
<i>Entire Colorability for a Class of Plane Graphs</i>	JMM, Jan 2018
<i>Avoiding Conflict through Zeros of Polynomials</i>	MathFest, Jul 2017
<i>Entire Colorability for a Class of Planar Graphs</i>	Cumberland Conference, May 2017
<i>Additive Coloring Planar Graphs with Girth at least 5</i>	Cumberland Conference, May 2017
<i>Fixing Congressional Dysfunction with Polynomials</i>	MAA SE Section, Mar 2017
<i>Entire Colorability for a Class of Planar Graphs</i>	Boca Conference, Mar 2017

**Posters**

<i>Taking Math to the Streets</i>	MathFest, Aug 2018
<i>IBL Mathematics Enrichment with Middle School Students</i>	IBL Conference, Jul 2017
<i>Mathematical Persistence in K-8 Summer Enrichment: A Preliminary Report</i>	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 “ <i>Surface Area, Volume, and Mammalian Heartrates</i> ” and “ <i>Will the Zombie Virus get you?</i> ” by predicting student resting heart rates and population growth rates	
– Mathematical thinking analyzed through games including “ <i>Finding Fifteen</i> ,” “ <i>Chomp</i> ,” and “ <i>Mastermind</i> ”	
– Mathematical skills reinforced in games (ex. “ <i>Kakuro</i> ,” “ <i>Towers of Hanoi</i> ”) or	

advanced mathematical ideas introduced in puzzles (ex. “*Drawing on Donuts*,” “*Extreme Relationships*”)

**Programs and Large Events**

- 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

**Sessions**

- Superpermutations* Western Massachusetts Math Circle, Apr 2019
- The Blind Professor* Rocky Mountain Math Teacher Circle, Nov 2015

PROFESSIONAL  
SERVICE

**Conferences**

- 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

**MAA**

- 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

**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