

# KATIE KRUZAN

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## Professional Summary

Driven professional energetic and passionate about the field of mathematics and the positive impact it can bring to a community. Research interests include applications of graph theory to the social sciences.

## Education

Doctor of Philosophy: Mathematics

*University of Illinois at Chicago*

4.00 GPA

*Chicago, IL*

August 2022 – Expected May 2028

Relevant courses:

- Computer Algorithms I & II
- Mathematical Foundations of Data Science
- Enumerative Combinatorics
- Combinatorial Optimization
- Mathematical, Statistical, and Scientific Software
- Programming Language Design
- Probabilistic Method
- Topics in Discrete Probability

Master of Science: Industrial Mathematics

*Middle Tennessee State University*

3.97 GPA

*Murfreesboro, TN*

August 2018 – December 2021

Relevant courses:

- Advanced Linear Algebra
- Sets and Logic
- Analysis I
- Number Theory
- Advanced Differential Equations I-II
- Advanced Combinatorics and Graph Theory
- Advanced Mathematical Statistics I
- Control Theory
- Thesis Research

Bachelor of Science: Applied Discrete Mathematics

Bachelor of Arts: Religious Studies

*Belmont University*

3.82 GPA

*Nashville, TN*

August 2014 - May 2018

Relevant courses:

- Calculus I-III
- Programming I-II
- General College Physics I-II
- Graph Theory
- Discrete Mathematics
- Probability
- Modeling and Simulation
- Differential Equations
- Linear Algebra
- Abstract Algebra
- Introduction to Analysis
- Research in Data Analysis

Associate of Arts: Mathematics

*Santa Fe College*

3.93 GPA

*Gainesville, FL*

May 2014

## Academic Achievements

*Dean's List*

*Fall 2014, Spring 2015, Spring 2016, Fall 2016, Spring 2017, Fall 2017, Spring 2018*

*Belmont University*

*Nashville, TN*

- To be eligible for Belmont University's Dean's List, a student must have a minimum load of 12 semester credit hours, no grade below a C, and a GA of 3.5 or higher.

*Stephen R. Campbell Mathematics and Computer Science Award*

*Department of Mathematics and Computer Science at Belmont University*

*2015 Recipient*

*Nashville, TN*

- This award recognizes the student who best demonstrates a high level of performance in introductory mathematics or computer science courses, clear potential for further study, and a positive attitude towards learning.

*Raymond H Medley, Jr. Outstanding Senior Mathematics Award*  
*Department of Mathematics and Computer Science at Belmont University*

*2018 Recipient*  
*Nashville, TN*

- This award recognizes the senior student who best demonstrates a high level of performance in mathematics courses, high level of community engagement, clear potential for further study, and a positive attitude towards learning.

*Alpha Chi National Honor Scholarship Society*  
*Tennessee Eta Chapter at Belmont University*

*March 2015- present*  
*Nashville, TN*

- Membership to this honor society is extended only to university juniors and seniors who rank in the top 10 percent of their classes and who demonstrate leadership and outstanding moral character.

*Dean's List*  
*Santa Fe College*

*Fall 2012- Spring 2014*  
*Gainesville, FL*

- Students who have taken a minimum of 9 credit hours of course work and who earn a GPA of 3.5 or above are placed on the Dean's List.

## Presenting/Publishing Opportunities

*Lead Author of "Explorations on Conjugations of Local Rotations"*  
*Master's Thesis*

*December 2021*  
*Middle Tennessee State University*

- **Abstract:** The process of manipulating single local rotations of vertices can represent standard topological graph theory techniques to add vertices or edges to an existing embedding. This paper looks to find patterns of these local rotations we can generalize. We start by reviewing the local rotations of vertices of small degree (3, 4, and 5). At those local rotations, we propose some hypotheses to be tested on local rotations of higher degree. We then move to outline an algorithm that can be used to analyze vertices of larger degrees programmatically.

*Lead Author and Presenter of "Optimizing Checkout Times"*  
*MAA-SE Sectional Meeting*

*March 2017*  
*Macon, GA*

- **Abstract:** Most major supermarkets have both general checkout lanes and express lanes with item limits. What is the express lane item limit that will minimize the average customer's waiting time? A natural extension of this question concerned how might we apply our findings to minimizing congestion in other contexts? This required more advanced probabilistic and programming methods to optimize the system. This model and future improvements may help lead to efficiently simulate optimizing congestion and traffic flow.

*Presenter of "Unique Opportunities for Growth and Collaboration via a Math/CS Club"*  
*MAA-SE Sectional Meeting*

*March 2016*  
*Birmingham, AL*

- **Abstract:** At Belmont, our math club strives to not only provide traditional opportunities for scholarly growth, but to serve the student as a whole. Through events such as Pizza, Problem Solving, and HackNight, we increase students' exposure to math and the ability to communicate math effectively. We pride ourselves in uniquely fostering relationships among students and professors by providing recreational activities that are extensions of our academic platform. In addition to typical club activities such as monthly meetings and lectures, we aim to produce social structures that allow students to thrive outside of the classroom through events like CRAM JAM. Moreover, our involvement in events that serve both Belmont and Nashville's communities produces well-rounded students that have a passion for math/computer science, as well as a serving heart.

## Professional Memberships

*President*  
*Vice President*  
*Belmont (MA(A)CM)*

*March 2017- May 2018*  
*March 2015- March 2017*  
*Nashville, TN*

- Served as President of Belmont University's joint chapter of the Mathematical Association of America and the Association for Computing Machinery for one term, and Vice President for two terms.
- Met with a team of four students and two advisors to coordinate meetings and events for the club twice a month.

- Created an agenda for officer meetings and led an officer meeting once a month.
- Coordinated a college wide celebration of Pi Day including participation from each student organization involved in the College of Science and Mathematics.

## Relevant Employment/Experience

*Teaching Assistant*  
*University of Illinois at Chicago*

*August 2022 – present*  
*Chicago, IL*

- Courses taught:
  - MATH 090 – Intermediate Algebra (Instructor of Record) (F23)
  - MATH 105 – Mathematical Reasoning (S24)
  - MATH 110 - College Algebra (F22)
  - MCS 260 – Introduction to Computer Science (S23, Su23)
  - MCS 360 – Introduction to Data Structures (F23)

*Applied Mathematics Consultant*  
*Katie Kruzan, LLC*  
*Chicago, IL*

*December 2020 - present*

- Offered Applied Mathematics and Machine Learning support to clients in the healthcare, technology, and music sectors.
- Key projects included:
  - Data Analytics lead. Introduced data science and machine learning tooling and application to increase business insight and promote data-led decision-making.
  - Master data management effort. Architected and implemented a data warehouse to allow for easy analytics
  - Meta-analysis creation. Synthesized results from multiple published academic papers to create a model using the results from all the studies.

*Adjunct Professor*  
*Belmont University*

*August 2021 - present*  
*Nashville, TN*

- Taught MTH1010: Quantitative Literacy and Reasoning to freshman students with various majors across the university.
- Managed and executed classes of 30 students in an online synchronous environment.

*Product Manager*  
*Mathematician*  
*Intern*

*January 2020 - January 2021*  
*May 2018 - December 2019*  
*May 2017 - May 2018*

*Perception Health*

*Brentwood, TN*

- Launched two products to market in 2020 and laid groundwork to release another in 2021.
- Created, developed, and managed a physician scoring and matching algorithm product to help find the ideal provider for any situation.
- Managed and aided in the development of disease prediction machine learning models to detect disease states before they are diagnosed.
- Developed a solution to find the best team of doctors for a particular patient using an application of a Minimal Spanning Tree Problem and Prim's algorithm.
- Analyzed large amounts of data (database of 26+ billion records) using Python, SQL, and Java.

*Calculus II Peer Tutor*  
*Belmont University*

*Spring 2017*  
*Nashville, TN*

- Graded student homework and assignments.
- Created and developed a Lab using Sage (an online computer algebra system) for the students to complete.
- Held weekly office hours for students to come get assistance if needed.
- Hosted class-wide study sessions before exams and occasionally taught old concepts in new ways in hopes of better understanding