John McAlister

Address: 1537 Coleman Rd. Apt K. Knoxville, TN. 37909
Phone: (513) 223-1616
email: jmcalis6@vols.utk.edu

Education

Expected May 2026 **PhD. in Mathematics** — University of Tennessee - Knoxville
Mathematical Biology concentration

May 2023 **M.S. in Mathematics** — University of Tennessee - Knoxville
Concurrent with PhD program

May 2021 **B.S. in Zoology** — The Ohio State University
With Honors Research Distinction

May 2021 **B.S. in Mathematics** — The Ohio State University
Math-Bio track

Research Interests

My research interests mostly concern dynamical systems on graphs. Using techniques from extremal graph theory and motivations from game theory, I like thinking about how, given a set of simple rules, networks can assemble and what they look like at equilibrium. I am also interested in how this work can be used in Mathematical biology to study ecological assemblages and make predictions about ecological networks.

Papers

under review Kirkland, S., Li, C., **McAlister, J.**, and Zhang, X. (2023) *Edge Addition and the Change in Kemeny's Constant.* Manuscript under review. `https://arxiv.org/abs/2306.04005`

April 2022 **McAlister, J.**, Hamilton, I. (2022) *An Adaptive Dynamic Model for the Vigilance Game in Group Foragers.* Journal of Theoretical Biology. 538:111033. DOI:10.1016/j.jtbi.2022.111030

Posters and Presentations

April 2023 **McAlister J.**(2023) *An Adaptive Dynamic Model for a Vigilance Game among Group Foragers.* Talk given at the SIAM Graduate Research Showcase at the University of Tennessee-Knoxville

October 2020 **McAlister, J.**, Hamilton, I. (2020) *An Adaptive Dynamic Model for the Vigilance Game in Group Foragers.* Poster presented at the Undergraduate Research Conference at the National Institute of Mathematical and Biological Synthesis at the University of Tennessee - Knoxville.

August 2019 Allen, R., Bains, A., Anderson, H., **McAlister, J.** (2019). *Parameter Estimation within an SIR Model of American Chestnut Blight.* poster presented at the Summer Research Expo at the University of Wisconsin - La Crosse

November 2019 Allen, R., Bains, A., Anderson, H., **McAlister, J.** (2019). *Parameter Estimation within an SIR Model of American Chestnut Blight.* talk given at the Undergraduate Research Festival at The Ohio State University

Workshops

May 2022 **CBMS conference: Interface of Mathematical Biology and Linear Algebra**
University of Central Florida, Orlando, FL.
—Attended talks from leading researchers about linear algebraic techniques in mathematical biology
—Researched the upper bound for an increase in Kemeny's constant by adding an edge to a graph
—Presented on preliminary findings to conference

Teaching Experience

Aug 2022 - present **Graduate Teaching Assistant- Instructor of Record** MATH 113
University of Tennessee-Knoxville, Knoxville, TN.
—Developed lecture material, in class activities, homework, and exams for two classes of 35+ students each semester
—Graded weekly homework and exams
—Hosted office hours weekly to assist students individually
—Attended regular professional development meetings to improve teaching techniques.

Aug 2021 - May 2022 **Graduate Teaching Assistant** MATH 119, 125
University of Tennessee-Knoxville, Knoxville, TN.
—Assisted in providing active learning instruction to 200 students per semester
—Participated in professional development to improve teaching techniques for developmental math
—Graded daily assignments and 4 exams per semester

Aug 2019- May 2021 **Undergraduate Teaching Assistant** MATH 1075, 1149, 1150
The Ohio State University, Columbus, OH.
—Worked approximately 20 hours per week
—Taught weekly recitations for two or three classes of thirty students for pre-college algebra, Trigonometry, or Precalculus
—Learned teaching styles and techniques for teaching developmental math and precalculus math

Leadership and Volunteerism

2022-present **President**—Math Graduate Student Council
—Hosted monthly Professional Development Luncheons for graduate students
—Created and oversaw social events for graduate students to grow community
—Communicated concerns of the graduate student body directly to the department head

2022-present **Member**—Graduate Teaching Assistantship Advisory Council
— Represented graduate student voices in decisions about how graduate students are mentored
— Assisted in developing GTA advising program along side faculty and administration.

2019-2020 **Secretary**—Jacob's Porch Board of Trustees
—Kept minutes of meetings and organized important documentation relating to church business
—Helped facilitate the transition of leadership after a formal change in ownership of the church
—Reshaped student engagement with the church during the COVID-19 pandemic

2018-2020 **President**—Jacob's Porch Student Organization (Lutheran Campus Ministry)
—Led religious student organization with more than 50 members
—Directed bimonthly leadership meetings.
—Oversaw and implemented programs for outreach and for community building.
—Managed and oversaw transition to remote engagement in response to the COVID-19 pandemic

Awards and Nominations

April 2023 **Eaves Teaching Award** - Finalist
—Nominated for excellence in teaching among early career graduate students
April 2023 **Math GTA Teaching Excellence Fellowship** - Winner
—Nominated for commitment to further the teaching mission of the University.

Research Experience

January 2022- Present **Graduate Researcher — Fefferman Lab**
University of Tennessee - Knoxville, Knoxville, TN.
Advisor: Prof. Nina Fefferman
—Coauthoring a paper about pandemic preparedness from results of a NSF funded workshop
—Studying extremal graph theory and game theory under the instruction of my advisor.

May 2018- May 2021 **Undergraduate Researcher — Hamilton Lab**
The Ohio State University, Columbus, OH.
Advisor: Prof. Ian Hamilton
—First authored undergraduate research thesis about the vigilance game in group foragers
—Derived novel discrete and continuous game theoretical models of vigilance
—Analyzed and visualized model output with tools coded in R
—Cared for fresh water Cichlids, in the Hamilton Lab, involved in behavioral ecology research
—Recorded temperature and water chemistry data weekly according the IACUC Protocols

May-Aug. 2019 **REU Fellow — Ecological Modeling of the Mississippi River Basin**
University of Wisconsin - La Crosse, La Crosse WI.
Advisors: Prof. Robert Allen, Prof. Anita Baines, Prof. James Pierce, Prof. Greg Sandland
—Expanded existing SIR type model for Chestnut Blight to include sprouting behavior
—Investigated model output using dynamical systems and real analysis
—Estimated and compared parameters from historical data using tools coded in R

Clinical Experience

May-Aug. 2018 **Plant and Pest Diagnostic Clinic Assistant**
Ohio Department of Agriculture — Plant and Pest Diagnostic Clinic, Columbus OH
—Tested plant samples from across the state for pathogens using methods like Simple Plating, Berlese funnel, ELISA, and ImmunoStrip Tests
—Prepared media for fungal and bacterial plating
—Cleaned lab spaces appropriately and handled sensitive biological samples including level 1 bio-hazardous material
—Assisted with Gypsy Moth sampling across central Ohio

May 2016-Aug. 2017 **Veterinary Kennel Assistant**
Liberty Veterinary Hospital, Liberty Twp. OH.
—Cared for around 30 pets daily as part of a small team
—Administered medication to sick and recovering pets
—Cleaned kennel and hospital facilities to American Animal Hospital Association (AAHA) standards
—Trained five new hires on animal care procedures and AAHA standards

Relevant Course Work

University of Tennessee - Knoxville

Math 571-572 **Numerical Analysis I, II** - Autumn 2022, Spring 2023
—Discussed linear algebraic results for numerically solving linear problems
—Discussed analytic results for the derivation of numerical methods for solving ODEs and PDEs
—Learned the techniques of proving convergence, consistence, and stability for numerical methods.

Math 535-536 **Partial Differential Equations I, II** - Autumn 2022, Spring 2023
—Discussed Properties of solutions The Poisson equations, Poisson equation, Heat equation etc.
—Proved existence and unitquenss theorems for particular PDEs
—Developed tools like Power series tools and energy methods to analyze PDEs

Math 681-682 **Advance Mathematical Ecology** - topics course in Spring 2022, Autumn 2022, Spring 2023
—Learned history and techniques of agent based models and hybrid modeling using NetLogo
—Learned fundamentals of evolutionary game theory through numerical and symbolic approaches
—Practiced essential tools for mathematical modeling in Python

Math 581-582 **Mathematical Biology I, II** - Autumn 2021, Spring 2022
—Learned dynamical system techniques analyze unstructured models in ecology
—Discussed optimal control of ODE systems
—Used PDE and linear algebraic techniques to investigate structured models in ecology

Math 578 **Numerical Methods for Partial Differential Equations**-Spring 2022
—Discussed numerical methods and PDE theory
— Produced final project using a numerical method to investigate spread of an invasive species.

Math 531 **Ordinary Differential Equations I**-Autumn 2021
—Learned analysis for differential equations and discussed and proved crucial results in ODE

Previous Course Work

Zoology Course Work

Autumn 2020 **Comparative Vertebrate Anatomy** —EEOB 4510
Autumn 2020 **Integrated Biology** — BIO 3401
Spring 2020 **Organismal Diversity** EEOB 3320
Spring 2020 **Evolution and Ecology of Mammals** EEOB 4220
Autumn 2019 **Evolution** — EEOB 3310
Spring 2019 **Ecology** — EEOB 3410
Autumn 2018 **Honors Molecular Genetics**— MOLGEN 4500H

Mathematics Course Work

Autumn 2021 **Numerical Methods**—Math 471
Spring 2021 **Combinatorics**—MATH 4574
Spring 2021 **Partial Differential Equations** —MATH 4557
Autumn 2020 **Abstract Algebra I**—MATH 4581
Spring 2020 **Introductory Analysis II**— MATH 4548
Spring 2020 **Mathematical Biology** — MATH 3350
Autumn 2019 **Introductory Analysis I**— MATH 4547
Autumn 2019 **Dynamical Systems** — MATH 4556
Spring 2019 **Introduction to Mathematical Statistics II**—STAT 4202
Autumn 2018 **Probability**—MATH 4530

Software Experience

Proficient

- R
- Python
- MatLab
- LaTeX
- Mathematica

Experienced

- C#
- Java
- Maple
- JMP
- NetLogo