Rayan K. Ibrahim

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RESEARCH INTERESTS

Extremal and structural graph theory. Applications of graph theory to topology and the natural sciences. Cellular automata and infection processes on graphs (r-neighbor bootstrap percolation).

EMPLOYMENT

Visiting Assistant Professor of Mathematics, Lafayette College   July 2024 – Current

EDUCATION

Ph.D. Systems Modeling and Analysis, Virginia Commonwealth University   August 2024
Concentration in Discrete Mathematics
- Dissertation: Problems in Graph Theory With Applications to Topology and Modeling RNA
- Advisors: Craig E. Larson & Allison H. Moore

M.S. Mathematics, Virginia Commonwealth University   May 2021

B.S. Mathematics, College of Staten Island   Jan. 2019
- The Verrazzano School - Selective Undergraduate Honors Program

AWARDS & HONORS

Outstanding Graduate Student Teaching Award   May 2024
- Virginia Commonwealth University

PUBLICATIONS & PREPRINTS

4. **Determinants of Simple Theta Curves**
   Journal of Knot Theory and Its Ramifications, with M. Elpers, A. H. Moore. *Accepted.*

3. **Bootstrap Percolation, Connectivity, and Graph Distance**
   The Art of Discrete and Applied Mathematics, with H. LaFayette, K. McCall. *Accepted.*

2. **Introducing 3-Path Domination**
   Journal of Combinatorial Mathematics and Combinatorial Computing (2024), with E. King, R. Jackson.

1. **Submesoscale Kinematic Properties in Summer and Winter Surface Flows in the Northern Gulf of Mexico**
   Journal of Geophysical Research: Oceans (2020), with M. Berta, A. Griffa, A. C. Haza, J. Horstmann, H. S. Huntley, B. Lund, T. M. Özgökmen, A. C. Poje.

PUBLICATIONS IN PREPARATION

3. **2-Neighbor Bootstrap Percolation and Forbidden Induced Subgraphs**
   In Preparation.

2. **r-Neighbor Bootstrap Percolation: Complementary Prisms and Bounds**
   In Preparation.

1. **2-Neighbor Bootstrap Percolation in 2-connected, Diameter 2 Graphs**
   with H. LaFayette, K. McCall. *Accepted.*

Teaching Experience

Lafayette College

Math 162, Calculus II	Sp25
Math 161, Calculus I	(x2) F24
Math 125, Calculus for the Life Sciences	F24
Math 104, A World of Mathematics	(x2) Sp25

Virginia Commonwealth University (Instructor)

Math 200, Calculus I	F23
Math 151, Precalculus	Sm21, Sm22, Sm23
Math 141, Algebra with Applications	F20
Math 131, Introduction to Contemporary Mathematics	Sm20

Virginia Commonwealth University (TA)

Oper 327, Mathematical Modeling	Sp21
Stat 210, Basic Practice of Statistics	F19
Math 151, Precalculus	Sp20

Presentations

6. **2-Neighbor Bootstrap Percolation in Graphs**. Lafayette College. (Apr. 2024)

5. **New Results On Bootstrap Percolation**. Virginia Commonwealth University Discrete Mathematics Seminar. (Nov. 2023)

4. **Determinants of Simple Theta Curves**. Joint Mathematics Meetings, AMS Contributed Paper Session on Topology. (Jan. 2023)

3. **The Structure of Graphs With Independence Number 2**. Virginia Commonwealth University Discrete Mathematics Seminar. (Feb. 2022)

2. **The Reconstruction Problem**. Virginia Commonwealth University SYSM Research Seminar. (Feb. 2021)

1. **Introducing 3-Path Domination**.
   - National Technical Institute for the Deaf, Rochester Institute of Technology. (Jul. 2018)
   - MAA MathFest 2018 Undergraduate Sessions. (Aug. 2018)
   - The Ohio State University Young Mathematicians Conference 2018. (Aug. 2018)

Outreach & Service

Math Kangaroo Competition   March 21, 2024
- Checked students in and proctored test at Virginia Commonwealth University.

Geometry Summer Camp, Virginia Commonwealth University   Jun. 12 – 16, 2023
- Guided middle school students through interactive mathematics activities and demonstrations.

Website Designer, College of Staten Island   Jul. 2017 – Aug. 2017
- Funded by: NYC DYCD Summer Youth Employment Program
- The Verrazzano Honors School and Macaulay Honors College Summer Bridge Program.

RESEARCH EXPERIENCE		

Graduate Research Assistant, Virginia Commonwealth University — Aug. 2021 – May 2024
- Funded by: NSF DMS–2204148, & The Thomas F. and Kate Miller Jeffress Memorial Trust, Bank of America, Trustee.
- Topology, Knot Theory, Graph Theory, Combinatorics

Undergraduate Research Assistant, College of Staten Island — Feb. 2017 – Jun. 2019
- Funded by: Grants from The Gulf of Mexico Research Initiative to the Consortium for Advanced Research on Transport of Hydrocarbon in the Environment (CARTHE)
- Oceanography, Data Processing and Presentation.
- Supervisor: Andrew C. Poje, PhD

Undergraduate Researcher, Hobart and William Smith Colleges — May 2018 – Aug. 2018
- Funded by: National Science Foundation DMS–1757616
- REU program, Graph Theory
- Supervisor: Erika L.C. King, PhD

OTHER ACTIVITIES

AMS Math Research Community: Trees in Many Contexts *(Selected)* — Jun. 5 – 11, 2022
- Participant in week-long workshop with funding from the AMS and National Science Foundation DMS–1641020.

Graph Theory Computational Discovery Lab — May 2022 - 2024
- Participant in annual 2-week research workshop hosted at VCU with a focus on discrete mathematics and generating conjectures via automated conjecturing (The Graph Brain Project).
- Topics Explored: Graphs, Knots, and Independence (2022), Hadamard Matrices (2023), Autoconnected Graphs (2024).

The Discrete MathemaTea, Virginia Commonwealth University — Aug. 2022 – May 2024
- Co-organizer with Neal Bushaw.
- An informal, student led discussion group on current research.

Math and Magic with Manjul Minicourse — Sep. 2018 – Dec. 2018
- National Museum of Mathematics, New York, NY
- Participant in a minicourse involving magic tricks and the math behind them.

Math Club, College of Staten Island — Aug. 2017 – May 2018
- President and Event Organizer

Computer Science Club, College of Staten Island — Sep. 2016 – May 2018
- Member.

TECHNICAL SKILLS

Programming:	Matlab, Python, SageMath
Markup:	LaTeX, HTML, CSS, Word, Excel
Operating Systems:	Windows, Linux