

# MATTHEW J. KUKLA

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## EDUCATION

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### University of Maryland

*Mathematics, BSc.*

awarded May 2022

*College Park, Maryland, USA*

- Selected for First-Year Innovation and Research Experience (FIRE)

## PROFESSIONAL EXPERIENCE

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### BlueHalo Labs

*Research Engineer*

June 2022 - present

*Rockville, Maryland, USA*

- Researcher in mathematics, focused on applications to automated reasoning, graph theory, scientific computing, signal processing
  - Design, implement, and deploy novel graph clustering algorithms. Optimize with high-performance linear algebra libraries.
  - Build algorithms for inference across relational structures
  - Develop and evaluate topological data analysis methods
- Write research articles, technical reports for delivery to government, academic, and private-sector customers

### The Math Citadel

*Researcher*

March 2019 - present

- Conduct original research in mathematics, including fuzzy sets/algebras, graphical probabilistic models
- Develop software packages:
  - Build digital signal processing software
  - Implement and optimize numerical methods
- Contribute to technical articles and professional lecture material

### Patton Electronics

*Software Engineering Intern*

Summer 2016

*Gaithersburg, Maryland, USA*

- Developed a Linux-based operating system for prototype VDSL router
- Wrote, patched hardware-specific kernel modules

## SKILLS

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### Programming Languages

C, OCaml, Python, Fortran, Julia, Prolog, Java, MATLAB

### Operating Systems

Linux, UNIX (BSD and Solaris), MS-DOS

### Tools, Libraries

Shell scripting, sed/AWK, Git, L<sup>A</sup>T<sub>E</sub>X, NumPy, SciPy, BLAS

### Web, Cloud

HTML, CSS, Gopher, OpenSearch, Solr

## PUBLICATIONS AND PREPRINTS

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### Logical Limit Laws for Layered Permutations and Related Structures

*Joint with Samuel Braunfeld.*

*Published, Enumerative Combinatorics and Applications. 2 no. 4. (2021)*

### Colored Convex Linear Orders and Logical Limit Laws

*Preprint. (2021)*

## **Rings of Typed Ordered Fuzzy Numbers**

*Joint with Rachel Traylor.*

*Preprint, arXiv:2010.07764. (2020)*

## **SELECTED TALKS**

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### **Relational Structures, Logical Limit Laws, and Layered Permutations**

*Knots in Washington 51, George Washington University (2025)*

### **First-Order Logical Limit Laws, Ordered Structures, and Permutation Classes**

*Computability & Complexity Seminar, George Washington University (2025)*

### **Double Factorization Systems and Double Fibrations**

*7th International Conference on Applied Category Theory, University of Oxford (2024)*

### **Double Categorical Limits**

*The Adjoint School (2024)*

### **Logical Limit Laws for Layered Permutations and Related Structures**

*Logic Seminar, University of Maryland (2022)*

### **Categorical Mirror Symmetry of Elliptic Curves (two lecture series)**

*Geometry and Physics Seminar, University of Maryland (2018)*

### **Generalized Calabi-Yau Manifolds**

*Geometry and Physics Seminar, University of Maryland (2018)*