

# 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

## PROFESSIONAL EXPERIENCE

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**The Math Citadel**

*Academic Researcher*

March 2019 - present

- Conduct original research in fuzzy algebra, stochastic geometry, graphical probabilistic models
- Develop software packages:
  - Design and implement fuzzy anomaly detection models
  - Optimize numerical methods for modeling random processes

**BlueHalo Labs**

*Research Engineer*

June 2022 - May 2025

*Rockville, Maryland, USA*

- Researcher in mathematics with a focus on graph theory, scientific computing, logic
  - Designed, implemented, and deployed novel graph clustering algorithms. Optimized with high-performance linear algebra libraries.
  - Constructed systems for knowledge representation, formal ontology, and automated reasoning across large relational structures
  - Developed specialized tools for signal processing and harmonic analysis
- Wrote research articles and technical reports for delivery to government, academic, and private-sector customers

## 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**

Shell scripting, sed, AWK, Git,  $\text{\LaTeX}$

**Libraries**

NumPy, SciPy, BLAS, LAPACK

**Web**

HTML, CSS, OWL, RDF, Gopher, AWS

**Databases**

SQL, Solr, ElasticSearch, Cypher

**Radio**

NEC2, GNURadio, SDR

## PUBLICATIONS AND PREPRINTS

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**Double Orthogonal Factorization Systems**

*(with C.B. Aberlé, Elena Caviglia, Rubén Maldonado, Luca Mesiti, Dorette Pronk, and Tanjona Ralaivaosoana)*  
*Preprint, arXiv:2509.26343, submitted. (2025)*

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

*(with Samuel Braufeld)*  
*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**

*(with Cassandra Traylor)*

*Preprint, arXiv:2010.07764. (2020)*

## **SELECTED TALKS**

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

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

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

*Computability & Complexity Seminar, The 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)*

## **LICENSES AND CERTIFICATIONS**

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### **EPA Part 608 Universal Certification**

July 2025

For service of stationary HVACR equipment and handling of refrigerants.