Eion Blanchard

CONTACT	eionmb2@illinois.edu

EDUCATION

University of Illinois at Urbana-Champaign — *Champaign, IL*
Doctor of Philosophy, Mathematics — Expected May 2023
Advanced to candidacy in Apr 2021 (adviser: Philipp Hieronymi)

Master of Science, Applied Mathematics — May 2020
Computational Science and Engineering (CSE) concentration

University of Florida — *Gainesville, FL*
Bachelor of Science, Mathematics — May 2018
Degree conferred *summa cum laude* · Honors Program · GPA 3.97

INTERESTS

applied science, algorithms and complexity theory, mathematical logic, theoretical computer science, voting systems and gerrymandering, optimization, numerical analysis

PUBLICATIONS

Decidability bounds for Presburger arithmetic extended by sine (2022) with P. Hieronymi (arXiv 2204.00099, submitted to Annals of Pure and Applied Logic)

Model-Guided Synthesis of Inductive Lemmas for FOL with Least Fixpoints (2022) with P. Madhusudan, et al. (Proc. of the ACM on Programming Languages, vol. 6)

Resilient adjudication in non-intrusive inspection with hierarchical object and anomaly detection (2022) with D. Krofcheck, et al. (Proc. of SPIE Defense + Commercial Sensing, vol. 12104)

A decoder for the color code with boundaries (2020) with B. La Cour, et al. (arXiv 2003.11602)

Measuring Congressional district meandering (2018) with K. Knudson (arXiv 1805.08208)

WORK

Microsoft — *Redmond, WA*
Research Intern — May 2022 - Aug 2022
· Reduced runtimes by 12% and resulting file size by 21% for ballot encryption of small plurality and large n-of-m voting contests on Democracy Forward's ElectionGuard
· Generated and proved correctness of 34 benchmark sets to prove necessity of election record verification checks and for quality assurance of third-party, end-to-end verifiers

Research Intern — May 2021 - Aug 2021
· Reduced runtimes by 33% and memory footprints by 90% for large industry problems in PUBO form on Azure Quantum's optimization solvers
· Detailed algorithms in C++ and Python for factored forms of cost function terms, accelerating Markov transition cost differencing from linear (in factor length) to constant time

Sandia National Laboratories — *Albuquerque, NM*
Mathematics and Analytics Research & Development Intern — May 2020 - Aug 2020
· Improved average precision of object detection by 6% over baseline models from FAIR's Detectron2 by developing a graph theoretic ensemble learning method in Python
· Crafted graph visualizations and analyzed temporal networks with GCNs

Applied Research Laboratories, University of Texas at Austin — *Austin, TX*
Research Engineering Scientist Associate — June 2019 - Aug 2019
· Bounded quantum color code error thresholds to $4-8\%$ for Pauli X errors and $0.7-0.8\%$ for Pauli Z errors by implementing decoder with measurement-based lattices in Python

Metric Geometry and Gerrymandering Group — *Cambridge, MA*
Voting Rights Data Institute Fellow — June 2018 - July 2018
· Gathered and analyzed vast demographic and election voting data sets for districting plans via QGIS visualizations, topological data analysis, and Markov chain Monte Carlo methods
· Prototyped *Districtr* app in Python to empower self-identification of communities of interest

Budapest Semesters in Mathematics, Eötvös Loránd University — *Budapest, Hungary*
Undergraduate Researcher and Study Abroad Student — June 2017 - Aug 2017

University of Washington — *Seattle, WA*
NSF Research Experience for Undergraduates (REU) Participant — June 2016 - Aug 2016

SKILLS	
	Intermediate: Python
	Basic: Git, C++, MATLAB, SQL, R

AWARDS		
	University Fellowship, Mathematics Department	Spring 2022
	List of Teachers Ranked As Excellent, Outstanding Distinction	Fall 2019; Spring 2019 & 2020
	List of Teachers Ranked As Excellent	Fall 2020, Spring 2021
	Anderson Scholarship, Highest Distinction	Oct 2016
	Benacquisto Scholarship	Aug 2014
	Bright Futures Florida Academic Scholarship	Aug 2014
	National Merit Scholarship	June 2014

TEACHING

University of Illinois at Urbana-Champaign — *Champaign, IL*

Research Assistant, Department of Mathematics — Aug 2022 - Dec 2022
· Developing new Linear Algebra for Data Science course with Python

Teaching Assistant, Department of Mathematics — Aug 2018 - Dec 2021
· Led Python programming labs for Linear Algebra with Computational Applications; developed weekly lessons and homework assignments; managed 8 classroom assistants
· Developed course content and led active-learning sections for Calculus I and II under the Merit program for students underrepresented in STEM

Teaching Assistant, Inmas — Jan 2021 - Feb 2021
· Developed and led NumPy tutorials; led problem-solving sessions for Python workshop

Research Mentor, Illinois Geometry Lab — Aug 2018 - Dec 2020
· Managed team of 5 undergraduate researchers in automated theorem proving
· Verified mathematical proofs with MSR's Lean and mechanized arithmetic for Ostrowski numeration systems with Walnut

University of Florida — *Gainesville, FL*

Teaching Assistant, Department of Computer Science & Engineering — Aug 2016 - May 2018
· Led weekly discussion sections for Applications of Discrete Structures

TALKS

"Decidability bounds for Presburger arithmetic extended by sine"

American Mathematical Society Spring Central Meeting	*West Lafayette, IN*	Mar 2022
Fields Institute Model Theory Seminar	*Toronto, ON, Canada*	Mar 2022
University of Illinois Logic Seminar	*Champaign, IL*	Apr 2021

"Ensemble learning with graph inference cliques"

Sandia Machine Learning & Deep Learning Workshop	*Albuquerque, NM*	Aug 2020

"When is scalar multiplication decidable?"

University of Illinois Computability Seminar	*Champaign, IL*	Apr 2020

"Measuring Congressional district meandering and gerrymandering"

Wolfram Research Summer School	*Champaign, IL*	Nov 2019

SERVICE

Association for Women in Mathematics — *Champaign, IL*
Member, University of Illinois Chapter — Aug 2018 - Present

Varsity Vocals — *Chicago, IL*
Judge, International Championship of Collegiate A Cappella — Feb 2019 - Present

Gestalt — *Gainesville, FL*
Director of Music, Co-Founder — May 2016 - Apr 2018
· Created and directed a cappella group to 1st place at ICCA Quarterfinals and to Runner-up at ICCA Semifinals, SoJam, BOSS, and NACC
· Garnered 13 nominations and 3 wins at the Contemporary A Cappella Recording Awards

University of Florida Mathematics Society — *Gainesville, FL*
Secretary — Sept 2014 - May 2017