

RYAN W. MATZKE

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EDUCATION

Ph.D. in MATHEMATICS, **University of Minnesota**

Expected May 2021

Advisor: Dmitriy Bilyk

M.S. in MATHEMATICS, **University of Minnesota**

April 2019

B.A. in MATHEMATICS, **Gettysburg College**

May 2015

Minor: Physics

Magna Cum Laude, Honors in Mathematics, Honors in Physics

Spring 2014 Budapest Semester in Mathematics

RESEARCH INTERESTS

Potential Theory, Discrepancy Theory, Approximation Theory, Convex Geometry, Additive Combinatorics, Harmonic Analysis, and Graph Theory.

PUBLICATIONS

Published/Accepted

1. On the Fejes Tóth Problem about the Sum of Angles Between Lines (with Dmitriy Bilyk). *Proceedings of the AMS*, **147**(1) (2019), 51-59. doi:[10.1090/proc/14263](https://doi.org/10.1090/proc/14263), arXiv:[1801.07837](https://arxiv.org/abs/1801.07837)
2. The Maximum Size of (k, l) -Sum-Free Sets in Finite Cyclic Groups (with Béla Bajnok). *Bulletin of the Australian Mathematical Society*, **99**(2) (2019), 184-194. doi:[10.1017/S000497271800117X](https://doi.org/10.1017/S000497271800117X), arXiv:[1809.01767](https://arxiv.org/abs/1809.01767)
3. The Edge Grundy Number of the Regular Turan Graphs (with Matthew DeVilbiss and Peter Johnson). *Bulletin of the Institute of Combinatorics and its Applications*, **84** (2018), 45-52. <http://luca-giuzzi.unibs.it/ICA/Volumes/84/Reprints/BICA2018-02-Main-Reprint.pdf>
4. Rainbow Connectivity in some Cayley Graphs (with Sheng Bau, Peter Johnson, Edna Jones, and Khumbo Kumwenda). *The Australasian Journal of Combinatorics*, **71**(3) (2018), 381-393. https://ajc.maths.uq.edu.au/pdf/71/ajc_v71_p381.pdf
5. Stolarsky Principle and Energy Optimization on the Sphere (with Dmitriy Bilyk and Feng Dai). *Constructive Approximation*, **48** (2018), no.1, 31-60. doi:[10.1007/s00365-017-9412-4](https://doi.org/10.1007/s00365-017-9412-4), arXiv:[1611.04420](https://arxiv.org/abs/1611.04420)
6. Connected Minimum Secure Dominating Sets in Grids (with Johnathan Barnett, Adam Blumenthal, Peter Johnson, Cadavious Jones, and Egbert Mujuni). *AKCE International Journal of Graphs and Combinatorics*, Vol. 14 Issue 3 (2017), 216-223. doi:[10.1016/j.akcej.2017.03.003](https://doi.org/10.1016/j.akcej.2017.03.003)
7. The Edge Grundy Number of some Graphs (with Loren Anderson, Matthew DeVilbiss, Sarah Holliday, Peter Johnson, Anna Kite, and Jessica McDonald). *International Journal of Mathematics and Computer Science*, **12** (2017), no. 1, 13-26. <http://ijmcs.future-in-tech.net/12.1/R-EdgeGrundyNumbers.pdf>
8. On the Minimum Size of Signed Sumsets in Elementary Abelian Groups (with Béla Bajnok). *The Journal of Number Theory*, **159** (2016), 384 - 401. doi:[10.1016/j.jnt.2015.07.023](https://doi.org/10.1016/j.jnt.2015.07.023), arXiv:[1412.1609](https://arxiv.org/abs/1412.1609)
9. The Minimum Size of Signed Sumsets (with Béla Bajnok). *The Electronic Journal of Combinatorics*, **22**(2) P2.50 (2015). doi:[10.37236/4881](https://doi.org/10.37236/4881), arXiv:[1412.1608](https://arxiv.org/abs/1412.1608)
10. Note on the Secure-Domination Number of a Graph (with Matthew DeVilbiss, Bradley Fain, and Peter Johnson). *Bulletin of the Institute of Combinatorics and its Applications*, **74** (2015), 113-119.

Submitted/in progress

1. Energy on Spheres and Discreteness of Minimizing Measures (with Dmitriy Bilyk, Alexey Glazyrin, Josiah Park, Oleksandr Vlasiuk). Submitted, arXiv:[1908.10354](https://arxiv.org/abs/1908.10354)

2. Optimal Measures for p -frame Energies on Spheres (with Dmitriy Bilyk, Alexay Glazyrin, Josiah Park, and Oleksandr Vlasjuk). Submitted, arXiv:1908.00885
3. On Subgraphs with Prescribed Eccentricities (with Kelly Bragan, Peter Dankelmann, Matthew DeVilbiss, and David Erwin). Submitted.
4. Stolarsky Principle: Interplay between Discrepancy and Optimal Energy (with Dmitriy Bilyk and Maxim Skriganov). In progress.
5. Stolarsky Principle on Hamming graphs (with Dmitriy Bilyk). In progress.
6. On the Signed Critical Numbers of Finite Abelian Groups (with Béla Bajnok). In progress.
7. Minimum size of $(k, 0)$ -sum-free Sets (with Béla Bajnok). In progress.

PRESENTATIONS

Invited Talks

MINIMIZATION OF MULTIVARIATE ENERGY
 2020 Shenks Conference
 *Postponed due to COVID-19

May 2020
 Vanderbilt University

GENERALIZED STOLARSKY PRINCIPLE
 AMS Central Spring Sectional Meeting: Optimization for Discrete Geometry
 *Postponed due to COVID-19

April 2020
 Purdue University

DISCRETENESS OF ENERGY MINIMIZING MEASURES
 NDSU Mathematics Colloquium

3/3/2020
 North Dakota State University

SUPPORT OF MINIMIZERS OF THE p -FRAME ENERGY
 Joint Math Meetings: AMS Special Session on Frames, Designs, and Optimal Spherical Configurations

1/15/2020
 Denver, CO

Contributed Talks

SUPPORT OF MINIMIZERS OF THE p -FRAME ENERGY
 Barcelona Analysis Conference

6/27/2019
 Universitat de Barcelona

MAXIMUM SIZE (k, l) -SUM-FREE SETS IN FINITE ABELIAN GROUPS
 17th Workshop on Combinatorial and Additive Number Theory

5/22/2019
 City University of New York

MINIMIZERS OF THE p -FRAME ENERGY
 CONDCOMP Optimal Point Configurations and Potential Theory Workshop

4/11/2019
 CIEM, Castro Urdiales, Spain

ENERGY OPTIMIZATION WITH ORTHOGONALIZING POTENTIALS ON THE SPHERE
 35th Southeastern Analysis Meeting

3/17/2019
 University of Alabama

ENERGY OPTIMIZATION WITH ORTHOGONAL POTENTIALS ON THE SPHERE
 Discrepancy Workshop

11/28/2018
 RICAM, Linz, Austria

ON FEJES TÓTH'S CONJECTURES ON THE SUM OF ANGLES
 BSM 100/3 Reunion

6/29/2018
 BSM, Budapest, Hungary

ON FEJES TÓTH'S CONJECTURES ON THE SUM OF ANGLES
 34th Southeastern Analysis Meeting

3/23/2018
 Georgia Institute of Technology

FINDING THE MAXIMUM SIZE OF (k, l) -SUM-FREE SETS IN FINITE CYCLIC GROUPS
 49th Southeastern International Conference on Combinatorics,
 Graph Theory & Computing

3/7/2018
 Florida Atlantic University

STOLARSKY PRINCIPLE AND ENERGY OPTIMIZATION ON THE SPHERE
 Joint Math Meetings

1/13/2018
 San Diego, CA

STOLARSKY PRINCIPLE AND ENERGY OPTIMIZATION ON THE SPHERE
 SAMSA Conference

11/21/2017
 Arusha, Tanzania

STOLARSKY PRINCIPLE AND ENERGY OPTIMIZATION ON THE SPHERE 3rd Annual Meeting of the SIAM Central States Section	10/1/2017 Colorado State University
STOLARSKY PRINCIPLE AND ENERGY OPTIMIZATION ON THE SPHERE Program on Tractability of High Dimensional Problems and Discrepancy	9/27/2017 ESI, Vienna, Austria
STOLARSKY PRINCIPLE AND ENERGY OPTIMIZATION ON THE SPHERE AMS Fall Central Sectional Meeting	9/10/2017 University of North Texas
LOOKING FOR SUM-FREEDOM: THE MAXIMUM SIZE OF (k, l) -SUM-FREE SETS 48th Southeastern International Conference on Combinatorics, Graph Theory & Computing	3/10/2017 Florida Atlantic University
LOOKING FOR SUM-FREEDOM: THE MAXIMUM SIZE OF (k, l) -SUM-FREE SETS Joint Math Meetings	1/6/2017 Atlanta, GA
ZEROING IN ON THE BEST SUBSETS: THE MAXIMUM SIZE OF $(k, 0)$ -SUM-FREE SETS SAMSA Conference	11/26/2015 University of Namibia
WHEN THINGS GET A LITTLE EDGY: FINDING THE GRUNDY NUMBER OF LINE GRAPHS MAA MathFest	8/8/2014 Portland, OR
SUBTRACTION ADDS NOTHING: CALCULATING THE MINIMUM SIZE OF h -FOLD UNRESTRICTED SIGNED SUMSETS OF m -SIZED SUBSETS OF CYCLIC GROUPS Joint Math Meetings	1/17/2014 Baltimore, MD
EDGE-GRUNDY NUMBERS OF COMPLETE MULTIPARTITE GRAPHS SAMSA Conference (with Matthew DeVilbiss)	11/28/2013 University of Stellenbosch
SUBTRACTION ADDS NOTHING: CALCULATING THE MINIMUM SIZE OF h -FOLD UNRESTRICTED SIGNED SUMSETS OF m -SIZED SUBSETS OF CYCLIC GROUPS MAA MathFest	8/2/2013 Hartford, CT
Poster Presentations	
DISCRETENESS OF ENERGY MINIMIZING MEASURES International Conference on Approximation and Potential Theory *Postponed due to COVID-19	March 2020 Georgia Southern University
STOLARSKY PRINCIPLE AND ENERGY OPTIMIZATION ON THE SPHERE Workshop in Convexity and Geometric Aspects of Harmonic Analysis	12/9/2019 Georgia Institute of Technology
STOLARSKY PRINCIPLE AND ENERGY OPTIMIZATION ON THE SPHERE Workshop in Approximation, Sampling, and Compression in High Dimensional Problems	6/20/2019 INI, Cambridge, UK
MINIMIZERS OF THE p -FRAME ENERGY Lectures in Fourier Analysis	5/13/2019 University of Wisconsin - Madison
MINIMIZERS OF THE PROBABILISTIC p -FRAME POTENTIAL Frame Theory and Exponential Bases Workshop	6/4/2018 ICERM, Providence, RI
ON FEJES TÓTH'S CONJECTURES ON THE SUMS OF ANGLES Optimal and Random Point Configurations Workshop	2/28/2018 ICERM, Providence, RI
WHAT DIFFERENCE SUBTRACTION MAKES: THE MINIMUM SIZE OF SIGNED SUMSETS Joint Math Meetings	1/12/2015 San Antonio, TX
IT JUST DOESN'T ADD UP: THE FROBENIUS NUMBER OF THREE NUMBERS Joint Math Meetings	1/17/2014 Baltimore, MD

WHEN THINGS GET A LITTLE EDGY: FINDING THE GRUNDY NUMBER OF LINE GRAPHS
Conference of Research Experiences for Undergraduates Student Scholarship
(with Matthew DeVilbiss) 10/28/2013
Arlington, VA

WHEN THINGS GET A LITTLE EDGY:
FINDING THE GRUNDY NUMBER OF LINE GRAPHS 10/25/2013
HHMI Poster Session Gettysburg College

SUBTRACTION ADDS NOTHING 4/19/2013
24th Sigma Xi Student Research Symposium St. Joseph's University

Local Presentations (University of Minnesota - Twin Cities)

ENERGY OPTIMIZATION ON THE SPHERE 4/2/2019
Master's Thesis and Oral Preliminary Exam

STOLARSKY PRINCIPLE AND ENERGY OPTIMIZATION ON THE SPHERE 4/18/2017
Analysis and PDE Working Seminar

ZEROING IN ON THE BEST SUBSETS: THE MAXIMUM SIZE OF $(k, 0)$ -SUM-FREE SETS 1/28/2016
Math Club

Local Presentations (Gettysburg College)

WHAT CAN SUBTRACTION ADD TO SUMS? 1/23/2014
Mathematics Colloquium

WHAT CAN SUBTRACTION ADD TO SUMS? 12/5/2013
Mathematics Research Symposium

WHEN THINGS GET A LITTLE EDGY: FINDING THE GRUNDY NUMBER OF LINE GRAPHS 9/12/2013
Mathematics Colloquium

NO NEGATIVE CONSEQUENCES 5/2/2013
Mathematics Research Symposium

Non-Research Presentations

MINIMAL RIESZ ENERGY POINT CONFIGURATIONS FOR RECTIFIABLE d -DIMENSIONAL MANIFOLDS 10/2/2019
Summer School on Sphere Packings and Optimal Configurations Kopp, Germany

OPTIMAL ASYMPTOTIC BOUNDS FOR SPHERICAL DESIGNS 12/8/2017
Analysis and PDE Working Seminar University of Minnesota - Twin Cities

GLACIALLY SLOW GLACIERS: A QUADRATIC APPROXIMATION 4/26/2016
TO BUDYKO'S ICE-ALBEDO FEEDBACK MODEL WITH THE LINE DYNAMICS University of Minnesota - Twin Cities
Climate Modeling Seminar

FIXED AND FURIOUS: FIXED POINTS IN MATHEMATICS 12/11/2014
Mathematics Capstone Colloquium Gettysburg College

SIGNAL AND IMAGE ANALYSIS 11/15/2012
Mathematics Colloquium Gettysburg College

TEACHING EXPERIENCE

Instructor, University of Minnesota (College of Liberal Arts)

MATH 4993: Directed Study (Research in Graph Theory and Additive Combinatorics) Spring 2018

Teaching Assistant, University of Minnesota

MATH 3592H: Honors Math 1 Fall 2017
College of Liberal Arts

MATH 2473: UM Talented Youth Mathematics Program Calculus 3 MathCEP	Spring 2020
MATH 2472: UM Talented Youth Mathematics Program Calculus 3 MathCEP	Fall 2019
MATH 2471: UM Talented Youth Mathematics Program Calculus 2 MathCEP	Spring 2019
MATH 2283: Sequences, Series, and Foundations College of Liberal Arts	Fall 2019
MATH 1473: UM Talented Youth Mathematics Program Calculus 2 MathCEP	Fall 2018
MATH 1272: Calculus II College of Liberal Arts	Spring 2017
MATH 1271: Calculus I College of Liberal Arts	Fall 2015
MATH 1142: Short Calculus College of Liberal Arts	Spring 2016
Grader, University of Minnesota MATH 5705: Enumerative Combinatorics	Fall 2015
Instructor, UMN MathCEP (Saturday Morning Enrichment Program) FRACTALS Professions & Recreations: Intermediate Mathematics Enrichment	11/2/2019
TAXI CAB GEOMETRY Young Emerging Scholars	12/2/2017
Peer Learning Assistant, Gettysburg College MATH 315: Abstract Math 2	Spring 2015
MATH 301: Intermediate Research in Mathematics	Fall 2013
MATH 215: Abstract Math 1	Fall 2014, Spring 2013
MATH 201: Introductory Research in Mathematics	Fall 2013
MATH 112H: Honors Calculus 2	Fall 2012
L ^A T _E X WRITING Math Department	Fall 2013
PHYSICS 310: Introduction to Quantum Mechanics	Fall 2014
PHYSICS 103: Elementary Physics	Fall 2013
PHYSICS 101: The Evolving Universe	Fall 2012
Lab Assistant, Gettysburg College PHYSICS 240: Electronics	Spring 2015
MathPath Counselor and Instructor for LINEAR SET GEOMETRY	June-July 2016 Macalester College, St. Paul, MN

GRANTS, FELLOWSHIPS, AND AWARDS

COLLABORATE@ICERM “Codes and Designs: Optimal Discrete Measures” ICERM	8/10/2020-8/14/2020
AMS GRADUATE STUDENT TRAVEL GRANT AMS	Spring 2020
COGS STUDENT TRAVEL GRANT UMN Council of Graduate Students	Summer 2019
NSF GRADUATE RESEARCH FELLOWSHIP National Science Foundation	2016-2019
GOLDWATER SCHOLARSHIP Barry Goldwater Scholarship Foundation	2014
J. ROGERS MUSSELMAN AWARD Gettysburg College Math Dept.	2014
BAUM MATHEMATICAL PRIZE Gettysburg College Math Dept.	2013
MALCOLM R. DOUGHERTY MATHEMATICAL AWARD Gettysburg College Math Dept.	2012
RUFUS M. WEAVER MATHEMATICAL SCHOLARSHIP Gettysburg College	2012-2014
PRESIDENTIAL SCHOLARSHIP Gettysburg College	2011-2015

MENTORING

MENTOR, DIRECTED READING PROGRAM	Spring 2020
PAL, MATHEMATICS PROJECT AT MINNESOTA (MPM)	Spring 2019
<ul style="list-style-type: none"> • MPM is a four day workshop for undergraduates underrepresented in mathematics • Met undergraduate student once a month to discuss math and give advice 	
FIRST YEAR PEER MENTOR	2016–2019

LEADERSHIP & SERVICE

REFeree Australasian Journal of Combinatorics, Journal de Théorie des Nombres de Bordeaux, Mathematika	
CO-ORGANIZER University of Minnesota Introduction to Research Seminar	2017–Present
TREASURER University of Minnesota AMS Student Chapter	2019–Present
<ul style="list-style-type: none"> • Applied for and received \$2616 from the University of Minnesota Student Service Fees Fund for AMS events for Spring 2020. 	

REVIEWER UMN Council of Graduate Students Travel Career Development Grants	Spring 2020
VINCENT HALL THESPIAN UMN Mathematics Department Open House and Graduate TA Orientation	2016-Present
<ul style="list-style-type: none"> • Practiced and performed skits to inform prospective graduate students about graduate life in the UMN mathematics department for the Open House. We then had a panel in which we answered additional questions the prospective students might have. • Practiced and performed skits to inform incoming graduate students about being a TA in the UMN mathematics department, and how to handle different situations. We then had a panel in which we answered additional questions the incoming students might have. 	
HOST UMN Mathematics Department Open House	2016-Present
PRESIDENT University of Minnesota AMS Student Chapter	2018–2019
<ul style="list-style-type: none"> • Applied for and received \$450 from the University of Minnesota Student Unions & Activities Fund for the AMS 2019 Prelim Bee. 	
WEBMASTER University of Minnesota AMS Student Chapter	2017–2018
VOLUNTEER Minnesota State Fair UMN Women in Mathematics Booth	August 2016
HOUSE LEADER Gettysburg College Science House	2014–2015
PRESIDENT, SECRETARY, CHARTER MEMBER Gettysburg College Pi Mu Epsilon Chapter	2012–2014

SELECTED WORKSHOPS, SUMMER SCHOOLS, AND RESEARCH PROGRAMS

WORKSHOP IN CONVEXITY AND GEOMETRIC ASPECTS OF HARMONIC ANALYSIS	December 2019 Georgia IT, Atlanta, GA
SUMMER SCHOOL ON SPHERE PACKINGS AND OPTIMAL CONFIGURATIONS	October 2019 Kopp, Germany
WORKSHOP IN APPROXIMATION, SAMPLING, AND COMPRESSION IN HIGH DIMENSIONAL PROBLEMS	June 2019 INI, Cambridge, UK
CONDCOMP OPTIMAL POINT CONFIGURATIONS AND POTENTIAL THEORY WORKSHOP	April 2019 CIEM, Castro Urdiales, Spain
DISCREPANCY WORKSHOP	November 2018 RICAM, Linz, Austria
SUMMER SCHOOL IN HARMONIC ANALYSIS	July 2018 PCMI, Park City, UT
FRAME THEORY AND EXPONENTIAL BASES WORKSHOP	June 2018 ICERM, Providence, RI
OPTIMAL AND RANDOM POINT CONFIGURATIONS WORKSHOP	February 2018 ICERM, Providence, RI
MASAMU ADVANCED STUDY INSTITUTE AND WORKSHOPS IN MATHEMATICAL SCIENCES	November 2017 Arusha, Tanzania
PROGRAM ON TRACTABILITY OF HIGH DIMENSIONAL PROBLEMS AND DISCREPANCY	September 2017 ESI, Vienna, Austria

MASAMU ADVANCED STUDY INSTITUTE AND WORKSHOPS IN MATHEMATICAL SCIENCES

November 2015
Windhoek, Namibia

REU IN MATHEMATICS

Summer 2014
University of West Georgia, Carrollton, GA

MASAMU ADVANCED STUDY INSTITUTE AND WORKSHOPS IN MATHEMATICAL SCIENCES

November 2013
Stellenbosch, South Africa

REU PROGRAM IN ALGEBRA AND DISCRETE MATHEMATICS

Summer 2013
Auburn University, Auburn, AL

MTCP PRE-REU

Summer 2012
Texas A & M University, College Station, TX

PROFESSIONAL AFFILIATIONS

AMERICAN MATHEMATICAL SOCIETY