Nicholas A. Scoville

Curriculum Vitae

101K Pfahler
Ursinus College
Collegeville, PA

Phone: 610-409-3118
E-Mail: nscoville@ursinus.edu
URL: http://webpages.ursinus.edu/nscoville/

POSITIONS HELD

Ursinus College

Full Professor	fall 2021- present
Joseph Beardwood III Chair of Mathematics	fall 2017-present
Associate Professor	fall 2016- spring 2021
Chair of Mathematics and Computer Science	spring 2016-present
Assistant Professor	fall 2010-spring 2016

Faulkner University

Adjunct Professor	2015

Regina Luminis Academy

Adjunct Instructor	2020-present

EDUCATION

Dartmouth College

Ph.D., Mathematics	June 2010
Masters of Arts, Mathematics	June 2007

Western Michigan University

Masters of Science, Mathematics	June 2005
Bachelors of Science, Mathematics	August 2003

Grand Rapids Community College

Associates, Architectural Drafting	May 2001

TEACHING EXPERIENCE

Ursinus College,

Math 335: Abstract Algebra
Math 491: Algebraic Topology
Math 451: Discrete Morse Theory
Math 361: Graph Theory
CIE 100: Common Intellectual Experience
Math 421: Topology
Math 211: Multivariable calculus
Math 235: Linear Algebra
Math 10: Problem Solving
Math 322: Geometry
Math 341: Probability
Math 236W: Discrete Mathematics
Stat 141Q: Statistics I
Math 111: Calculus I
Math 112: Calculus II

Adjunct Professor, Faulkner University

Math 1312: Mathematics Spring 2015

Other teaching experience,

Teaching Assistant: Dartmouth College	Summer 2009
Instructor: Dartmouth College	2007-2009
Teaching Assistant: Dartmouth College	2005-2007
Instructor: Western Michigan University	2003-2005
Undergraduate Teaching Assistant: Western Michigan University	2002-2003

INDEPENDENT STUDIES

Ursinus College,

Discrete Morse theory and knots, Connor Donovan	Spring 2021
Discrete Morse theory, Elvi Sopiqoti	Spring 2020
Discrete plates and Olives, Matthew Furgele	Spring 2020
Analyzing heart data, Ben Minardi	Spring 2019
Algebraic topology, Nick Tulio	Spring 2019
Strong collapsibility and the Morse complex, Max Lin	Spring 2019
Group of strong self-homotopy equivalences, Vince Sergi, Ryan Quick	Spring 2019
Boolean functions, Ryan Quick	Fall 2018
Algebraic topology, Jason Bennett	Fall 2018
Generating Discrete Morse Functions from Point Data, Ashlyn Welch	Spring 2018
Random discrete Morse theory, Nikolai Peralta	Spring 2018
Homotopy theory, Karthik Yegnesh	Fall 2016 Spring 2017, Fall 2017, Spring 2018
Topology, Ian Rand	Spring 2017
Discrete Morse theory and Persistent homology, Yuqing Liu	Spring 2017
Random discrete Morse theory, Nikolai Peralta, Chase Babrich	Fall 2016, Spring 2017
Algebraic topology, Matan Peleg	Fall 2016, Spring 2017
Category theory, Michael Vennettilli	Spring 2015
Multiplication in discrete Morse theory, Rose Blanchard	Spring 2015
Number theoretic notions in discrete Morse theory, Ian Rand	Spring 2015

Discrete Morse theory, Tyler Helms	Fall 2014
Estimating the discrete LS category, Brian Green	Fall 2013
Homology and Cohomology, Seth Aaronson, Brian Green, Michelle Tanco	Spring 2013
Discrete LS category, Seth Aaronson	Spring 2013
Counting discrete Morse functions, Seth Aaronson	Spring 2012
Lie Groups, Brian Green	Spring 2012
Discrete Morse Theory, Mike Agiorgousis	Spring 2012
Markov Chains, Jayant Velagala	Spring 2012
Probability, Jayant Velagala	Fall 2011
Knot Theory, Will Molden	Fall 2011
Discrete Morse Theory, Seth Aaronson	Spring 2011

STUDENT POSTERS AND PRESENTATIONS

Connor Donovan *"Towards the homotopy type of the Morse complex,*
Exploring Innovation in Appalachia, (virtual), won third place in the math/physics/astronomy category, August 2021

Connor Donovan *"Towards the homotopy type of the Morse complex,*
Mathfest, (virtual) August 2021

Benjamin Johnson *"Merge trees in discrete Morse theory,*
Mathfest, Cincinnati, Ohio August 2019

Yuqing Liu *"Persistence equivalence of discrete Morse functions on trees,*
Mathfest, Denver, Colorado August 2018

Karthik Yegnesh *"Families of Objects in Categories and Elementary Topoi,*
AMS/MAA Joint Math Meetings, Atlanta, Georgia January 2017

Karthik Yegnesh *Cosheaf theoretical constructions in networks and persistent homology,*
68^{th} annual Delaware Valley Science Fair, Oaks, Pennsylvania (won "first place" in Mathematics) March 2016

Karthik Yegnesh *Cosheaf theoretical constructions in networks and persistent homology,*
59^{th} annual Montgomery County Science Research Competition, Collegeville, Pennsylvania
(won "first place" in math category) March 2016

Matt Belle *Arboricity,*
AMS/MAA Joint Math Meetings, Baltimore, Maryland January 2014

Brian Green *Estimating the discrete Lusternik–Schnirelmann category,*
AMS/MAA Joint Math Meetings, Baltimore, Maryland January 2014

Seth Aaronson *Lusternik–Schnirelmann category for cell complexes,*
AMS/MAA Joint Math Meetings, San Diego, California January 2013

Mike Agiorgousis, Brian Green, and Alex Onderdonk *Discrete Morse Functions and Homology,*
AMS/MAA Joint Math Meetings, San Diego, California (won "Outstanding Presentation" award) January 2013

Mike Agiorgousis, Brian Green, and Alex Onderdonk *Discrete Morse Functions and Homology,*
Undergraduate Science Research Symposium, Haverford College September 2012

Mike Agiorgousis, Brian Green, and Alex Onderdonk *Discrete Morse Functions and Homology,* Mathfest, Madison, Wisconsin August 2012

Mike Agiorgousis, Brian Green, Alex Onderdonk,and Kim Rich *Discrete Morse Functions and Homology, Disappearing Boundaries Summer Research Meeting, Lebanon Valley College* July 2012

Seth Aaronson and Marie Meyer, *"Graph Isomorphisms in Discrete Morse Theory", AMS/MAA Joint Meetings, Boston, MA* January 2012

PUBLICATIONS

Benjamin Johnson and Nicholas A. Scoville, "Merge trees in discrete Morse theory," *submitted*

Gregory Lupton, John Oprea, and Nicholas A. Scoville, "The digital Hopf construction," *submitted*

Dominic Klyve and Nicholas A. Scoville, "Summation graphs and discrete Morse theory," *submitted*

Gregory Lupton and Nicholas A. Scoville, "Digital Fundamental Groups and Edge Groups of Clique Complexes," *Journal of Applied and Computational Topology*, (to appear)

Desamparados Fernandez-Ternero, Enrique Macias-Virgos, David Mosquera-Lois, Nicholas A. Scoville, and Jose-Antonio Vilches, "Fundamental Theorems of Morse theory on posets," *AIMS Mathematics* 2022, Volume 7, Issue 8: 14922-14945. doi: 10.3934/math.2022818

Gregory Lupton, John Oprea, and Nicholas A. Scoville, "Subdivision of Maps of Digital Images," *Discrete and Computational geometry*, 67, 698742 (2022). https://doi.org/10.1007/s00454-021-00350-z

Nicholas A. Scoville and Matthew C. B. Zaremsky, "Higher connectivity of the Morse complex," *Proceedings of the AMS Series B*, 9 (2022), 135149.

Connor Donovan, Maxwell Lin, and Nicholas A. Scoville, "On the homotopy and strong homotopy type of complexes of discrete Morse functions, *Canadian Mathematical Bulletin*, 1-19, 2022, doi:10.4153/S0008439522000121

Maxwell Lin and Nicholas A. Scoville, "On the automorphism group of the Morse complex," *Advances in Applied Mathematics*, Volume 131, October 2021, 102250

Gregory Lupton, John Oprea, and Nicholas A. Scoville, "Homotopy Theory in Digital Topology," *Discrete and Computational geometry*, 67 (2022), no. 1, 112165, doi.org/10.1007/s00454-021-00336-x

Gregory Lupton, John Oprea, and Nicholas A. Scoville, "A Fundamental Group for Digital Images," *Journal of Applied and Computational Topology*, 5 (2021), no. 2, 249311.

Nicholas A. Scoville, "Topology from Analysis: A Mini-Primary Source Project for Topology Students," *Convergence* (June 2020)

Desamparados Fernandez-Ternero, Enrique Macias-Virgos, Nicholas A. Scoville, and Jose-Antonio Vilches, "Strong discrete Morse theory and simplicial LusternikSchnirelmann category: A discrete version of the Lusternik-Schnirelmann Theorem," *Discrete and Computational Geometry*, 63 (2020), no. 3, 607623.

Ian Rand and Nicholas A. Scoville, "Discrete Morse functions, vector fields, and homological sequences on trees," *Involve, A Journal of Mathematics* Involve, a Journal of Mathematics 13-2 (2020), 219–229. DOI 10.2140/involve.2020.13.219

Yuqing Liu and Nicholas A. Scoville, "The realization problem for discrete Morse functions on trees," *Algebra Colloquium*, **27** : 3 (2020) 455–468 DOI: 10.1142/S1005386720000371

Nicholas A. Scoville, "The Cantor Set Before Cantor: A Mini-Primary Source Project for Analysis and Topology Students," *Convergence* (May 2019)

Mike Agiorgousis, Brian Green, Alex Onderdonk, Nicholas A. Scoville, and Kim Rich, "Homological sequences in discrete Morse theory," *Topology Proceedings*, 54 (2019) 283–294

Colin Adams, Allison Henrich, Kate Kearney and Nicholas A. Scoville, "Knots Related by Knotoids," *American Mathematical Monthly* Volume 126, 2019 - Issue 6, 483–490

Nicholas A. Scoville and Karthik Yegnesh "A Persistent Homological Analysis of Network Data Flow Malfunctions," *Journal of Complex Networks*, Issue 6, 1 December 2017, Pages 884-892

Nicholas A. Scoville, "Connecting Connectedness: A Mini-Primary Source Project for Topology Students," *Convergence* (October 2017)

Nicholas A. Scoville and Willie Swei "On the Lusternik–Schnirelmann category of a simplicial map," *Topology and its applications* 216 (2017), 116-128

Brian Green, Nicholas A. Scoville, and Mimi Tsuruga, "Estimating the discrete Lusternik–Schnirelmann category," *Topological Methods in Nonlinear Analysis*, 45, No. 1 (2015), 103–116

Akshaye Dhawan, Michelle Tanco, and Nicholas A. Scoville, "A Distributed Greedy Algorithm for Constructing Connected Dominating Sets in Wireless Sensor Networks," SENSORNETS, Lisbon, Portugal January 2014

Nicholas A. Scoville, "Metric Structures for CW Complexes," *Topology Proceedings*, 44 (2014) 117–131

Seth Aaronson, Marie Meyer, Nicholas A. Scoville, Mitchell T. Smith, and Laura Stibich, "Graph Isomorphisms in discrete Morse theory," *AKCE Int. J. Graphs Comb.,* 11, No. 2 (2014), 163–176

Seth Aaronson and Nicholas A. Scoville, "Lusternik–Schnirelmann category for cell complexes," *Illinois J. of Mathematics*, 57, No. 3 (2013), 743–753

Nicholas A. Scoville, "Georg Cantor at the Dawn of Point-Set Topology," *Loci*, (March 2012), DOI: 10.4169/loci003861

Nicholas A. Scoville, "Lusternik–Schnirelmann Category and the Connectivity of X," *Algebraic & Geometric Topology*, 12 (2012) 435-448

Nicholas A. Scoville, "Mapping Cone Sequences and a Generalized Notion of Cone Length," *JP Journal of Geo. and Top.*, 11(2011), Issue 3, 209-233

Nicholas A. Scoville, "A Metric for Homotopy Types," Ph.D. Thesis, Dartmouth College, Spring 2010

Rob Nendorf, Nicholas A. Scoville, Jeff Strom, "Categorical Sequences," *Algebraic & Geometric Topology*, 6 (2006) 809–838

BOOKS

Discrete Morse theory, AMS/MAA Press, 2019

BOOK CHAPTERS

Nicholas A. Scoville, "Sometimes when your hopes have all been shattered," *Living Proof: Stories of resilience along the mathematical journey*, Edited by Henrich et al., AMS/MAA Press, 2019

BOOK REVIEWS

Nicholas A. Scoville, "Never a dull moment: Hassler Whitney, Mathematics Pioneer" by Keith Kendig, *The American Mathematical Monthly* Volume 126, 2019 - Issue 9

PRESENTATIONS (past 4 years only)

The homotopy type of the Morse complex for some collections of trees June, 2022
Union College Mathematics Conference 2022, Union College

The homotopy type of the Morse complex for some collections of trees April, 2022
Virtual AMS/MAA Joint Meetings (invited talk) (invited talk)

Towards a new digital homotopy theory December, 2021
Virtual University of Regina seminar (invited talk)

Discrete Morse theory as an introduction to topology November, 2021
Virtual Rutgers undergraduate seminar (invited talk)

Higher connectivity of the Morse complex January, 2021
Virtual AMS/MAA Joint Meetings (invited talk)

Discrete Morse theory as an introduction to topology March, 2020
Juniata College math colloquium (invited talk)

Towards a new digital homotopy theory February, 2020
University of Albany Geometry/Topology seminar (invited talk)

Digital topology: A smooth introduction November, 2019
Westminster College, Fulton Missouri (invited talk)

Towards a new digital homotopy theory November, 2019
University of Missouri Geometry/Topology seminar (invited talk)

Strong discrete Morse theory and an application to simplicial Lusternik–Schnirelmann category November, 2019
Topological Complexity and Related topics, AMS Southeastern
Sectional Meeting, University of Florida (invited talk)

On the automorphism group of the Morse complex November, 2019
General Contributed Paper Session, AMS Southeastern Sectional Meeting, University of Florida

On the automorphism group of the Morse complex September, 2019
Union College Mathematics Conference 2019, Union College

A new digital homotopy theory June, 2019
Lehigh Geometry/Topology Conference

Towards a new digital homotopy theory May, 2019
Lehigh University Algebraic Topology seminar (invited talk)

Build your own topology January, 2019
General Contributed Paper Session on Research in Topology, Joint Math Meetings, Baltimore

Digital Topology: A smooth introduction October, 2018
Western Michigan University (invited talk)

Strong discrete Morse theory July, 2018
ICART 2018, Rabat Morocco

Digital Topology: A smooth introduction March, 2018
Colloquium, Elon University (invited talk)

S^1 and S^2 and S^3, oh fy! A digital Hopf fibration January, 2018
Math Colloquium, Montana State University (invited talk)

S^1 and S^2 and S^3, oh fy! A digital Hopf fibration November, 2017
Colloquium, Catholic University of America (invited talk)

Digital Topology: A smooth introduction November, 2017
Colloquium, Bard College (invited talk)

S^1 and S^2 and S^3, oh fy! A digital Hopf fibration November, 2017
Colloquium, Dartmouth College (invited talk)

Digital Topology: A smooth introduction October, 2017
Colloquium, Seattle University (invited talk)

Digital Topology: A smooth introduction October, 2017
Colloquium, Central Washington University (invited talk)

Simplicial Lusternik–Schnirelmann category and strong discrete Morse theory October. 2017
Topology Seminar, University of Florida (invited talk)

S^1 and S^2 and S^3, oh fy! A digital Hopf fibration October, 2017
Colloquium, University of Florida Colloquium (invited talk)

Digital Topology: A smooth introduction September, 2017
Math Club, Cleveland State University (invited talk)

A Persistent Homological Analysis of Network Data Flow Malfunctions August, 2017
Applied Algebraic Topology in Sapporo, Sapporo Japan

A Persistent Homological Analysis of Network Data Flow Malfunctions June, 2017
Applied Topology in Bedlewo, Bedlwo Poland

A Simplicial Lusternik–Schnirelmann Theorem (poster) June, 2017
Topological Data Analysis: Theory and Applications, Macalester College

Towards a new digital homotopy theory April 2017
Colloquium, Cleveland State University (invited talk)

Collaborative Research: Transforming Instruction in Undergraduate Mathematics via Primary Historical (TRIUMPHS) January, 2017
MAA Invited Paper Session on Research in Improving Undergraduate Mathematical Sciences Education Program, AMS/MAA Joint Meetings, Atlanta (invited talk)

WORKSHOPS RUN

MAA Workshop: Teaching Undergraduate Mathematics via Primary Source Projects. January, 2020
AMS/MAA Joint Math Meetings, Denver Colorado

TRIUMPHS Graduate student training Workshop July 19-20, 2019
New Mexico State University

TRIUMPHS Training Workshop September 13-15, 2018
University of Colorado Denver

Teaching Undergraduate Mathematics via Primary Source Projects January 2018
AMS/MAA Joint Math Meetings, San Diego CA

Teaching Mathematics with Primary Historical Sources April 1, 2017
MAA EPADEL sectional meeting, Kutztown PA

TRIUMPHS Training Workshop September 8-10, 2016
University of Colorado Denver

Connecting Past to Present: An approach to teaching topology via original resources July, 2016
HPM 2016, Montpelier France

PROFESSIONAL AFFILIATIONS

Council on Undergraduate Research 2013-2017

History of Mathematics Special Interest Group of the Mathematical Association of America (HOMSIGMAA) 2012-Present

Association of Christians in the Mathematical Sciences 2011-Present

Mathematical Association of America 2009-Present

American Mathematical Society 2005-Present

Pi Mu Epsilon Mathematics Honors Society Fall 2002-Spring 2005

HONORS AND AWARDS

Paul R. Halmos-Lester R. Ford Award
for article of expository excellence published in The American Mathematical Monthly August 2020

REU SITE: Exploration and Professional Excellence in the Mathematical Sciences
NSF Grant 1851948 (April 2020- March 2023) $225,469

Western Michigan University
Department of Mathematics Alumni Achievement Award October 2018

Collaborative Research: RUI: Transforming Instruction in Undergraduate Mathematics via Primary History Sources
NSF IUSE Grant 1524065 (Aug. 2015- Sept. 2020) PIs at Colorado State, Central Washington, NMSU, Xavier, U Colorado, Denver, U Florida $71,002

Best oral presentation at HTCA conference in Genoa, Italy
sponsored by Gruppo Italiano Ricercatori in Pattern Recognition. February 2015

Mellon travel grant July 2013

Mellon travel grant May 2012

Project NExT Fellow Aug. 2010 – Aug. 2011

ADDITIONAL SKILLS

Mathematical Software: LATEX, MATLAB, Maple, BlackBoard, WeBWork, HTML, Minitab, Derive, Java.

MATHEMATICAL ACTIVITIES

Served on MA math thesis committee for Marwa Mosallam
"On cup-products of cofibers of maps between Moore spaces,
Hopf invariant, and Lusternik–Schnirelmann category"
Western Michigan University, July 2021

Served on virtual panel "Teaching and the Liberal Arts"
University of Tennessee, Knoxville April 2020

Referee for several journals (available upon request) 2013-present

Member of NSFs College of Reviewers for Undergraduate Education 2018-2021

Scientific Committee, ESU8, Oslo Norway July 2018

Scientific Committee, ICART 2018, Rabat Morocco July 2018

Organized Special Session "AMS Special Session on Open & Accessible Problems
for Undergraduate Research, "
with Allison Henrich and Michael Dorff at AMS/MAA Joint Math Meetings January 2018

Focus Magazine, editorial board November 2017-present

Served on NSF panel review 2016, 2017, 2018

Served on MAA Basic Library List Committee January 2017-January 2020

Organized Special Session "AMS Special Session on Open & Accessible Problems
for Undergraduate Research, "
with Allison Henrich and Michael Dorff at AMS/MAA Joint Math Meetings January 2017

Served on panel "The Research and Teaching Pendulum: January 2017 Finding
a Stable Equilibrium" at AMS/MAA Joint Math Meetings January 2017

Organized Special Session "Applied and Computational Topology, "
with Matthew Wright and Paweł Dłotko at AMS/MAA Joint Math Meetings January 2016

Organized panel "Finding a thesis topic and advisor, " at
AMS/MAA Joint Math Meetings January 2016

Reviewed applications for Posters on the Hill Fall 2015

Reviewer for MathSciNet Mathematical Reviews	February 2015-present
Organized panel "Graduate school: Choosing one, getting in, staying in, " at AMS/MAA Joint Math Meetings	January 2015
Reviewed applications for Posters on the Hill	Fall 2014
Book reviewer for online MAA book reviews	2014-Present
Faculty representative for Ursinus MAA student chapter	2014-Present
CUR Councilor in the Mathematics and Computer Sciences Division	2014-Present
Served on panel "You published your dissertation: now what?" at AMS/MAA Joint Math Meetings	January 2013
Organized panel "The on-campus interview survival guide" at AMS/MAA Joint Math Meetings	January 2013
Reviewer for mathematical publication database Zentralblatt	August 2012-present
Senior Personal, Ursinus College REU (NSF Grant No. DMS-1003972)	June 2012-August 2012
Organized Panel "Hit the Ground Running! Interview like a Pro and land the job" at AMS/MAA Joint Math Meetings	January 2012
Senior Personal, Ursinus College REU (NSF Grant No. DMS-1003972)	June 2011-August 2011
Judge for MAA Student Paper Session 3, MathFest	August 2011
Judge of research abstracts for Young Mathematicians Network Conference applicants	July 2011
Judge for MAA Student Poster Session, Joint Mathematics Meetings	January 2011
Calculus Committee, Ursinus College; Member	August 2010-present
Statistics Committee, Ursinus College; Member	August 2010-present
Organizer for Ursinus College ϵ-talks	Fall 2010-Fall 2016

Treasurer for YMN (Young Mathematicians Network) 2010-2015

Judge for MAA Student Paper Session 11, MathFest August 2010

Reader/Reviwer for "Introduction to Homotopy Theory" by Martin Arkowitz 2007-2008

Student Seminar Organizer 2004-2005

WMU Pi Mu Epsilon Graduate Representative 2003-2005

Grader Summer 2004, Summer 2003

ADDITIONAL ACTIVITIES

Completed Level 19 on high speed in *Dr Mario* January 2022
Dr. Mario, Nintendo Entertainment System, 1990

Tutor for Critical Point Test Prep Fall 2020-present
Berwyn, PA

Director of Religious Education Fall 2019-present
Sacred Heart Parish, Royersford PA.

Second Grade PREP Teacher Fall 2016-Spring 2019
Taught hour-long once weekly religious formation/catechism class to second grade students at Sacred Heart Parish, Royersford PA.

First Grade PREP Teacher Fall 2015-Spring 2016
Taught hour-long once weekly religious formation/catechism class to first grade students at Sacred Heart Parish, Royersford PA.

Fourth Grade PREP Teacher Fall 2014-Spring 2015
Taught hour-long once weekly religious formation/catechism class to fourth grade students at Sacred Heart Parish, Royersford PA.

Ursinus College Newman Society Faculty Advisor Fall 2011-present

Sixth Grade PREP Teacher Fall 2011-Spring 2014
Taught hour-long once weekly religious formation/catechism class to sixth grade students at Sacred Heart Parish, Royersford PA.

Beat *Silver Surfer* September 2011
Finished NES game *Silver Surfer* (Arcadia Systems, 1990), considered by many to be the most difficult game in NES history.

Sixth Grade Religious Education Teacher Fall 2010-Spring 2011
Taught hour-long once weekly religious formation/catechism class to sixth grade students at St. Norbert Parish, Paoli PA.

Seventh Grade Religious Education Teacher Fall 2009-Spring 2010

Taught hour-long once weekly religious formation/catechism class to seventh grade students at St. Denis Parish, Hanover NH.

Contra Speedrun Fall 2008

Defeated NES video game Contra in 11 minutes and 4 seconds without cheats or turbos, Hanover NH

Youth Group Leader at St. Denis Parish Fall 2008-Spring 2009

Gave lectures, organized activities, participated in service projects