HELEN JENNE

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EDUCATION

University of Oregon, Eugene, OR   2014-2020
Ph.D. in Mathematics, June 2020
M.S. in Mathematics, December 2017
Advisor: Dr. Benjamin Young

Budapest Semesters in Mathematics, Budapest, Hungary   2013-2014

Whitman College, Walla Walla, WA   2009-2013
B.A. in Mathematics and Psychology, May 2013
Graduated summa cum laude with honors in both majors
Advisors: Dr. Barry Balof (Mathematics), Dr. Melissa Clearfield (Psychology)

PROFESSIONAL EXPERIENCE

Post Doctorate RA, Pacific Northwest National Laboratory, Seattle, WA   Feb 2022-present
Group: Data Sciences and Analytics
Advisor: Dr. Emilie Purvine

Postdoctoral Researcher, CNRS, Institut Denis Poisson, University of Tours, France   Sept 2020-Aug 2021
Advisor: Dr. Kilian Raschel

Ph.D. Intern, Pacific Northwest National Laboratory, Seattle, WA   Summer 2015, 2017, 2018, 2019
Selected for the National Security Internship Program summers 2018 and 2019
Group: Math, Stats, and Data Science
Advisor: Dr. Emilie Purvine
Projects:
  Anomaly detection in network traffic data using tensor decomposition
  Exploring anomaly detection and visualization in cyber network graphs
  Particle tracking in streaming images
  Graph models of the power grid

AWARDS AND HONORS

Outstanding Peformance Award, PNNL   November 2023

Postgraduate Laboratory Mission Award Finalist, PNNL   August 2022

Early Career Invited Lecture Award, University of British Columbia   Feb 2021

Jack and Peggy Borsting Award for Scholastic Excellence, University of Oregon Math Department June 2020

University of Oregon College of Arts and Sciences Dissertation Research Fellowship   Sept 2019-June 2020

Walter Brattain Merit Scholarship, Whitman College   2009-2013

PROGRAMMING SKILLS

Computer Languages: Python, SageMath, MATLAB
Python libraries: Matplotlib, NetworkX, NumPy, Pandas, PyTorch, SciKit-Learn, SciPy

MACHINE LEARNING COURSEWORK AND WORKSHOPS

COURSES:

Andrew Ng's Machine Learning Coursera course	Spring 2022
Introduction to Neural Computation (University of Oregon)	Spring 2019

WORKSHOPS:

PNNL Hands On Deep Learning Workshop	
PNNL Hands On Natural Language Processing Workshop	August 2022
Stanford ICME Summer Workshop: Deep Learning for Natural Language Processing	August 2022

PUBLICATIONS AND PREPRINTS

CONFERENCE PUBLICATIONS:

Comparing Mapper Graphs of Artificial Neuron Activations, with Y. Zhou (lead author), D. Brown, M. Shapiro, E. Purvine, B. Praggastis, B. Jefferson, C. Joslyn, G. Henselman-Petrusek. Accepted to TopoInVis@VIS 2023.

Malicious Cyber Activity Detection using Zigzag Persistence, with A. Myers (lead author), S. Aksoy, D. Best, A. Bittner, C. Joslyn, G. Henselman-Petrusek, G. Seppala, S. Young, and E. Purvine. Accepted to the Workshop on AI/ML for Cybersecurity, IEEE DSC 2023.

Hypergraph Topological Features for Autoencoder-Based Intrusion Detection for Cybersecurity Data, with B. Kay (lead author), S. Aksoy, M. Baird, D. Best, C. Joslyn, G. Henselman-Petrusek, C. Potvin, G. Seppala, S. Young, and E. Purvine. Conference Proceedings of ICML workshop on Machine Learning for Cybersecurity, 2022.

JOURNAL PUBLICATIONS:

MATHEMATICS:

Stepping out of Flatland: Discovering Behavior Patterns as Topological Structures in Cyber Hypergraphs, with S. Aksoy, D. Best, A. Bittner, G. Henselman-Petrusek, C. Joslyn, B. Kay, A. Myers, G. Seppala, J. Warley, S.J. Young, E. Purvine. arXiv preprint.

Using Higher-Order Moments to Assess the Quality of GAN-generated Image Features, with L. Luzi, C.M. Ortiz Marrero, and R. Murray. arXiv preprint, arXiv:2310.20636, 2023.

Lattice walks confined to an octant in dimension 3: (non-)rationality of the second critical exponent, with L. Hillairet and K. Raschel. Accepted to Annales de l'Institut Henri Poincaré D: Combinatorics, Physics and their Interactions.

Double-dimer condensation and the PT-DT correspondence, with G. Webb and B. Young. Submitted. arXiv preprint, arXiv:2109.11773, 2021.

The combinatorial PT-DT correspondence., with G. Webb and B. Young. Proceedings of FPSAC 2021, to appear.

Matching complexes of trees and applications of the matching tree algorithm, with M. Jelić Milutinović, A. McDonough, and J. Vega. Annals of Combinatorics, 2022.

Combinatorics of the double-dimer model. Advances in Mathematics, 392, 3 December 2021.

Combinatorics of the double-dimer model. Séminaire Lotharingien de Combinatoire, 84B (Proceedings of FPSAC 2020)

Tilings, continued fractions, derangements, scramblings, and e, with B. Balof. In *Journal of Integer Sequences*, 17(2): Article 14.2.7, 2014.

Socioeconomic status affects means-end behavior across the first year, with M.W. Clearfield and S. Stanger. In *Journal of Applied Developmental Psychology*, 38:22-28, 2015.

Socioeconomic status affects oral and manual exploration across the first year, with M.W. Clearfield, L. Bailey, S. Stanger, and N. Tacke. In *Infant Mental Health Journal*, 35(1):63-69, 2014.

TALKS AND PRESENTATIONS

RESEARCH TALKS AND POSTERS:

Can we Count on Deep Learning: Exploring and Characterizing Combinatorial Structures using Machine Learning, MATH-AI workshop at NeurIPS'23 (upcoming)

Hypergraphs and SVD for Interpretable AI
  PNNL Techfest, July 2023
  Workshop on Modelling and Mining Complex Networks as Hypergraphs, May 2023
  Rising Stars in Computational and Data Sciences, April 2023

Applications of path homology to cybersecurity
  PNNL Cybersecurity Expo, October 2022
  WSU Data Science Day (poster), September 2022
  PNNL Postgraduate Research Symposium, August 2022

3D lattice walks confined to an octant: nonrationality of the second critical exponent, Canadian Discrete and Algorithmic Mathematics Conference (Virtual), May 2021

The combinatorial Pandharipande-Thomas/Donaldson-Thomas correspondence
  AlCoVE 2021 (Virtual), June 2021
  Les Journées ALÉA (Virtual), Centre International de Recontres Mathématiques, March 2021
  Early Career Invited Lecture (Virtual), University of British Columbia, Feb 2021
  Bordeaux Combinatorial Days (Virtual), Laboratoire Bordelais de Recherche en Informatique, Feb 2021

Combinatorics of the dP3 Quiver
  Institut de Recerche en Informatique Fondamentale Enumerative and Analytical Combinatorics Seminar (Virtual), Université de Paris, Dec 2020
  Graduate Online Combinatorics Colloquium, Nov 2020

Double-dimer condensation and the dP3 Quiver
  Canadian Mathematical Society Winter Meeting, Enumerative Combinatorics Session (Virtual), Dec 2020
  Algebraic geometry and moduli seminar, ETH Zürich (Virtual), Nov 2020
  Séminaire DIMERS, Sorbonne University (Virtual), Oct 2020

Combinatorics of the double-dimer model.
  Dimers in Combinatorics and Cluster Algebras, University of Michigan (Virtual), Aug 2020
  FPSAC 2020 Online, July 2020
  University of Oregon Women in Graduate Sciences Science Slam, June 2020
  Discrete Math Seminar, University of Massachusetts Amherst, May 2020
  Combinatorics and Geometry Seminar, University of Washington, May 2020
  Combinatorics Seminar, UC Berkeley, March 2020
  Combinatorics Seminar, University of Minnesota, Feb 2020
  Combinatorics Seminar, University of Michigan, Nov 2019
  Algebra Seminar, University of Oregon, Nov 2019

Anomaly detection in network traffic data using tensor decomposition. Pacific Northwest National Laboratory National Security Internship Program (NSIP) Symposium, Sept 2019

Visualizing network traffic graphs using structural equivalence grouping. Pacific Northwest National Laboratory NSIP Poster Session, Aug 2018

Grove probabilities and the double-dimer model. Poster Session: Building Bridges II, July 2018

Combinatorics of the double-dimer model. Pacific Northwest Combinatorics Day, March 2018

Particle tracking in streaming images. Seattle Science Social at Pacific Northwest National Labs, Aug 2017

Tilings, continued fractions, derangements, scramblings, and e. SMP Graduate Education Mentoring Workshop during the Joint Mathematics Meetings, Jan 2015

Expository Talks:

The Dimer Model and Kuo Condensation. Combinatorics and Geometry Pre-Seminar, University of Washington, May 2020

Using vertex operators to prove MacMahon's plane partition generating function. Student Algebra and Combinatorics Seminar at University of Minnesota, Feb 2020

Topology of Matching Complexes. Student Combinatorics Seminar at University of Oregon, April 2019

Better binomials begin with Fibonacci. Student Combinatorics Seminar at University of Oregon, Oct 2018

The cube recurrence. Grad Notions Student Seminar at University of Oregon, March 2018

Graphical condensation. Student Combinatorics Seminar at University of Oregon, Feb 2017

Robinson-Schensted algorithm. Student Combinatorics Seminar at University of Oregon, Nov 2016

TEACHING EXPERIENCE

Graduate Employee at University of Oregon   Fall 2014-present

For each of the following courses, I was the instructor of record. As such, I was responsible for designing the syllabus and preparing and presenting the material, as well as writing and grading all homework, quizzes, and exams.

  – Calculus I (Math 251), Winter 2017, Spring 2017, Winter 2019

  – Discrete Math II (Math 232), Fall 2017

  – Elementary Functions (Math 112), Spring 2015

  – College Algebra (Math 111), Fall 2014, Winter 2015, Spring 2015, Fall 2018

  – University Math I (Math 105), Summer 2016

I was a teaching assistant for the following courses:

  – Introduction to Probability and Statistics (Math 243), Spring 2018

  – Calculus for Business and Social Science (Math 241), Fall 2015, Winter 2016, Fall 2016

SERVICE

Women in Data Science Volunteer, Events committee	October 2023 - present
Reviewer for ICML 2023 Topological Deep Learning Challenge	July 2023
Member of the Organizing Committee for FPSAC 2020 Online	July 2020
Referee for Proceedings of the American Mathematical Society, Journal of Combinatorial Theory A	
Mentor in first-year graduate student mentoring program	Fall 2018-Spring 2020
Organizer of UO Student Combinatorics Seminar	Fall 2018-Spring 2019

UO Association for Women in Mathematics (AWM) Student Chapter
Organizer of Reading Room	Fall 2019-present
Member of K-12 Outreach Committee	Jan 2018-present
Secretary	Fall 2017-Spring 2019

CONFERENCES AND WORKSHOPS ATTENDED

AIM Workshop: Applied Homological Algebra Beyond Persistence Diagrams	June 2023
Rising Stars in Computational and Data Sciences	April 2023
AMS Mathematics Research Communities: Models and Methods for Sparse (Hyper)Network Science	June 2022
AMS Mathematics Research Communities: Combinatorial Applications of Computational Geometry and Algebraic Topology	June 2021
Canadian Discrete and Algorithmic Mathematics Conference (Virtual),	May 2021
Les Journées ALÉA (Virtual)	March 2021
Bordeaux Combinatorial Days (Virtual)	Feb 2021
Canadian Mathematical Society Winter Meeting (Virtual)	Dec 2020
Dimers in Combinatorics and Cluster Algebras, University of Michigan (Virtual)	Aug 2020
FPSAC 2020 Online	July 2020
MSRI Mathematics of Machine Learning, Seattle, WA	July 29-Aug 9 2019
FPSAC 2018, Hanover, NH	July 2018
Building Bridges II, Budapest, Hungary	July 2018
Graduate Research Workshop in Combinatorics, Ames, IA	May 2018
Pacific Northwest Combinatorics Day, Seattle, WA	March 31, 2018
AMS/MAA Joint Mathematics Meetings	Jan 2015, 2016, 2017
University of Nebraska IMMERSE, Lincoln City, NE	June-July 2014
Park City Math Institute Summer Session, Park City, UT	June-July 2013
Mount Holyoke Research Experience for Undergraduates, South Hadley, MA	June-Aug 2012
Carleton Summer Mathematics Program for Undergraduate Women, Northfield, MN	July 2011