HELEN JENNE

hjenne.github.io
helen.jenne@pnnl.gov

ABOUT ME

My research interests include topological data analysis and interpretability of convolutional neural networks. I enjoy working with complex data, especially thinking about how to model it as a graph or hyeprgraph and what analytics might be most informative. One of my favorite parts about working at PNNL is the collaborative culture and the opportunities to communicate my research to a broad audience.

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: Data Sciences and Analytics
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

PROGRAMMING SKILLS

Computer Languages: Python, SageMath, MATLAB, R
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

AWARDS AND HONORS

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

PUBLICATIONS AND PREPRINTS

Conference Publications:

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

Journal Publications:

Mathematics:

Lattice walks confined to an octant in dimension 3: (non-)rationality of the second critical exponent, with L. Hillairet and K. Raschel. Submitted. arXiv preprint, arXiv:2112.03567, 2021.

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.

Psychology:

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:

Hypergraphs and SVD for Interpretable AI
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 Recherce 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

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

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