

# L. NATE VELDT

Center for Applied Mathematics, Cornell University, 657 Frank H.T. Rhodes Hall, Ithaca, NY  
nveldt@cornell.edu, <https://people.cam.cornell.edu/lmv22/>

## EDUCATION

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<b>PhD in Mathematics, Concentration: Computational Science</b> Purdue University, West Lafayette, IN Advisor: David F. Gleich, Computer Science Department Dissertation: Optimization Frameworks for Graph Clustering	May 2019
<b>M.S. in Mathematics</b> Purdue University, West Lafayette, IN	May 2017
<b>B.S. in Mathematics</b> Summa Cum Laude Wheaton College, Wheaton, IL	May 2013

## PROFESSIONAL EXPERIENCE

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<i>Postdoctoral Research Associate</i> , Center for Applied Mathematics, Cornell University	July 2019-Present
<i>Research Assistant</i> , Purdue University Computer Science Department	2016-Spring 2019
<i>Student Computation Intern</i> , Lawrence Livermore National Lab	Summer 2017
<i>Visiting Fellow</i> , NSF East Asia and Pacific Summer Institute, The University of Melbourne	Summer 2016
<i>Instructor</i> , Purdue University Mathematics Department	2013-2015

## AWARDS AND HONORS

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Chorafas Award, Dimitris N. Chorafas Foundation	August 2019
Session Best Talk Award, Purdue SIAM CSE Student Conference	April 2017
East Asia and Pacific Summer Institute Fellowship, National Science Foundation	Summer 2016
Excellence in Teaching Award, Purdue University Mathematics Department	Fall 2015
Wheaton College Scholastic Honors Society, Wheaton College	May 2013
Angelina Brandt Memorial Award for Excellence in Mathematics, Wheaton College	May 2013

## PUBLICATIONS

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### Refereed Publications

- Strongly Local Hypergraph Diffusions for Clustering and Semi-supervised Learning  
Meng Liu, Nate Veldt, Haoyu Song, Pan Li, and David F. Gleich, 2020  
*Proceedings of the 30th International World Wide Web Conference*, May 2021  
<https://arxiv.org/abs/2011.07752>
- Graph Clustering in All Parameter Regimes  
Junhao Gan, David F. Gleich, Nate Veldt, Anthony Wirth, Xin Zhang  
*International Symposium on Mathematical Foundations of Computer Science*, August 2020  
<https://drops.dagstuhl.de/opus/volltexte/2020/12706/>
- Minimizing Localized Ratio Cut Objectives in Hypergraphs  
Nate Veldt, Austin R. Benson, Jon Kleinberg  
*ACM SIGKDD Conference on Knowledge Discovery and Data Mining*, August 2020  
<https://dl.acm.org/doi/10.1145/3394486.3403222>

11. Parameterized Correlation Clustering in Hypergraphs and Bipartite Graphs  
Nate Veldt, Anthony Wirth, David F. Gleich  
*ACM SIGKDD Conference on Knowledge Discovery and Data Mining*, August 2020  
<https://dl.acm.org/doi/abs/10.1145/3394486.3403238>
10. Clustering in graphs and hypergraphs with categorical edge labels  
Ilya Amburg, Nate Veldt, Austin R. Benson  
*Proceedings of the 29th International World Wide Web Conference*, May 2020  
<https://dl.acm.org/doi/fullHtml/10.1145/3366423.3380152>
9. A Parallel Projection Method for Metric-Constrained Optimization  
Cameron Ruggles, Nate Veldt, David F. Gleich  
*SIAM Workshop on Combinatorial Scientific Computing*, February 2020  
<https://epubs.siam.org/doi/abs/10.1137/1.9781611976229.5>
8. Metric-Constrained Optimization for Graph Clustering Algorithms  
Nate Veldt, David F. Gleich, Anthony Wirth, James Saunderson  
*SIAM Journal on Mathematics of Data Science*, June 2019  
<https://epubs.siam.org/doi/10.1137/18M1217152>
7. Learning Resolution Parameters for Graph Clustering  
Nate Veldt, David F. Gleich, Anthony Wirth  
*Proceedings of the 28th International World Wide Web Conference*, May 2019  
<https://dl.acm.org/citation.cfm?id=3313471>
6. Flow-Based Local Graph Clustering with Better Seed Set Inclusion  
Nate Veldt, Christine Klymko, David F. Gleich  
*Proceedings of the 2019 SIAM International Conference on Data Mining*, May 2019  
<https://epubs.siam.org/doi/abs/10.1137/1.9781611975673.43>
5. Correlation Clustering Generalized  
David F. Gleich, Nate Veldt, Anthony Wirth  
*Proceedings of the 29th International Symposium on Algorithms and Computation*, December 2018  
[http://drops.dagstuhl.de/opus/frontdoor.php?source\\_opus=9992](http://drops.dagstuhl.de/opus/frontdoor.php?source_opus=9992)
4. A Correlation Clustering Framework for Community Detection  
Nate Veldt, David F. Gleich, Anthony Wirth  
*Proceedings of the 27th International World Wide Web Conference*, April 2018  
doi:10.1145/3038912.3052586
3. Low-rank Spectral Network Alignment  
Huda Nassar, Nate Veldt, Shahin Mohammadi, Ananth Grama, David F. Gleich  
*Proceedings of the 27th International World Wide Web Conference*, April 2018  
doi:10.1145/3178876.3186128
2. Correlation Clustering with Low-Rank Matrices  
Nate Veldt, Anthony Wirth, David F. Gleich  
*Proceedings of the 26th International World Wide Web Conference*, April 2017  
doi:10.1145/3178876.3186110
1. A Simple and Strongly-Local Flow-Based Method for Cut Improvement  
Nate Veldt, David F. Gleich, Michael Mahoney  
*Proceedings of the 33rd International Conference on Machine Learning*, June 2016  
<http://jmlr.org/proceedings/papers/v48/veldt16.html>

## Preprints

5. Higher-order Homophily is Combinatorially Impossible  
Nate Veldt, Austin R. Benson, Jon Kleinberg, 2021  
<https://arxiv.org/abs/2103.11818>

4. Hypergraph clustering: from blockmodels to modularity  
Philip S. Chodrow, Nate Veldt, Austin R. Benson, 2021  
<https://arxiv.org/abs/2101.09611>
3. Augmented Sparsifiers for Generalized Hypergraph Cuts  
Austin R. Benson, Jon Kleinberg, Nate Veldt, 2020  
<https://arxiv.org/abs/2007.08075>
2. Hypergraph Clustering for Finding Diverse and Experienced Groups  
Ilya Amburg, Nate Veldt, Austin R. Benson, 2020  
<https://arxiv.org/abs/2006.05645>
1. Hypergraph Cuts with General Splitting Functions  
Nate Veldt, Austin R. Benson, Jon Kleinberg, 2020  
<https://arxiv.org/abs/2001.02817>

## Thesis

1. Optimization Frameworks for Graph Clustering  
Nate Veldt, PhD Thesis, Purdue University, May 2019  
[https://hammer.figshare.com/articles/Optimization\\_Frameworks\\_for\\_Graph\\_Clustering/8044592](https://hammer.figshare.com/articles/Optimization_Frameworks_for_Graph_Clustering/8044592)

## PRESENTATIONS

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### Invited Talks

1. *Hypergraph Data Analysis: Algorithms and Applications*, William and Mary, CS Colloquium 03/2021
2. *Hypergraph Cut Algorithms for Higher-order Data Analysis*, Texas A&M, CS Colloquium 03/2021
3. *Algorithms and Applications for Hypergraph Data Analysis*, George Mason University, CS Seminar 02/2021
4. *Minimizing Localized Ratio Cut Objectives in Hypergraphs*, ACM SIGKDD Conference, Virtual Event 08/2020
5. *Parameterized Correlation Clustering in Hypergraphs and Bipartite Graphs*, ACM SIGKDD Conference, Virtual Event 08/2020
6. *Metric-Constrained Linear Program Solvers for Graph Clustering Relaxations*, International Conference on Continuous Optimization, Berlin, Germany 08/2019
7. *Algorithmic Advances in Higher-Order Correlation Clustering*, Minisymposium on Mining and Modeling Evolving and Higher-Order Complex Data and Networks, ICIAM 2019, Valencia, Spain 07/2019
8. *Flow-Based Local Graph Clustering with Better Seed Set Inclusion*, SIAM International Conference on Data Mining, Calgary, Alberta, Canada 05/2019
9. *Approximation Algorithms and Optimization Tools for Graph Clustering*, Computer Science Department Seminar, North Carolina State University, Raleigh, NC 02/2019
10. *New Results for a Generalized Graph Clustering Framework*, School of Computing and Information Systems Seminar, The University of Melbourne, Parkville, Australia 12/2018
11. *Correlation Clustering: Sixteen Years On, New Directions, New Colleagues (with Anthony Wirth)*, Discrete Mathematics Group Seminar, Monash University, Clayton, Australia 12/2018
12. *New Equivalence Results and Metric-Constrained Linear Programming Algorithms for Correlation Clustering*, Data Science Seminar, University of Utah, Salt Lake City, UT 09/2018
13. *An Introduction to Graph Clustering and its Applications*, Mathematics Seminar, Rose-Hulman Institute of Technology, Terre Haute, IN 09/2018
14. *A Unifying Framework for Graph Clustering*, SIAM Network Science Workshop, Portland, OR 07/2018
15. *A Correlation Clustering Framework for Community Detection*, WWW Conference, Lyon, France 04/2018
16. *Finding Sparse Cuts and Dense Clusters with Correlation Clustering*, JMM, San Diego, CA 01/2018
17. *Enumerating Zonotope Vertices for Correlation Clustering*, Graduate Computational Algebraic Geometry Seminar, UIC, Chicago, IL 04/2017

18. *A Polynomial-Time Solution for Correlation Clustering on Low-Rank Positive Semidefinite Matrices*, AMS Spring Western Sectional Meeting, Pullman, WA 04/2017
19. *Correlation Clustering with Low-Rank Matrices*, WWW Conference, Perth, Australia 04/2017
20. *Low-rank Matrices in Correlation Clustering*, Theoretical Research in Computer Science Seminar, The University of Melbourne, Parkville, Australia 08/2016
21. *A Simple and Strongly-Local Flow-Based Method for Cut Improvement*, ICML 2016, New York, NY <http://techtalks.tv/events/369/1915/> 06/2016

### Poster Presentations

1. *Hypergraph Cuts with General Splitting Functions*, SIAM Network Science, Virtual Event 08/2020
2. *Learning Resolution Parameters for Graph Clustering*, The Web Conference 2019, San Francisco, CA 05/2019
3. *Spatial-Relational Algorithms for Brain Networks*, BigData Joint PI Meeting, Alexandria, VA 06/2018
4. *A Simple and Local Method for Cut Improvement: Poster Version*, ICML 2016, New York, NY 06/2016

### Contributed and Local Talks

1. *Generalized Hypergraph Cuts: from Theoretical Foundations to Applications*, Scientific Computing and Numerics seminar, Cornell University, Ithaca, NY 03/2021
2. *Practical Techniques for Metric-Constrained Optimization*, Scientific Computing and Numerics seminar, Cornell University, Ithaca, NY 03/2020
3. *Detecting and Learning Community Structure in Graphs with LambdaCC*, Center for Applied Mathematics Colloquium, Cornell University, Ithaca, NY 09/2019
4. *A Generalized Objective for Graph Clustering* Purdue Math Dept. Student Colloquium 02/2018
5. *Efficiently Solving Linear Programs with Triangle Inequality Constraints*, Purdue University Numerical Linear Algebra Seminar <https://youtu.be/TIZQOGVMzPQ> 02/2018
6. *Correlation Clustering on Graphs with a Rank-2 Adjacency Matrix*, Purdue SIAM Computational Science and Engineering Student Conference 04/2017
7. *Solving Low-Dimensional Optimization Problems via Zonotope Vertex Enumeration*, Purdue Numerical Linear Algebra Seminar [https://youtu.be/NH\\_CpMYe3tw](https://youtu.be/NH_CpMYe3tw) 02/2017
8. *Detecting Local Graph Clusters with the Min-cut Max-flow Theorem*, Purdue University Math Department Grad Student Research Day 11/2016
9. *Clustering in Low-Dimensions with Inconsistent Advice*, Purdue Math Dept. Student Colloquium 10/2016
10. *Flow-based Methods for Community Detection*, Purdue Math Dept. Student Colloquium 02/2016
11. *Totally Unimodular Matrices in Linear Programming*, Purdue University Numerical Linear Algebra Seminar, <https://youtu.be/Fmjy74c-R-I> 01/2016

## TEACHING EXPERIENCE

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### Cornell University Courses

Fall 2020 · Instructor · MATH 2210: Linear Algebra

Spring 2020 · Instructor · CS 1132: Short Course on Matlab

### Purdue University Courses

Listed is the group median score from 1-5 for anonymous student evaluations in response to the question, “Overall, I would rate this instructor as \_\_\_\_\_.”

Fall 2015 · Instructor · Applied Calculus II · Two sections 4.7, 4.8

Summer 2015 · Instructor · Applied Calculus II · One section 4.9

Spring 2015 · Instructor · Applied Calculus II · Two sections 4.8, 4.7

Fall 2014 · Instructor · Precalculus · Two sections	4.4, 4.1
Spring 2014 · Recitation Instructor · Calculus II · Two sections	4.3, 4.7
Fall 2013 · Recitation Instructor · Calculus II · Two sections	4.9, 4.9

## SERVICE

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### Journal Reviewing

Journal of Machine Learning Research (JMLR)  
 Signal Processing  
 Theoretical Computer Science  
 Mathematical Modelling and Numerical Analysis (ESAIM: M2NA)  
 Science Advances  
 SIAM Journal on Scientific Computing (SISC)  
 Mathematics of Operations Research  
 Data Mining and Knowledge Discovery (DAMI)  
 IEEE Transactions of Knowledge and Data Engineering (TKDE)  
 Applied Network Science

### Conference Program Committees

The Web Conference 2019, 2020, 2021  
 NeurIPS 2020

### Seminar Organization

Purdue University Numerical Linear Algebra Group	Fall 2016-Spring 2018
Bridge to Research Seminar, Purdue University Mathematics Department	Fall 2015

<b>Graduate Student Representative</b> · Purdue University Mathematics Department	2015-2016
<b>New Student Mentor</b> · Association for Women in Mathematics	Spring 2016