Dimitris Papailiopoulos

Assistant Professor
University of Wisconsin-Madison
Department of Electrical and Computer Engineering

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Academic Employment

University of Wisconsin-Madison *2016 – present*
Assistant Professor
Department of Electrical and Computer Engineering
Department of Computer Sciences (by courtesy)
Grainger Institute for Engineering (fellow)
Wisconsin Institute for Discovery (affiliate)

University of California, Berkeley *2014 – 2016*
Postdoctoral Researcher
Member of the AMPLab and BLISS
Mentors: Benjamin Recht and Kannan Ramchandran

Education

Ph.D. in Electrical and Computer Engineering
University of Texas at Austin *2013 – 2014*
University of Southern California *2009 – 2012*
Advisor: Alexandros G. Dimakis

M.Sc. in Electronic and Computer Engineering
Technical University of Crete *2007 – 2009*

Diploma in Electronic and Computer Engineering
Technical University of Crete (5-year degree) *2002 – 2007*

Research Interests

Machine Learning, Coding Theory, Optimization

Awards & Distinctions

- Research
  - IEEE Joint Communications Society/Information Theory Society Best Paper Award, *2020*.
  - NSF CAREER Award, *2019*.
  - Sony Faculty Innovation Award, *2019, 2020, and 2021*.
  - Vilas Associate Award (campus level), *2021*.
  - ECE Grainger Faculty Scholarship Award (department level), *2020*.
  - IEEE Signal Processing Society, Young Author Best Paper Award, *2015*.
  - Gerondelis Foundation Fellowship, *2012*.
- Teaching
  - IEEE Education Society Mac Van Valkenburg Early Career Teaching Award, *2021*.
  - Emil Steiger Distinguished Teaching Award (campus level), *2021*.
  - Benjamin Smith Reynolds Award for Excellence in Teaching Engineers (college level), *2019*.

JOURNAL PUBLICATIONS

12. K. Lee, M. Lam, R. Pedarsani, D. Papailiopoulos, K. Ramchandran, "Speeding Up Distributed Machine Learning using Codes," *IEEE Transactions on Information Theory*, Vol. 64, pp. 1514 – 1529, 2018.
11. H. Mania, X. Pan, D. Papailiopoulos, B. Recht, K. Ramchandran, M. I. Jordan, "Perturbed Iterate Analysis for Asynchronous Stochastic Optimization," *SIAM Journal on Optimization (SIOPT)*, Vol. 27, pp. 2202 – 2229, 2017.
10. A. S. Rawat, D. Papailiopoulos, A. G. Dimakis, S. Vishwanath, "Locality and Availability in Distributed Storage," *IEEE Transactions on Information Theory*, Vol. 62, pp. 4481 – 4493, 2016.
9. I. Tamo, D. Papailiopoulos, A. G. Dimakis, "Optimal Locally Repairable Codes and Connections to Matroid Theory," *IEEE Transactions on Information Theory*, Vol. 62, pp. 6661 – 6671, 2016.
8. D. Papailiopoulos and A. G. Dimakis, "Locally Repairable Codes," *IEEE Transactions on Information Theory*, Vol. 60, pp. 5843 – 5855, May 2014.
7. M. Asteris, D. Papailiopoulos, G. N. Karystinos "The Sparse Principal Component of a Constant-rank Matrix," *IEEE Transactions on Information Theory*, Vol. 60, pp. 2281 – 2290, April 2014.
6. K. Shanmugam, D. Papailiopoulos, A. G. Dimakis, G. Caire "A Repair Framework for Scalar MDS Codes," *IEEE Journal on Selected Areas in Communications (JSAC), special issue on Communication Methodologies for the Next-Generation Storage Systems*, Vol. 32, pp. 998 – 1007, May 2014.
5. M. Sathiamoorthy, M. Asteris, D. Papailiopoulos, A.G. Dimakis, R. Vadali, S. Chen, D. Borthakur, "XORing Elephants: Novel Erasure Codes for Big Data," Proceedings of the VLDB Endowment 2013.
4. D. Papailiopoulos, A. G. Dimakis, V. R. Cadambe, "Repair Optimal Erasure Codes through Hadamard Designs," *IEEE Transactions on Information Theory*, Vol. 58, pp. 3021 – 3037, May 2013.
3. D. Papailiopoulos, G. A.-Elkheir, G. N. Karystinos, "Maximum-Likelihood Noncoherent PAM Detection," *IEEE Transactions on Communications*, Vol. 61, pp. 1152 – 1159, Mar. 2013.
2. D. Papailiopoulos and A. G. Dimakis, "Interference Alignment as a Rank Constrained Rank Minimization," *IEEE Transactions on Signal Processing*, vol. 60, pp. 4278 – 4288, Aug. 2012.
1. D. Papailiopoulos and G. N. Karystinos, "Maximum-likelihood noncoherent OSTBC detection with polynomial complexity," *IEEE Transactions on Wireless Communications*, Vol. 6, pp. 1935 – 1945, June 2010.

REFEREED CONFERENCE PUBLICATIONS

56. S Rajput, K Sreenivasan, D Papailiopoulos, A Karbasi "An Exponential Improvement on the Memorization Capacity of Deep Threshold Networks," NeurIPS 2021.
55. H. Wang, S. Agarwal, D. Papailiopoulos, "Pufferfish: Communication-efficient Models At No Extra Cost," The 2021 Conference of Machine Learning and Systems (MLSys), 2021.
54. S. Agarwal, H. Wang, K. Lee, S. Venkataraman, D. Papailiopoulos, "Accordion: Adaptive Gradient Communication via Critical Learning Regime Identification," The 2021 Conference of Machine Learning and Systems (MLSys), 2021.
53. A. Pensia, S. Rajput, A. Nagle, H. Vishwakarma, D. Papailiopoulos, "Optimal Lottery Tickets via SubsetSum: Logarithmic Over-Parameterization is Sufficient," (spotlight) Neural Information Processing Systems (NeurIPS), 2020.
52. H. Wang, K. Sreenivasan, S. Rajput, H. Vishwakarma, S. Agarwal, J.Y, Sohn, K. Lee, and D. Papailiopoulos, "Attack of the tails: Yes, you really can backdoor federated learning", Neural Information Processing Systems (NeurIPS), 2020.
51. S. Liu, D. Papailiopoulos, D. Achlioptas, "Bad Global Minima Exist and SGD Can Reach Them", Neural Information Processing Systems (NeurIPS), 2020.
50. S Rajput, A Gupta, D Papailiopoulos, "Closing The Convergence Gap Of SGD Without Replacement", International Conference on Machine Learning (ICML), 2020.
49. H. Wang, M. Yurochkin, Y. Sun, D. Papailiopoulos, Y. Khazaeni "Federated Learning with Matched Averaging", (oral) International Conference on Learning Representations (ICLR), 2020.
48. S. Rajput, H. Wang, Z. Charles, D. Papailiopoulos "DETOX: A Redundancy-based Framework for Faster and More Robust Gradient Aggregation?," Neural Information Processing Systems (NeurIPS), 2019.
47. S. Rajput, Z. Feng, Z. Charles, P.-L. Loh, D. Papailiopoulos "Does Data Augmentation Lead to Positive Margin?," International Conference on Machine Learning (ICML), 2019.

46. Z. Charles, H. Rosenberg, D. Papailiopoulos, "A Geometric Perspective on the Transferability of Adversarial Directions," the 22nd International Conference on Artificial Intelligence and Statistics (AISTATS), 2019.
45. H. Wang, S. Sievert, S. Liu, Z. Charles, D. Papailiopoulos, S. Wright, "ATOMO: Communication-efficient Learning via Atomic Sparsification," Neural Information Processing Systems (NeurIPS), 2018.
44. L. Chen, H. Wang, J. Zhao, D. Papailiopoulos, P. Koutris, "The Effect of Network Width on the Performance of Large-batch Training," Neural Information Processing Systems (NeurIPS), 2018.
43. L. Chen, H. Wang, Z. Charles, D. Papailiopoulos, "DRACO: Byzantine-resilient Distributed Training via Redundant Gradients," International Conference on Machine Learning (ICML), 2018.
42. Z. Charles, D. Papailiopoulos, "Stability and Generalization of Learning Algorithms that Converge to Global Optima," International Conference on Machine Learning (ICML), 2018.
41. Z. Charles, D. Papailiopoulos, "Gradient Coding via the Stochastic Block Model," International Symposium of Information Theory (ISIT), 2018.
40. D. Yin, A. Pananjady, M. Lam, D. Papailiopoulos, K. Ramchandran, P. Bartlett, "Gradient Diversity: a Key Ingredient for Scalable Distributed Learning," the 21st International Conference on Artificial Intelligence and Statistics (AISTATS), 2018.
39. K. Lee, R. Pedarsani, D. Papailiopoulos, K. Ramchandran, "Coded Computation for Multicore Setups," International Symposium of Information Theory (ISIT), 2017.
38. X. Pan, M. Lam, S. Tu, D. Papailiopoulos, C. Zhang, M. I. Jordan, K. Ramchandran, C. Re, B. Recht "Cyclades: Lifting the Curse of Coordination in Parallel Machine Learning," Neural Information Processing Systems (NIPS), 2016.
37. S. O. Chan, D. Papailiopoulos, A. Rubinstein "On the Worst-Case Approximability of Sparse PCA," Conference on Learning Theory (COLT), 2016.
36. K. Lee, M. Lam, R. Pedarsani, D. Papailiopoulos, K. Ramchandran, "Speeding Up Distributed Machine Learning using Codes," International Symposium of Information Theory (ISIT), 2016.
35. M. Asteris, D. Papailiopoulos, A. Kyrillidis, A. G. Dimakis, "Bipartite Correlation Clustering - Maximizing Agreements," Artificial Intelligence and Statistics Conference (AISTATS), 2016.
34. H. Mania, X. Pan, D. Papailiopoulos, B. Recht, K. Ramchandran, M. I. Jordan, "Perturbed Iterate Analysis for Asynchronous Stochastic Optimization," Workshop on Optimization, Neural Information Processing Systems (NIPS), 2015.
33. K. Lee, M. Lam, R. Pedarsani, D. Papailiopoulos, K. Ramchandran, "Speeding Up Distributed Machine Learning using Codes," Workshop on Learning Systems, Neural Information Processing Systems (NIPS), 2015.
32. X. Pan, D. Papailiopoulos, S. Oymak, B. Recht, K. Ramchandran, M. I. Jordan, "Parallel Correlation Clustering on Big Graphs," Neural Information Processing Systems (NIPS), 2015.
31. M Asteris, D Papailiopoulos, A. Kyrillidis, A. G. Dimakis, "Sparse PCA via Bipartite Matchings," Neural Information Processing Systems (NIPS), 2015.
30. M Asteris, D Papailiopoulos, A. Kyrillidis, A. G. Dimakis, "Orthogonal NMF through Subspace Exploration," Neural Information Processing Systems (NIPS), 2015.
29. X. Pan, D. Papailiopoulos, B. Recht, K. Ramchandran, M. I. Jordan, "Scaling up Correlation Clustering through Parallelism and Concurrency Control," NIPS Workshop on Discrete and Combinatorial Problems in Machine Learning (DISCML), 2014.
28. D. Papailiopoulos, A. Kyrillidis, C. Boutsidis, "Provable Deterministic Leverage Score Sampling," ACM Conference on Knowledge, Discovery, and Data Mining (KDD), 2014.
27. D. Papailiopoulos, I. Mitlagkas, A. G. Dimakis, C. Caramanis, "Finding Dense Subgraphs via Low-Rank Bilinear Optimization," International Conference on Machine Learning (ICML), 2014.
26. M. Asteris, D. Papailiopoulos, A. G. Dimakis, "Nonnegative Sparse PCA with Provable Guarantees," International Conference on Machine Learning (ICML), 2014.
25. A. S. Rawat, D. Papailiopoulos, A. G. Dimakis, S. Vishwanath, "Locality and Availability in Distributed Storage," IEEE International Symposium on Information Theory (ISIT), 2014.
24. D. Papailiopoulos, I. Mitlagkas, A. G. Dimakis, C. Caramanis, "Big Graph Analytics through Low-rank Approximations" Graduation talk at Information Theory and Applications Workshop (ITA), 2014.
23. A. S. Rawat, D. Papailiopoulos, A. G. Dimakis, S. Vishwanath, "Locality and Availability in Distributed Storage," Allerton Conference on Communication, Control, and Computing, 2013.

22. M. Sathiamoorthy, M. Asteris, D. Papailiopoulos, A. G. Dimakis, R. Vadali, S. Chen, and D. Borthakur, "XORing Elephants: Novel Erasure Codes for Big Data," International conference on Very Large Data Bases (VLDB), 2013.
21. D. Papailiopoulos, A. G. Dimakis, and S. Korokythakis, "Sparse PCA through Low-rank Approximations," International Conference on Machine Learning (ICML), 2013.
20. I. Tamo, D. Papailiopoulos, and A. G. Dimakis "Optimal Locally Repairable Codes and Connections to Matroid Theory," IEEE International Symposium on Information Theory (ISIT), 2013.
19. A. G. Dimakis and D. Papailiopoulos, "Locality in Erasure Codes for Hadoop Mapreduce," Allerton Conference on Communication, Control, and Computing, 2012.
18. K. Shanmugam, D. Papailiopoulos, A. G. Dimakis, and G. Caire, "A Repair Framework for Scalar MDS Codes," Allerton Conference on Communication, Control, and Computing, 2012.
17. D. Papailiopoulos and Alexandros G. Dimakis, "Locally Repairable Codes," IEEE International Symposium on Information Theory (ISIT), 2012.
16. D. Papailiopoulos, Changho Suh, Alexandros G. Dimakis, "Feedback in the K-user Interference channel," IEEE International Symposium on Information Theory (ISIT), 2012.
15. D. Papailiopoulos, J. Luo, A. G. Dimakis, C. Huang, and J. Li, "Simple Regenerating Codes: Network Coding for Cloud Storage," IEEE International Conference on Computer Communications – Miniconference (INFOCOM), 2012.
14. D. Papailiopoulos, G. N. Karystinos, "Maximum-likelihood Blind PAM Detection," International Conference on Communications (ICC), 2012.
13. D. Papailiopoulos, A. G. Dimakis, and V. R. Cadambe, "Repair Optimal Erasure Codes through Hadamard Designs," Allerton Conference on Communication, Control, and Computing, 2011.
12. D. Papailiopoulos and A. G. Dimakis, "Distributed Storage Codes through Hadamard Designs," IEEE International Symposium on Information Theory (ISIT), 2011.
11. M. Asteris, D. Papailiopoulos, G. N. Karystinos, "Sparse Principal Component of a Rank-deficient Matrix," IEEE International Symposium on Information Theory (ISIT), 2011.
10. D. Papailiopoulos and A. G. Dimakis, "Repairing Erasure Codes," Refereed Work-In-Progress (WiP) and Poster at USENIX Conference on File and Storage Technologies (FAST) 2011.
9. D. Papailiopoulos and A. G. Dimakis, "Distributed Storage Codes Meet Multiple-Access Wiretap Channels," Allerton Conference on Communication, Control, and Computing, 2010.
8. B. Hassibi, A. G. Dimakis, and D. Papailiopoulos, "MCMC Methods for Integer Least-Squares Problems," Allerton Conference on Communication, Control, and Computing, 2010.
7. D. Papailiopoulos and A. G. Dimakis, "Connecting Interference Alignment and Distributed Storage Through Rank Minimization," Asilomar Conference on Signals, Systems, and Computers, 2010.
6. D. Papailiopoulos and A. G. Dimakis, "Interference Alignment as a Rank Constrained Rank Minimization," IEEE Global Telecommunications Conference (GLOBECOM), 2010.
5. D. Papailiopoulos and G. N. Karystinos, "Optimal OSTBC Sequence Detection over Unknown Correlated Fading Channels," Asilomar Conference on Signals, Systems, and Computers, 2009.
4. D. Papailiopoulos and G. N. Karystinos, "Efficient maximum-likelihood noncoherent orthogonal STBC detection," Allerton Conference on Communication, Control, and Computing, 2008.
3. D. Papailiopoulos and G. N. Karystinos, "Polynomial-complexity maximum-likelihood block noncoherent MPSK detection," IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2008.
2. D. Papailiopoulos and G. N. Karystinos, "Efficient computation of the M-phase vector that maximizes a rank-deficient quadratic form," Conference in Information Sciences and Systems (CISS), 2008.
1. D. Papailiopoulos and G. N. Karystinos, "Near ML detection of nonlinearly distorted OFDM signals," Asilomar Conference on Signals, Systems, and Computers, 2007.

INVITED TALKS

42. ICML Workshop on Federated Learning for User Privacy and Data Confidentiality (**Keynote Speaker**) 2021
41. Technical Unviersity of Crete (Greece), ECE Departmental Colloquium 2021
40. Flower Summit (**Keynote Speaker**) *2021*
39. UMichigan, Communications and Signal Processing Seminar *2021*
38. Google, Federated Learning Seminar *2021*
37. UPenn, ESE departmental seminars (distinguished speaker) *2020*
36. CMU, Machine Learning/Duolingo Seminar *2020*
35. UC Berkeley, EECS BLISS Seminar *2020*
34. Yale, YINS Seminar *2020*
33. Google, Workshop on Federated Learning *2020*
32. Stanford, HazyResearch Seminar *2020*
31. Federated Learning One World (FLOW) Seminar *2020*
30. UIUC, CSL Seminar *2020*
29. UT Austin, ECE ML Seminar *2020*
28. University of Chicago/TTIC, ML Seminar *2020*
27. International Workshop on Embedded and Mobile Deep Learning, within MobiSys 2018 (**Keynote Speaker**) *2018*
26. International Symposium on Mathematical Programming (ISMP) *2018*
25. Allerton Conference on Communication, Control, and Computing *2018*
24. Information Theory and Applications Workshop *2018*
23. Allerton Conference on Communication, Control, and Computing *2017*
22. SIAM Conference on Optimization (OP17) *2017*
21. Information Theory and Applications Workshop *2017*
20. UW-Madison, SILO Seminar *2016*
19. Asilomar Conference on Signals, Systems, and Computers *2016*
18. Cornell University, CS Colloquium *2016*
17. Cornell Tech, CS Colloquium *2016*
16. University of Washington, CSE Colloquium, *2016*
15. UPenn, ESE Colloquium, *2016*
14. ETH-Zurich, CS Colloquium *2016*
13. Princeton, CS and EE Colloquium *2016*
12. USC, EE Colloquium *2016*
11. Caltech, Frontiers in Computing and Mathematical Sciences *2016*
10. EPFL, CS Colloquium *2016*
9. UW-Madison, ECE Colloquium *2016*
8. Information Theory and Applications Workshop *2016*
7. The Berkeley Vision & Learning Center Retreat *2015*
6. Allerton Conference on Communication, Control, and Computing *2015*
5. AMPLab Summer Retreat *2015*
4. Information Theory and Applications Workshop *2015*
3. AMPLab Winter Retreat *2015*
2. Milibo Information Services Webinar Series *2015*
1. Information Theory and Applications Workshop, graduation day *2014*

Teaching Experience

- ECE331: Introduction To Probability and Random Processes. *Fall 2021*
- ECE611: Introduction To Doctoral Research In Electrical & Computer Engineering. *Spring 2021*
  Instructor rating: 4.80/5.00
- ECE331: Introduction To Probability and Random Processes. *Fall 2020*
  Instructor rating: 4.48/5.00
- ECE901: Recent Theoretical Advances in Machine Learning Systems. *Spring 2019*
- ECE331: Introduction To Probability and Random Processes (**re-developed entirely in a flipped format**) *Fall 2019*
  Instructor rating: 4.50/5.00
- ECE330: Signals and Systems. *Fall 2018*
  Instructor rating: 4.55/5.00
- ECE901: Concentration of Measure and Machine Learning *Spring 2018*
  Instructor rating: 4.67/5.00
- ECE901: Large-scale Machine Learning and Optimization. *Spring 2018*
  Instructor rating: 4.77/5.00
- ECE330: Signals and Systems. *Fall 2017*
  Instructor rating: 4.64/5.00
- ECE330: Signals and Systems (shadowing Barry Van Veen) *Spring 2017*
- ECE901: Large-scale Machine Learning and Optimization (**new course**) *Fall 2016*
  Instructor rating: 4.61/5.00

Mentoring

- Postdoctoral fellows:
  - Zachary Charles (UW-Madison, ECE), currently at Google AI *2017 – 2019*
- Ph.D. Students
  - Hongyi Wang (UW-Madison, CS), currently a postdoc at CMU CS *2016 – 2021*
  - Shashank Rajput (UW-Madison, CS) *2018 – expected Aug. 2022*
  - Saurabh Agarwal (UW-Madison, CS), co-advised with Shivaram Venkataraman *2019 – present*
  - Kartik Srinivasan (UW-Madison, CS) *2020 – present*
  - Liu Liang (UW-Madison, CS), co-advised with Rob Nowak and Kangwook Lee *2020 – present*
  - Nayoung Lee (UW-Madison, ECE), co-advised with Kangwook Lee *2020 – present*
  - Angeliki Giannou (UW-Madison, CS) *2021 – present*
- M.Sc. Students
  - Alliot Nagle (UW-Madison, ECE) *2019 – present*
  - Matthew Grinde (UW-Madison, ECE) *2020 – present*
  - Shengchao Liu (UW-Madison, CS), currently a CS PhD student at UMontreal/MILA *2018 – 2020*
  - Saurabh Agarwal (UW-Madison, ECE), currently a CS PhD Student at UW-Madison *2018 – 2019*
  - Pradyot Prakash (UW-Madison, ECE) *2018 – 2019*

FUNDING

- NSF CAREER Award 2019
  Awarded Amount: $508,000
- ONR: "A Theoretically Principled Framework for Learning by Pruning", 2021. Role: PI
  Requested Amount: $400,000 (recommended for funding)
- AFRL: "Machines, Algorithms and Data Lab (MADLab): A University Center of Excellence in Efficient and Robust Machine Learning," 2017. Role: Co-PI
  Awarded amount: $ 4,960,880
- ARPA-E "Accelerated Materials Design for Molten Salt Technologies Using Innovative High-Throughput Methods," 2018. Role: Co-PI
  Awarded amount: $$2,730,000
- NSF TRIPODS: "Institute for Foundations of Data Science," multi-institution proposal involving UChicago, TTIC, UCSC, UW-Seattle (2020). Role: Senior personnel
  Awarded amount: $5,000,000
- NSF TRIPODS: "Institute for Foundations of Data Science", 2017. Role: Senior personnel leading a main thrust
  Awarded amount: $1,500,000
- Sony Faculty Innovation Award, 2019
  Awarded Amount: $100,000
- Sony Faculty Innovation Award, 2020
  Awarded Amount: $100,000
- Vilas Associates Award, 2021
  Awarded Amount: $60,000
- American Family Data Science Research Grant, 2021. Role: Co-PI
  Awarded Amount: $150,000
- Two American Family Data Science Research Grants, 2020. Role: Co-PI
  Awarded Amount: $285,000
- Four intramural WARF / Graduate School Fall Competition grants, 2016, 2017, 2018, and 2020. Role: PI
  Total Awarded Amount: $160,000
- AWS Cloud Credits for Research Awarded amount (2017),
  Total Awarded Amount: $15,000

PROFESSIONAL SERVICE

- Co-Founder and Program Co-Chair of the 1st Conference on Machine Learning and Systems (MLSys), 2018.
- Program Co-Chair of the 3rd Conference of Machine Learning and Systems (MLSys), 2020.
- Program Co-Chair of the 3rd Midwest Machine Learning Symposium (MMLS), 2019.
- Co-organizer of the 1st ICML Workshop on Coding for Machine Learning, 2019.
- Co-Organizer of Dagstuhl Workshop 18112, "Coding Theory for Inference, Learning and Optimization", 2018.
- Area Chair/Program Committee member : NeurIPS, ICML, AISTATS, ICLR, MLSys.
- NSF CISE and Eng Panelist, 2020, 2021.