Cristopher Moore

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1 Education

Born March 12, 1968 in New Brunswick, New Jersey.

Northwestern University, B.A. in Physics, Mathematics, and the Integrated Science Program, with departmental honors in all three departments, 1986.

Cornell University, Ph.D. in Physics, 1991. Philip Holmes, advisor. Thesis: "Undecidability and Unpredictability in Dynamical Systems."

2 Employment

Professor, Santa Fe Institute	2012-present
Professor, Computer Science Department with a joint appointment in the	e Department of Physics
and Astronomy, University of New Mexico, Albuquerque	2008 – 2012
Associate Professor, University of New Mexico	2005 – 2008
Assistant Professor, University of New Mexico	2000-2005
Research Professor, Santa Fe Institute	1998–1999
City Councilor, District 2, Santa Fe	1994 – 2002
Postdoctoral Fellow, Santa Fe Institute	1992 – 1998
Lecturer, Cornell University	Spring 1991
Graduate Intern, Niels Bohr Institute/NORDITA, Copenhagen	Summers 1988 and 1989
Teaching Assistant, Cornell University Physics Department	Fall 1986–Spring 1990
Computer programmer, Bio-Imaging Research, Lincolnshire, Illinois	Summers 1984–1986

3 Other Appointments

Visiting Researcher, Microsoft Research New England	Fall 2019
Visiting Professor, École Normale Supérieure	October–November 2016
Visiting Professor, Northeastern University	October–November 2015
Visiting Professor, University of Michigan, Ann Arbor	September–October 2005
Visiting Professor, École Normale Supérieure de Lyon	June 2004
Visiting Professor, Institut Universitaire de France	June 2003
Visiting Professor, Université Paris 7 (Denis Diderot)	June 2001 and 2002

4 Honors and awards

Fellow, Network Science Society, elected 2024

Rocky Mountain Emmy Award for The Majesty of Music and Mathematics, 2019

Fellow, American Association for the Advancement of Science, elected 2017

Fellow, American Mathematical Society, class of 2016

Fellow, American Physical Society, elected 2014

University of New Mexico School of Engineering Outstanding Senior Faculty Award for Excellence in Research, 2007

University of New Mexico School of Engineering Outstanding Junior Faculty Award for Excellence in Teaching, 2002

University of New Mexico School of Engineering Outstanding Junior Faculty Award for Excellence in Research, 2002

National Science Foundation Graduate Fellowship, 1986-1989

Clark Award for Best Teaching Assistant, 1987

Marcy Award for Undergraduate Independent Study, 1986

Richter Fellowship for Undergraduate Independent Study, 1985

Phi Beta Kappa, 1985

5 Public lectures and educational outreach

R. Kent Nagle Lecture, University of South Florida. Easy, Hard, and Impossible: The Limits of Computation. April 2024.

Presidential Dream Course, University of Oklahoma. Data, Algorithms, Justice, and Fairness. April 2022.

Reese Prosser Memorial Lecture, Dartmouth College, October 2021.

Ulam Memorial Lecture #1, Easy, Hard, and Impossible: The Limits of Computation. Santa Fe, September 2018.

Ulam Memorial Lecture #2, Data, Algorithms, Fairness and Justice. Santa Fe, September 2018.

The Majesty of Music and Mathematics, a collaboration with the Santa Fe Symphony (Guillermo Figueroa, conductor). On stage at the Lensic Theater in Santa Fe, November 2013 (conducted by David Felberg) and a New Mexico PBS special, aired in 2018. Short version at the Julia Robinson Mathematics Festival in Santa Fe, 2018.

Sending Secrets: Security and Privacy in a Quantum World. Santa Fe Institute Community Lecture, April 2011; John von Neumann Public Lecture Series in Complexity and Computation, Wisconsin Institute for Discovery, January 2015; Complex Data Systems Distinguished Lecture, University of South Florida, October 2016.

6 Recent invited talks, lecture series, and colloquia

Keynote, Computational Social Science Society of the Americas, Santa Fe, October 2024

Applied Math Seminar, Dartmouth, October 2024

Probabilitas Seminar, Harvard, October 2024

Network Science Seminar, Northeastern, October 2024

Quantitative Bootcamp for Qualitative Social Scientists, Howard University, May 2024

Distinguished Lecture, School of Computer and Communication Sciences, EPFL, May 2024

Mathematics and Statistics Seminar, University of South Florida, April 2024

Network Science Society Colloquium, March 2024

Applied Mathematics and Statistics Seminar, Johns Hopkins, March 2024

Banff Workshop on Computational Complexity of Statistical Inference, February 2024

Foundations of Data Science Colloquium, Yale, December 2023

Donahue Professor of the Arts Speaker, Philosophy, University of Massachusetts Lowell, December 2023

Panelist, American Society of Criminology, Philadelpha, November 2023

Princeton Day of Statistics, November 2023

National Conference of State Legislatures (NLPES) Professional Development Seminar, Santa Fe, October 2023

ENS Paris, Focus Day on Statistical Physics and Computation, October 2023

Session chair, Solvay Conference on Physics, October 2023

Mathematical Physics Webinar, Rutgers University, August 2023

Algorithms, Fairness, and Equity, Simons-Laufer Mathematical Sciences Institute, August 2023

Statistical Physics and Machine Learning Back Together Again, Institute d'Études Scientifiques de Cargese, August 2023

Los Alamos Conclave on Complexity, July 2023

From Impact Factor to Influence Factor: Data Science and Policy for Social Justice, ICERM, Brown University, June 2023

Hypatia Colloquium, Centre de Recerca Matemàtica, June 2023

Simons Institute Workshop on Cracking the Glass Problem, March 2023

Physics and Astronomy Colloquium, University of New Mexico, September 2022

NetSci School, tutorial lecture on statistical inference, July 2022

Complex Systems Seminar, Northwestern University, May 2022

Computer Science Colloquium, University of New Mexico, May 2022

Stockholm University Physics Colloquium, April 2022

Mesa Community College Math Club, November 2021

Mathematics Colloquium, Dartmouth College, October 2021

Conference on Future Synergies for Stochastic and Learning Algorithms, Central International de Rencontres Mathématiques, Marseille, September 2021

National Meeting of the Portuguese Mathematical Society, July 2021

Staff Briefing on Disparate Impact and Fair Housing, House Financial Services Committee of the US Congress, April 2021

MIT-Harvard Communications Information Networks Circuits and Signals (CINCS) / Hamilton Institute Seminar, February 2021

New Mexico Black Lawyers Association Continuing Legal Education, November 2020

Los Angeles Combinatorics and Complexity Seminar, November 2020

Simons Institute Seminar, Program on Probability, Geometry, and Computation in High Dimensions, November 2020

Northwestern Institute on Complex Systems Seminar, Northwestern University, October 2020

Probability Seminar, University of Waterloo, October 2020

Tufts Workshop on Graphs and Networks, July 2020

Cardano Virtual Summit, July 2020

Computer Science Seminar, West University of Timişoara, Romania, May 2020

Complex Networks and Systems Colloquium, Indiana University, February 2020

Complex Systems Seminar, University of Vermont, December 2019

Network Science Seminar, Northeastern, November 2019

Physics Colloquium, Boston University, November 2019

Computer Science Colloquium, Dartmouth, October 2019

Stochastics and Statistics Seminar, MIT, October 2019

57th Annual Allerton Conference on Communication, Control, and Computing. University of Illinois, Urbana-Champaign, September, 2019

Tutorial on Noisy Tensors for Machine Learning, at Tensors: Algebra, Computation, Applications. University of Colorado, Boulder, June 2019

Distinguished Lecture, Computer Science and Engineering, University of Michigan, April 2019

Plenary, Condensed Matter Section of Deutsche Physikalische Gesellschaft, Regensburg, April 2019

7 Publications

7.1 Books, book chapters, and less-technical writing

- S. Blumsack, P. Hines, C. Moore, J.E. Trancik, I. Azevedo, K. Araújo, R. Bent, P. Brown, M. Cather, M.R. Edwards, G. Kavlak, D. Klein, H. Passell, D. Patino-Echeverri, L.C. Stokes, M.S. Ziegler, "The Energy Transition in New Mexico: Insights from a Santa Fe Institute Workshop." Santa Fe Institute, 2020.
- C. Moore, "Why COVID-19 Flare-Ups Will Keep Happening: Like earthquakes and forest fires, outbreaks have a 'heavy tail' of large events." Nautilus May 13, 2020.
- C. Moore and J. Kaag, "The Uncertainty Principle: in an age of deep disagreements, mathematics shows us how to pursue truth together." The American Scholar March 2, 2020.
- A. Decelle, J. Hüttel, A. Saade, and C. Moore, "Computational Complexity, Phase Transitions, and Message-Passing for Community Detection." In *Statistical Physics, Optimization, Inference, and Message-Passing Algorithms.* F. Krzakala, F. Ricci-Tersenghi, L. Zdeborová, R. Zecchina, E. W. Tramel, L. F. Cugliandolo, Eds., Oxford University Press, 2016.
- C. Moore, "A Complex Legacy." Nature Physics 7 (2011) 828–830.
- C. Moore and S. Mertens, The Nature of Computation. Oxford University Press, 2011.
- A. Percus, G. Istrate, and C. Moore, Eds., Computational Complexity and Statistical Physics. Oxford University Press, 2005.
- D. Griffeath and C. Moore, Eds., New Constructions in Cellular Automata. Oxford University Press, 2003.
- C. Moore, "Limiting the Computational Power of Recurrent Neural Networks: VC Dimension and Noise." J. Kolen and S. Kremer, Eds., A Field Guide to Dynamical Recurrent Networks. IEEE Press, 2001.

7.2 Articles in journals, peer-refereed conference proceedings, and preprints

C. R. Shalizi and C. Moore, "What Is a Macrostate? Subjective Observations and Objective Dynamics." Foundations of Physics 55 article number 2 (2025).

Dmitriy Kunisky, Cristopher Moore, and Alexander S. Wein, "Tensor cumulants for statistical inference on invariant distributions." *Proc. Foundations of Computer Science* (FOCS '24) 1007–1026.

Andrea Della Vecchia, Kibidi Neocosmos, Daniel B. Larremore, Cristopher Moore, and Caterina De Bacco, "Model for efficient dynamical ranking in networks." *Physical Review E* 110, 034310 (2024).

Andrea J. Allen, Cristopher Moore, and Laurent Hébert-Dufresne, "Compressing the Chronology of a Temporal Network with Graph Commutators." *Physical Review Letters* 132, 077402 (2024).

Varsha Dani, Josep Díaz, Thomas P. Hayes, and Cristopher Moore, "Reconstruction of random geometric graphs: Breaking the $\Omega(r)$ distortion barrier." European Journal of Combinatorics 121 (2024) 103842. Conference version "Improved Reconstruction of Random Geometric Graphs." Proc. Intl. Colloquium on Automata, Languages and Programming (ICALP '22), 48:1–48:17.

Cristopher Moore, Elise Ferguson, and Paul Guerin, "Pretrial Risk Assessment on the Ground: Algorithms, Judgments, Meaning, and Policy." MIT Case Studies in Social and Ethical Responsibilities of Computing, Summer 2023 https://doi.org/10.21428/2c646de5.e057132a

Cristopher Moore, Elise Ferguson, and Paul Guerin, "How Much Risk, and Risk of What? A Closer Look at Pretrial Risk Assessment." Preprint, https://ssrn.com/abstract=4352036

Dmitriy Kunisky and Cristopher Moore, "The spectrum of the Grigoriev-Laurent pseudomoments." SIAM J. Discrete Mathematics 38(1) 103–131 (2024).

Cristopher Moore, Elise Ferguson, and Paul Guerin, "How Accurate are Rebuttable Presumptions of Pretrial Dangerousness? A Natural Experiment from New Mexico." *J. Empirical Legal Studies* 20(2) 377–408 (2023).

A. Allard, C. Moore, S. V. Scarpino, B. M. Althouse, and L. Hébert-Dufresne, "The role of directionality, heterogeneity and correlations in epidemic risk and spread." *SIAM Review* 65(2) 471–492 (2023).

A. Kiayias, C. Moore, S. Quader, and A. Russell, "Adaptively Secure Random Beacons for Ungrindable Blockchains." Proc. ICDCS 62–72 (2023).

David Gamarnik, Cristopher Moore, and Lenka Zdeborová, "Disordered Systems Insights on Computational Hardness." *Journal of Statistical Mechanics: Theory and Experiment* 114015 (2022).

Alexander M. Mercier, Samuel V. Scarpino, and Cristopher Moore, "Effective Resistance for Pandemics: Mobility Network Sparsification for High-Fidelity Epidemic Simulation." *PLoS Computational Biology* 18(11): e1010650 (2022).

Sandro Coretti, Aggelos Kiayias, Cristopher Moore, and Alexander Russell, "The Generals' Scuttlebutt: Byzantine-Resilient Gossip Protocols." Proc. ACM Conference on Computer and Communications Security (CCS' 22) 595–608.

George T. Cantwell and Cristopher Moore, "Belief propagation for permutations, rankings, and partial orders." *Physical Review E* 105, L052303 (2022).

Afonso S. Bandeira, Jess Banks, Dmitriy Kunisky, Cristopher Moore, and Alexander S. Wein, "Spectral Planting and the Hardness of Refuting Cuts, Colorability, and Communities in Random Graphs." *Proc. 34th Ann. Conf. on Learning Theory* (COLT '21) 410–473.

M. Moharrami, C. Moore, and J. Xu, "The Planted Matching Problem: Phase Transitions and Exact Results." *Annals of Applied Probability* 31(6): 2663–2720 (2021).

- E. Blum, A. Kiayias, C. Moore, S. Quader, and A. Russell, "The Combinatorics of the Longest-Chain Rule: Linear Consistency for Proof-of-Stake Blockchains." *Proc. Symposium on Discrete Algorithms* (SODA '20) 1135–1154.
- S. Mertens and C. Moore, "Percolation is Odd." Physical Review Letters 123 (2019) 230605.
- A. Wein, A. El Alaoui, and C. Moore, "The Kikuchi Hierarchy and Tensor PCA." *Proc. Foundations of Computer Science* (FOCS '19) 1446–1468.
- J. Banks, C. Moore, and R. Kleinberg, "The Lovász Theta Function for Random Regular Graphs and Community Detection in the Hard Regime." SIAM J. Computing 48(3) 1098–1119 (2019). Conference version in Proc. 21st Intl. Workshop on Randomization and Computation (RANDOM '17) 1–28.
- S. Mertens and C. Moore, "Series Expansion of Critical Densities for Percolation on \mathbb{Z}^d ." J. Physics A: Mathematical and Theoretical, 51 (47) 475001 (2018).
- S. Mertens and C. Moore, "Percolation Thresholds and Fisher Exponents in Hypercubic Lattices." *Physical Review E* 98, 022120 (2018).
- C. De Bacco, D. B. Larremore, and C. Moore, "A physical model for efficient ranking in networks." *Science Advances* 4 (7) 2018.
- J. Banks, C. Moore, R. Vershynin, N. Verzelen, and J. Xu, "Information-theoretic bounds and phase transitions in clustering, sparse PCA, and submatrix localization." *IEEE Transactions on Information Theory* 64(7):4872–4894 (2018). Conference version in Proc. IEEE International Symposium on Information Theory (ISIT 2017).
- E. Allender, J. A. Grochow, D. van Melkebeek, C. Moore, and A. Morgan, "Minimum Circuit Size, Graph Isomorphism, and Related Problems." *SIAM J. Computing* 47(4) 1339–1372 (2018). Conference version in Proc. Innovations in Theoretical Computer Science (ITCS '18), 1–20.
- S. Mertens and C. Moore, "Percolation Thresholds in Hyperbolic Lattices." *Physical Review E* 96, 042116 (2017).
- X. Zhang, C. Moore, and M.E.J. Newman, "Random graph models for dynamic networks." European Physical Journal B, 90:200 (2017).
- C. Moore, "The Computer Science and Physics of Community Detection: Landscapes, Phase Transitions, and Hardness." *Bulletin of the EATCS* 121, 25–61 (2017).
- C. De Bacco, E. A. Power, D. B. Larremore, and C. Moore, "Community detection, link prediction, and layer interdependence in multilayer networks." *Physical Review E* 95, 042317 (2017).
- J. A. Grochow and C. Moore, "Matrix multiplication algorithms from group orbits." Preprint, arxiv.org/1612.01527.
- A. Godoy-Lorite, R. Guimera, C. Moore, and M. Sales-Pardo, "Accurate and scalable social recommendation using mixed-membership stochastic block models." *Proc. National Academy of Sciences* 113 (50) 14207–14212 (2016).
- T. Lesieur, C. De Bacco, J. Banks, F. Krzakala, C. Moore, and L. Zdeborová, "Phase transitions and optimal algorithms in high-dimensional Gaussian mixture clustering." Proc. 54th Allerton Conference on Communication, Control, and Computing (2016).
- A. Z. Jacobs, J. A. Dunne, C. Moore, and A. Clauset, "Untangling the roles of parasites in food webs with generative network models." Preprint, arxiv:1505.04741
- T. P. Hayes and C. Moore, "Lower bounds on the critical density in the hard disk model via optimized metrics." Preprint, arxiv:1407.1930
- J. Banks, C. Moore, J. Neeman and P. Netrapalli, "Information-theoretic thresholds for community detection in sparse networks." *Proc. 29th Ann. Conf. on Learning Theory* (COLT 2016) 383–416.

- A. Ghasemian, P. Zhang, A. Clauset, C. Moore, and L. Peel, "Detectability thresholds and optimal algorithms for community structure in dynamic networks." *Physical Review X* 6, 031005 (2016).
- C. Moore, "The phase transition in random regular exact cover." Annales l'Institut Henri Poincaré D, Combinatorics, Physics and their Interactions, 3 (3) 349–362 (2016).
- V. Dani, T. P. Hayes, C. Moore, and A. Russell, "Codes, lower bounds, and phase transitions in the symmetric rendezvous problem." *Random Structures and Algorithms* 49(4) 742–765 (2016).
- H. Youn, L. Sutton, E. Smith, C. Moore, J. F. Wilkins, I. Maddieson, W. Croft, and T. Bhattacharya, "On the universal structure of human lexical semantics." *Proc. National Academy of Sciences*, 113(7) 1766–1771 (2016).
- P. Zhang, C. Moore, and M. E. J. Newman, "Community detection in networks with unequal groups." *Physical Review E* 93, 012303 (2016).
- S. Lovett, C. Moore, and A. Russell, "Group representations that resist random sampling." *Random Structures and Algorithms* 47(3) 605–614 (2015).
- M. Shrestha, S. Scarpino, and C. Moore, "Message-passing approach for recurrent-state epidemic models on networks." *Physical Review E* 92 022821 (2015).
- C. Moore and A. Russell, "Optimal ϵ -biased sets with just a little randomness." SIAM J. Discrete Math. 29(3) 1303–1311 (2015).
- C. Moore and A. Russell, "Approximate representations, approximate homomorphisms, and low-dimensional embeddings of groups." SIAM J. Discrete Math. 29 (1) 182–197 (2015).
- H. Dinh, C. Moore, and A. Russell, "Limitations of single coset states and quantum algorithms for code equivalence." *Quantum Information and Computation* 15 260–294 (2015).
- C. Moore and A. Russell, "Heat and Noise on Cubes and Spheres: The Sensitivity of Randomly Rotated Polynomial Threshold Functions." Preprint, arXiv:1408.5425.
- P. Zhang and C. Moore, "Scalable detection of statistically significant communities and hierarchies: message-passing for modularity." *Proc. National Academy of Sciences* 111 (51) 18144–18149 (2014).
- P. Zhang, C. Moore, and L. Zdeborová, "Phase transitions in semisupervised clustering of sparse networks." *Physical Review E* 90 052802 (2014).
- M. Shrestha and C. Moore, "A message-passing approach for threshold models of behavior in networks." *Physical Review E* 89 022805 (2014).
- F. Caccioli, M. Shrestha, C. Moore, and J. D. Farmer, "Stability analysis of financial contagion due to overlapping portfolios." *J. Banking and Finance* 46 233–245 (2014).
- G. Ver Steeg, C. Moore, A. Galstyan, and A. E. Allahverdyan, "Phase transitions in community detection: a solvable toy model." *Europhysics Letters* 106 48004 (2014).
- C. Moore and L.J. Schulman, "Tree codes and a conjecture on exponential sums." *Proc. 5th Innovations in Theoretical Computer Science* (ITCS '14) 145–154.
- R. Impagliazzo, C. Moore, and A. Russell, "An entropic proof of Chang's inequality." SIAM J. Discrete Math., 28(1) 173–176 (2014).
- X. Yan, J. Jensen, F. Krzakala, C. Moore, C. Shalizi, L. Zdeborová, P. Zhang, and Y. Zhu, "Model Selection for Degree-corrected Block Models." *J. Stat. Mech.* 5 P05007 (2014). Conference version in *Workshop on Social Network and Social Media Analysis*, NIPS '12.
- Y. Zhu, X. Yan, and C. Moore, "Oriented and Degree-generated Block Models: Generating and Inferring Communities with Inhomogeneous Degree Distributions." *J. Complex Networks* 2(1) 1–18 (2014). Conference version in *Workshop on Social Network and Social Media Analysis*, NIPS '12.
- F. Krzakala, C. Moore, E. Mossel, J. Neeman, A. Sly, L. Zdeborová, and P. Zhang, "Spectral redemption in clustering sparse networks." *Proc. National Academy of Sciences* 110 (52) 20935—

- 20940 (2013).
- V. Dani, J. Diaz, T. P. Hayes, and C. Moore, "The power of choice for random satisfiability." *Proc.* 17th Intl. Workshop on Randomization and Computation (RANDOM '13) 484–496.
- S. Chen, C. Moore, and A. Russell, "Small-Bias Sets for Nonabelian Groups: Derandomizing the Alon-Roichman Theorem." *Proc.* 17th Intl. Workshop on Randomization and Computation (RANDOM '13) 436–451.
- Y. Zhu, X. Yan, L. Getoor, and C. Moore, "Scalable text and link analysis with mixed-topic link models." *Proc.* 19th Int. Conf. on Knowledge Discovery and Data Mining (KDD '13) 473–481.
- S. Mertens and C. Moore, "The complexity of the fermionant, and immanants of constant width." *Theory of Computing* 9 (6) 273–282 (2013).
- C. D. Brummitt, P. D. H. Hines, I. Dobson, C. Moore, R. M. D'Souza, "Transdisciplinary electric power grid science." *Proc. National Academy of Sciences* 110 (30) 12159 (2013).
- S. Mertens and C. Moore, "Continuum percolation thresholds in two dimensions." *Physical Review* E 86 (2012) 061109.
- C. Moore and A. Russell, "Approximating the permanent via nonabelian determinants." $SIAM\ J.$ Computing 41 (2012) 332–355.
- V. Dani, C. Moore, and A. Olson, "Tight bounds on the threshold for permuted k-colorability." *Proc.* 16th Intl. Workshop on Randomization and Computation (RANDOM '12) 505–516.
- H. Bauke, C. Moore, J.-B. Rouquier, and D. Sherrington, "Topological phase transition in a network model with preferential attachment and node removal." *Euro. Phys. J. B* 83 (2011) 519–524.
- A. Decelle, F. Krzakala, C. Moore, and L. Zdeborová, "Asymptotic analysis of the stochastic block model for modular networks and its algorithmic applications." *Physical Review E* 84 (2011) 066106.
- A. Decelle, F. Krzakala, C. Moore, and L. Zdeborová, "Phase transition in the detection of modules in sparse networks." *Physical Review Letters* 107 (2011) 065701.
- J. Machta, S. DeDeo, S. Mertens, and C. Moore, "Parallel complexity of random Boolean circuits." J. Stat. Mech. P04015 (2011).
- C. Moore and A. Russell, "A graph integral formulation of the circuit partition polynomial." *Combinatorics, Probability, and Computing* 20 (2011) 911–920.
- H. Dinh, C. Moore, and A. Russell, "McEliece and Niederreiter Cryptosystems That Resist Quantum Fourier Sampling Attacks." *Proc. 31st Annual Cryptology Conference* (CRYPTO '11) 761–779.
- V. Dani and C. Moore, "Independent sets in random graphs from the weighted second moment method." *Proc.* 15th Intl. Workshop on Randomization and Computation (RANDOM '11) 472–482.
- C. Moore, X. Yan, Y. Zhu, J.-B. Rouquier, and T. Lane, "Active learning for node classification in assortative and disassortative networks." *Proc.* 17th Int. Conf. on Knowledge Discovery and Data Mining (KDD '11) 841–849.
- S. Kasiviswanathan, C. Moore, and L. Theran, "The rigidity transition in random graphs." *Proc. 22nd Symp. on Discrete Algorithms* (SODA '11) 1237–1252.
- S. Hallgren, C. Moore, M. Rötteler, A. Russell, and P. Sen, "Limitations of quantum coset states for Graph Isomorphism." *J. ACM* 57 (6) (2010). Conference version in *Proc. 38th Symp. on Theory of Computing* (STOC '06), 604–617.
- C. Moore, A. Russell, and P. Śniady, "On the impossibility of a quantum sieve algorithm for Graph Isomorphism." SIAM J. Computing 39(6) (2010) 2377–2396. Conference version in Proc. 39th Symp. on Theory of Computing (STOC '07), 536–545.
- A. Denney, C. Moore, and A. Russell, "Finding conjugate stabilizer subgroups in PSL(2,q) and related groups." Quantum Information and Computation 10(3-4) (2010) 282–291.

- Y. Park, C. Moore, and J.S. Bader, "Dynamic networks from hierarchical Bayesian graph clustering." *PLoS One* 5(1) (2010).
- D. Kempe, M. Salek, and C. Moore, "Frugal and truthful auctions for vertex covers, flows, and cuts." *Proc.* 51st. Foundations of Computer Science (FOCS '10) 745–754.
- S. Bravyi, C. Moore, and A. Russell, "Bounds on the quantum satisfiability threshold." *Proc. 1st Symp. on Innovations in Computer Science* (ICS '10) 482–489.
- G. Alagic, C. Moore, and A. Russell, "Quantum algorithms for Simon's problem over general groups." *ACM Transactions on Algorithms* 6 (2009) 331–345. Conference version in *Proc. 18th Symp. on Discrete Algorithms* (SODA '07), 1217–1224.
- D. Achlioptas, A. Clauset, D. Kempe, and C. Moore, "On the bias of traceroute sampling: or, power-law degree distributions in regular graphs." *J. ACM* 56(4) (2009) 1–28. Conference version in *Proc. 37th Symp. on Theory of Computing* (STOC '05), 694–703.
- V. Kalapala and C. Moore, "The phase transition in Exact Cover." *Chicago Journal of Theoretical Computer Science*, article 5 (2008).
- A. Clauset, C. Moore, and M. E. J. Newman, "Hierarchical structure and the prediction of missing links in networks." *Nature* 453 (2008) 98–101.
- C. Moore, A. Russell, and L.J. Schulman, "The symmetric group defies strong Fourier sampling." SIAM J. Computing 37 (2008) 1842–1864. Invited paper in special issue for FOCS 2005. Conference version in Proc. 46th Foundations of Computer Science (FOCS '05), 479–490.
- C. Moore, A. Russell, and U. Vazirani, "A classical one-way function to confound quantum adversaries." Preprint, arXiv:0701115.
- R.M. D'Souza, P.L. Krapivsky, and C. Moore, "The power of choice in growing trees." *European J. Phys. B* 59 535–543 (2007).
- C. Moore and A. Russell, "For distinguishing conjugate hidden subgroups, the Pretty Good Measurement is as good as it gets." Quantum Information and Computation 7 (2007) 752–765.
- C. Moore, D. Rockmore, A. Russell, and L.J. Schulman, "The value of strong Fourier sampling: quantum algorithms for affine groups and hidden shifts." *SIAM J. Computing* 37 (2007) 938–958. Conference version in *Proc.* 15th Symp. on Discrete Algorithms (SODA '04), 1113–1122.
- C. Moore, G. Istrate, D. Demopoulos, and M.Y. Vardi, "A continuous-discontinuous second-order transition in the satisfiability of random Horn-SAT formulas." *Random Structures and Algorithms* 31 (2007) 173–185.
- H. Jia, C. Moore, and D. Strain, "Generating hard satisfiable formulas by hiding solutions deceptively." *J. Artificial Intelligence Research* 28 (2007) 107–118. Conference version in *Proc. 20th Natl. Conf. on Artificial Intelligence* (AAAI '05), 384–389.
- T. Berger-Wolfe, C. Moore, and J. Saia, "A computational approach to animal breeding." *Journal of Theoretical Biology* 244 (2007) 433–439.
- C. Moore, D. Rockmore, and A. Russell, "Generic quantum Fourier transforms." *ACM Transactions on Algorithms* 2 (2006) 707–723. Invited paper in special issue for SODA 2004. Conference version in *Proc.* 15th Symp. on Discrete Algorithms (SODA '04), 778–787.
- D. Achlioptas and C. Moore, "Two moments suffice to cross a sharp threshold." SIAM J. Computing 36 (2006) 740–762.
- C. Moore and M. Nauenberg, "New periodic orbits for the *n*-body problem." *Journal of Computational and Nonlinear Dynamics* 1 (2006) 271–367. Special issue for Philip Holmes' 60th birthday.
- A. Coja-Oghlan, C. Moore, and V. Sanwalani, "Counting connected graphs and hypergraphs via the probabilistic method." *Random Structures and Algorithms* 28 (2006) 289–322. Conference version

- in Proc. 8th Intl. Workshop on Randomization and Computation (RANDOM '04), 322–333.
- C. Moore, G. Ghoshal, and M. E. J. Newman, "Exact solutions for models of evolving networks with addition and deletion of nodes." *Physical Review E* 74 (2006) 036121.
- C. R. Shalizi, R. Haslinger, J.-B. Rouquier, K. L. Klinkner, and C. Moore, "Automatic filters for the detection of coherent structure in spatiotemporal systems." *Physical Review E* 73 (2006) 036104.
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- C. Moore and M. E. J. Newman, "Height representation, critical exponents, and ergodicity in the four-state triangular Potts antiferromagnet." *Journal of Statistical Physics* 99 (2000) 629–660.
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- M. Lachmann, C. Moore, and I. Rapaport, "Who wins Domineering on rectangular boards?" In R.J. Nowakowski, Ed., *More Games of No Chance* (MSRI Workshop on Combinatorial Games, 2000) 307–315.
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- D.M. Barrington, P. McKenzie, C. Moore, P. Tesson, and D. Thérien, "Equation satisfiability and program satisfiability for finite monoids." *Proc. 25th Intl. Symp. on Mathematical Foundations of Computer Science* (MFCS '00) 172–181.
- M. Campagnolo and C. Moore, "An analog characterization of the subrecursive functions." *Proc.* 4th Real Numbers and Computers (RNC '00) 91–110.
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- P. Koiran and C. Moore, "Closed-form analytic maps in one and two dimensions can simulate universal Turing Machines." *Theoretical Computer Science* 210(1) (1999) 217–223, Special Issue on Real Numbers.
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- C. Moore, "Quasi-linear cellular automata." Physica D 103 (1997) 100–132.
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- D. Griffeath and C. Moore, "Life without death is P-complete." Complex Systems 10 (1996) 437–447.
- C. Moore, "Recursion theory on the reals and continuous-time computation." *Theoretical Computer Science* 162 (1996) 23–44.
- C. Moore and A. Drisko, "Algebraic properties of the block transformation on cellular automata." Complex Systems 10(3) (1996) 185–194.
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- C. Moore, "Generalized shifts: undecidability and unpredictability in dynamical systems." Non-linearity 4 (1991) 199–230.
- C. Moore, "Undecidability and unpredictability in dynamical systems." *Physical Review Letters* 64 (1990) 2354–2357.
- C. Moore, "Comment on 'Space-time as a causal set'." Physical Review Letters 60 (1988) 655.

8 Recent professional, editorial, and organizing activities

Advisor, Microgrid Systems Laboratory, 2021–

Co-organizer, Simons Institute Workshop on Computational Phase Transitions, September 2020

Steering Committee, Workshop on Randomization and Computation (RANDOM) 2018–

Program Committee, Symposium on Theory of Computing (STOC) 2017

Chair, Lars Onsager Prize Committee, American Physical Society, 2016

Advisory Board, Indiana University Interdisciplinary Training Program in Complex Networks and Systems, 2016–

Program Committee, International Colloquium on Automata, Languages and Programming (ICALP) 2016, Track $\mathcal C$

Program Committee, Foundations of Computer Science (FOCS) 2015

Program Committee, Workshop on Mining Networks and Graphs (SDM) 2015

Member, Lars Onsager Prize Committee, American Physical Society, 2015

Program Committee (Chair), Workshop on Randomization and Computation (RANDOM) 2014

Organizing Committee, SIAM Workshop on Network Science, 2014

Technical Advisory Group, HRL 2014

Jury, Turing Centenary Research Fellowship and Scholar Competition, 2012

External Review Panel, CIFAR Quantum Information Processing Program, 2012

Associate Editor, Journal of Complex Networks, 2012–2018

Associate Editor, SIAM Journal on Discrete Mathematics, 2010–2018

9 Teaching

9.1 Courses taught at UNM

Introduction to the Theory of Computation (grad) Spring '04, '07-'12 Data Structures and Algorithms Spring and Fall '02, Fall '03, '04, '06 Spring '00, Spring '01, Spring and Fall '02, Spring '04, Fall '10 Physics and Computation Introduction to Quantum Computation Fall '04, Spring '08, Fall '11 Combinatorics, Probability, and Computation Fall '06 Introduction to the Theory of Computation (undergrad) Spring '03 Theoretical Foundations of Computer Science Fall '03 Intermediate Object-Oriented Programming Fall '00, Fall '01

9.2 Courses taught elsewhere

Summer 2005–2018: Santa Fe Institute Complex Systems Summer School, Santa Fe.

January 2003: Complex Systems Summer School. Valparaiso, Chile.

Summer 2001, 2002: Santa Fe Institute Complex Systems Summer School, Budapest.

Spring 2001: Short Course on Computational Complexity for the NSF Physics Graduate Student Fellowship program at the Santa Fe Institute.

Spring 1991: Cornell University, "Components, Systems, and Society: Science and Engineering in a Social Context" (with Zellman Warhaft, Mechanical and Aerospace Engineering).

9.3 Students supervised

Munik Shrestha, Ph.D., Physics, 2015, "Statistics of Epidemics in Networks by Passing Messages." Currently a postdoc at the University of Vermont.

Yaojia Zhu, Ph.D. Computer Science, 2013, "Community Detection in Complex Networks." Now a data scientist at Microsoft.

Xiaoran Yan, Ph.D. Computer Science, 2013, "Model Selection for Stochastic Block Models." Currently a postdoc at ISI at the University of Southern California.

Aaron Denney, Ph.D. Physics, 2012, "Quantum Algorithms, Symmetry, and Fourier Analysis."

Tiffany Pierce, M.S. Computer Science, 2008, "Inference of Large-Scale Structure in Networks."

Haixia Jia, Ph.D. with distinction, Computer Science, 2007, "Hard Problems with Hidden Solutions."

Aaron Clauset, Ph.D. with distinction, Computer Science, 2006, "Structural Inference and the Statistics of Networks." After a postdoc at the Santa Fe Institute, Aaron is now an Assistant Professor in Computer Science at the University Colorado-Boulder.

Vishal Sanwalani, Ph.D. with distinction, Computer Science, 2005, "Applications of the Probabilistic Method to Random Graphs." Postdocs at the University of Waterloo and at Microsoft Research.

Vamsi Kalapala, M.S. 2005, "Results on Phase Transitions and Scale Invariance." Douglas Strain, M.S. 2005.

Qian Liang, M.S. 2003, "The Evolution of Mulan, Some Studies in Game-Tree Pruning and Evaluation Functions in the Game of Amazons." Now at Microsoft.

Manuel Campagnolo. Ph.D. 2002 from the Lisbon University of Technology (co-advised with José Felix Costa). "Computational Complexity of Real-valued Recursive Functions and Analog Circuits." Now Professor of Mathematics at the Lisbon University of Technology.

9.4 Reviewing

(Computer Science, Mathematics, and Statistics) Journal of the ACM, SIAM Journal of Computing, SIAM Journal of Discrete Mathematics, SIAM Journal on Mathematics of Data Science, SIAM Review, Theory of Computing, Journal of Computer and System Sciences, Information and Computation, Theoretical Computer Science, Information Processing Letters, Random Structures and Algorithms, Quantum Information and Computation, Theory of Computing Systems, Discrete and Computational Geometry, IEEE Trans. on Information Theory, IEEE Trans. on Computers, IEEE Trans. on Networks, ACM Trans. on Modeling and Computer Simulation, Computer Networks, Foundations of Computer Science (FOCS), Symposium on Theory of Computing (STOC), Symposium on Discrete Algorithms (SODA), Randomization and Approximation Techniques in Computer Science (RANDOM), Intl. Colloquium on Automata, Languages, and Programming (ICALP), Symposium on Theoretical Aspects of Computer Science (STACS), Mathematical Foundations of Computer Science (MFCS), Computing and Combinatorics Conference (COCOON), Intl. Symposium on Symbolic and Algebraic Computation (ISSAC), Annals of Statistics, Annals of Applied Statistics, Annals of Applied Probability, International Mathematics Research Notices, Revista Matemática Iberoamericana, Portugaliae Mathematica, Mathematics Magazine

(Physics) Physical Review Letters, Nature Physics, Physical Review A, Physical Review E, Physics Letters A, Physica A, Physica D, Europhysics Letters, Communications in Mathematical Physics, Intl. J. Modern Physics C, Computers in Physics

(Other) Nature, Science, Proceedings of the National Academy of Sciences, Proceedings of the Royal Society, PLoS One, Journal of Theoretical Biology, Applied Artificial Intelligence, IEEE Trans. Evolutionary Computation, Fluctuation and Noise Letters, Advances in Complex Systems, Chaos, Journal of Complexity, History and Philosophy of Logic, Perspectives on Psychological Science

10 Recent Funding (Principal Investigator)

NSF IIS BIGDATA with Jiaming Xu, "Mining for Patterns in Graphs and High-Dimensional Data: Achieving the Limits." \$737,645, 2018–2021.

NSF REU Site, "Computational and Mathematical Modeling of Complex Systems." \$346,958, 2014–2017 and \$323,821, 2018–2021.

DARPA GRAPHS with Aaron Clauset and Mark Newman, "Statistical Inference for Detecting Structures and Anomalies in Networks." \$2.9M, 2012–2016.

NSF CCF with Tom Hayes, "The Physics of Markov Chains: Closing the Gap Between Theory and Practice." \$200,000, 2012–2015.

NSF CCF with Alex Russell, "Representation-theoretic Techniques for Pseudorandomness and Lower Bounds." \$240,979, 2012–2015.

McDonnell Foundation with Aaron Clauset and Mark Newman, "Statistical Inference and Machine Learning for Complex Networks." \$417,576, 2008–2011.