

JOHN WILMES

Senior Machine Learning Researcher

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SUMMARY

- **Machine learning and algorithms researcher** with 10 years experience in Deep Learning and Markov chain Monte Carlo techniques
- **Project management** skills demonstrated by leading team of researchers producing two Ph.D. theses, an NSF grant, and publications in top computer science venues

EXPERIENCE

Senior Machine Learning Researcher

Symbolica AI

📅 August 2023 – present

Founder and Principal Research Scientist

Wilmes Consulting LLC

📅 February 2018 – present 📍 Chicago, IL

Machine learning and data analysis consulting firm specializing in overcoming algorithmic barriers in deep learning

Assistant Professor of Mathematics

Brandeis University

📅 July 2018 – June 2021 📍 Waltham, MA

- Awarded \$175k NSF grant “Guarantees for Training Neural Networks,” producing first training guarantees for convolutional graph neural networks on SBM data, published in ICLR.
- Supervised two Ph.D. theses, producing new state-of-art algorithms using deep learning and Markov chain Monte Carlo techniques. My students graduated on schedule and achieved their career goals

Research Scientist

Georgia Institute of Technology

📅 September 2016 – June 2018 📍 Atlanta, GA

- Outstanding Post-Doctoral Research Award for advances in machine learning and Markov chain Monte Carlo algorithms
- NeurIPS “spotlight” talk on provable guarantees for deep learning, and invited presentations worldwide

SKILLS

Communication

- Taught over a dozen university courses, from introductory to graduate-level
- Over 40 research talks, including cross-disciplinary and non-technical audiences

Collaboration

- Built cross-departmental relationships to revise Applied Mathematics major
- Over a dozen co-authors; led team of five student research assistants

Machine Learning

Tensorflow, XGBoost, scikit-learn

- Led research on deep learning guarantees and graph neural networks, published in NeurIPS, COLT, ICLR
- Designed and taught courses to 100+ students on big data, optimization, and machine learning in Python using numpy, pandas, and scikit-learn

Programming

C, Python, R, Lua, Rust, SQL

- 15 years experience developing Python for research, web service development, and data science and machine learning consulting
- Wrote new Neovim user interface in Lua and keyboard firmware in C

EDUCATION

Ph.D. and M.S. in Mathematics

University of Chicago

📅 September 2010 – August 2016

B.A. in Mathematics

Reed College

📅 September 2006 – June 2010

PAPERS

1. Santosh Vempala and John Wilmes. Gradient descent for one-hidden-layer neural networks: Polynomial convergence and SQ lower bounds. In *Proceedings of the 32nd Conference on Learning Theory (COLT)*, 2019.
2. Daniel Štefankovič, Eric Vigoda, and John Wilmes. On counting perfect matchings in general graphs. In *Proceedings of the 13th Latin American Symposium on Theoretical Informatics (LATIN)*, pages 873–885, 2018.
3. Le Song, Santosh Vempala, John Wilmes, and Bo Xie. On the complexity of learning neural networks. In *Advances in Neural Information Processing Systems (NeurIPS)*, pages 5514–5522, 2017.
4. László Babai and John Wilmes. Asymptotic Delsarte cliques in distance-regular graphs. *Journal of Algebraic Combinatorics*, 43(4):771–782, 2016.
5. Xiaorui Sun and John Wilmes. Faster canonical forms for primitive coherent configurations. In *Proceedings of the 47th ACM on Symposium on Theory of Computing (STOC)*, pages 693–702, 2015.
6. Madhusudan Manjunath, Frank-Olaf Schreyer, and John Wilmes. Minimal free resolutions of the G -parking function ideal and the toppling ideal. *Transactions of the American Mathematical Society*, 367(4):2853–2874, 2015.
7. László Babai, Xi Chen, Xiaorui Sun, Shang-Hua Teng, and John Wilmes. Faster canonical forms for strongly regular graphs. In *Proceedings of the 54th IEEE Symposium on Foundations of Computer Science (FOCS)*, pages 157–166, 2013.
8. Laszlo Babai and John Wilmes. Quasipolynomial-time canonical form for Steiner designs. In *Proceedings of the 45th ACM Symposium on Theory of Computing (STOC)*, pages 261–270, 2013.
9. David Perkinson, Jacob Perlman, and John Wilmes. Primer for the algebraic geometry of sandpiles. *Tropical and non-Archimedean geometry*, 605:211–256, 2013.

PRESENTATIONS

Selected Invited Talks

2019 Combinatorics Seminar, Dartmouth College, Hanover, NH
2018 WL2018: Symmetry vs. Regularity, Pilsen, Czech Republic
2017 Computational Challenges in Machine Learning, Simons Institute for the Theory of Computing, Berkeley, CA
2015 Max Planck Institute for Informatics, Saarbrücken, Germany
2015 China Theory Week, Shanghai Jiao Tong University, Shanghai, China
2015 Theory Seminar, Northwestern University, Evanston, IL
2014 Theory of Computing and Probability Seminars, Cornell University, Ithaca, NY
2014 Modern Trends in Algebraic Graph Theory, Villanova University, Villanova, PA
2013 AMS Special Session on Topological Combinatorics, Joint Meetings of Mathematics, San Diego, CA

Selected Contributed Talks

2017 Spotlight Presentation, Neural Information Processing Systems, Long Beach, CA
2015 Dagstuhl Seminar on the Graph Isomorphism Problem, Wadern, Germany