JOHN WILMES

Machine Learning Scientist

Chicago, IL (224) 475-1565 jw@johnwilmes.name johnwilmes.name john-wilmes johnwilmes

SUMMARY

- **Machine learning and algorithms scientist** with 10 years experience in Deep Learning and Markov Chain Monte Carlo
- **Technical leadership skills** demonstrated by directing development of all AI models demoed for $31m Series A

EXPERIENCE

Director of Research Engineering
2023.11 – 2024.11

Senior Machine Learning Researcher
2023.08 – 2023.10

Symbolica AI
Chicago, IL

- Developed proof-of-concept models beating industry-leading LLMs on a formal language task using 10000x fewer parameters, leading to $31m Series A
- Led research and engineering of SoTA mathematical theorem proving models combinining LLMs, RAG, neurosymbolic integration, and reinforcement learning.
- Grew team of researchers and engineers to eight ICs and wrote technical roadmap to translate business objectives into R&D deliverables

Founder and Principal Scientist
2018.02 – 2023.12

Wilmes Consulting LLC
Chicago, IL

- Generative AI client: Achieved >200x speedup of NLP training pipeline in C and Rust, removing bottleneck
- Medical AI client: Designed and implemented deep learning algorithms for categorizing human activities from motion sensor data using Python, Tensorflow, and AWS, improving accuracy by 20%

Assistant Professor of Mathematics
2018.07 – 2021.06

Brandeis University
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

SKILLS

Machine Learning

Tensorflow, PyTorch, 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

Python, R, Lua, Rust, C, SQL

- 15 years experience writing Python for machine learning, data science, and research

Leadership

- Transformed C-suite business goals into technical objectives to manage team of eight engineers and researchers
- Supervised successful delivery of prototypes on fast-paced startup timelines

EDUCATION

Postdoc in Stochastic Algorithms
Georgia Institute of Technology
September 2016 – June 2018

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