JOHN WILMES

Machine Learning Researcher

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SUMMARY

- **Project management** skills demonstrated by leading team of researchers producing two Ph.D. theses, an NSF grant, and publications in top computer science venues

- Experienced **machine learning and algorithms researcher** with Deep Learning and Markov chain Monte Carlo expertise

EXPERIENCE

Machine Learning Consultant

February 2018 – present

- Medical AI startup: Designed and implemented deep learning algorithms for categorizing human activities from embedded motion sensor data using Python, Tensorflow, and AWS, improving accuracy by 20%

- Professional membership organization: Integrated 11 data sources to build predictive model of member retention and design behavioral member segmentation

Assistant Professor of Mathematics

Brandeis University

July 2018 – June 2021 • Waltham, MA

- Collaborated across departments and with university administration to win approval for my revision of Applied Mathematics major

- Designed curriculum on communicating and presenting mathematical results, used by 100+ students

- Awarded $175k NSF grant "Guarantees for Training Neural Networks" producing first-in-class training guarantees for convolutional graph neural networks and resulting in two Ph.D. theses

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 training neural networks, 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, 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. Will Burstein and John Wilmes. Obstacles to depth compression of neural networks. In *Proceedings of the 29th International Conference on Artificial Neural Networks (ICANN)*, 2020.

2. 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.

3. 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.

4. 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.

5. László Babai and John Wilmes. Asymptotic Delsarte cliques in distance-regular graphs. *Journal of Algebraic Combinatorics*, 43(4):771–782, 2016.

6. 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.

7. 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.

8. 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.

9. 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.

10. 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