H E I D I   D I X O N
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EDUCATION

Ph.D.   2004   in Computer and Information Science, University of Oregon

Thesis: *Automating Pseudo-Boolean Inference within a DPLL Framework*

Advisor: Matthew L. Ginsberg

B.A.   1993   in Geology, Oberlin College

EXPERIENCE

Homeschool Teacher — 2013-2025

• Homeschooled my son from fourth grade through high school. Our homeschool philosophy combined project-based learning with additional instruction from outside institutions.

• Developed techniques and strategies for working with students with disabilities.

• Tutored my son in math classes taken at the University of Oregon. Classes tutored: *Calculus I, Calculus III, Elements of Discrete Math I and II, Several-Variable Calculus I and II, Fundamentals of Analysis I and II, Elementary Linear Algebra I and II, Fundamentals of Number Theory I, Introduction to Abstract Algebra I, Introduction to Programming and Problem Solving, Automata Theory*

Adjunct Instructor, University of Oregon, Eugene, Oregon — 2013-2014
Taught *Automata Theory*, a combined graduate and undergraduate class and the graduate level *Algorithms and Complexity* class in the Computer and Information Science Department.

Senior Research Scientist, On Time Systems, Eugene, Oregon — 2004-2012

• Conducted research in search and optimization with a focus in satisfiability testing, planning and large scale scheduling and routing problems. My personal research focused on applying group theory to automated logical proof systems to solve structured constraint satisfaction problems with efficient general purpose methods.

• Familiar with solution methods from the field of Operations Research including linear and integer programming methods.

• Worked for GreenDriver (now Connected Signals at connectedsignals.com) developing a mobile app that provides real-time traffic routing and traffic light predictions for passenger cars using live traffic light data streams. Scientifically investigated in house methods for predicting traffic routes from smart phone GPS data streams generated by moving cars in traffic. Developed code in C++, Python, Objective C and Java on both the server side and client side.

• Worked on the human resources team as the lead code reviewer for incoming interview candidates and as lead interviewer for identifying mathematical and algorithmic problem solving skills.

Research Assistant, Computational Intelligence Research Lab, University of Oregon — 1998-2004

- Conducted research into integrating pseudo-Boolean representations and inference methods into standard satisfiability engines to improve the power of the underlying proof system and improve runtime efficiency.
- Participated in research into search and optimization in the domains of scheduling and routing.

Software Engineer, Terralink, Portland Maine — 1997-1998

Developed software in Delphi for hazardous waste tracking and management.

Mathematics Teacher, The Chewonki Foundation, Maine Coast Semester Program — 1996-1997

Taught high school mathematics at the Chewonki Foundation's Maine Coast Semester Program, an environmentally based semester away program for high school juniors. Mostly Algebra 2, but also a calculus class and a statistics class.

Geologist, R.G. Gerber Inc. Freeport Maine— 1995-1996

Ran and evaluated ground water models for environmental consulting firm. Wrote and maintained code in FORTRAN.

PROJECTS / CODE

PBChaff Built a pseudo-Boolean satisfiability solver that outperformed traditional SAT solvers on problems from the planning domain.

ZAP General-purpose DPLL-style solver that uses permutation group based logical representation and inference system.

Web Developer —- 2017-2024
Built a website with interactive mathematical learning experiences. It includes a visual introduction to calculus plus interactive apps on fractals, penrose tilings, and alternative base systems. https://wildthinks.org/

VOLUNTEER WORK

YouTube Channel Advisor —- **2016-2018**
Adult supervisor for the kid run YouTube channel **GoldfishAndRobin.** The channel creates educational math content for K-12 level. Helped kids organize and plan content and production. Helped create a safe process for young people to share online. https://www.youtube.com/channel/UCciX2VHmW7lx_FVWQ_u4RwQ

FLL Lego Robotics Coach — 2013-2017
Taught basic programming and robotics skills to students in the 4th through 8th grade. My curriculum focused on iterative design, helping students manage complexity, and creating strategies that are precise and tolerant of error.

PUBLICATIONS

- J. Apple, P. Chang, A. Clauson, H. E. Dixon, H. Fakhoury, M. L. Ginsberg, E. Keenan, A. Leighton, K. Scavezze and B. Smith. Green Driver: AI in a Microcosm. In *Proceedings of the Twenty-Fifth National Conference on Artificial Intelligence (AAAI-2011),* 2011.

- H. E. Dixon, M. L. Ginsberg, D. Hofer, E. M. Luks and A. J. Parkes. Generalizing Boolean Satisfiability III: Implementation. *Journal of Artificial Intelligence Research,* 23:441-531, 2005.

- Heidi E. Dixon, PhD Thesis. Automating Pseudo-Boolean Inference withing a DPLL Framework University of Oregon. 2004.

- H. E. Dixon, M. L. Ginsberg, E. M. Luks and A. J. Parkes. Generalizing Boolean Satisfiability II: Theory. *Journal of Artificial Intelligence Research,* 22:481-534, 2004.

- H. E. Dixon, M. L. Ginsberg, D. K. Hofer, E. M. Luks and A. J. Parkes. Implementing a generalized version of resolution. In *Proceedings of the Nineteenth National Conference on Artificial Intelligence (AAAI-2004),* 2004.

- H. E. Dixon, M. L. Ginsberg and A. J. Parkes. Generalizing Boolean Satisfiability I: Background and Survey of Existing Work. *Journal of Artificial Intelligence Research,* 21:193-243, 2004.

- Heidi E. Dixon, Matthew L. Ginsberg, and Andrew J. Parkes, 2002. Likely Near-term Advances in SAT Solvers. Workshop on Microprocessor Test and Verification (MTV 2002). Held in Austin, Texas, USA. June 2002.

- H. E. Dixon and M. L. Ginsberg. Inference methods for a pseudo-Boolean satisfiability solver. In *Proceedings of the Eighteenth National Conference on Artificial Intelligence (AAAI-2002),* 2002.

- H. E. Dixon and M. L. Ginsberg. Combining Satisfiability Techniques from AI and OR. *The Knowledge Engineering Review*, 15(1):31-45, 2000.

INTERESTS   Rock climbing, piano, quilting