Curriculum Vitae

Contact Information

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Current Position

- Research Assistant Professor and Claremont Graduate University
- Supported by Computing Innovation Fellowship 2010 from Computing Research Association and NSF

Education

- **PhD in Computer Science, Cornell University**, Ithaca, NY (2005 - 2009)
  - GPA: 4.0 (out of 4.3)
  - Dissertation title: *Probabilistic Techniques for Constraint Satisfaction Problems*
  - Advisor: Bart Selman (selman@cs.cornell.edu), co-advisor: John Hopcroft (jeh@cs.cornell.edu)
  - Minor field: Cognitive Science. Minor field advisor: Michael Spivey (spivey@ucmerced.edu)
  - Areas of interest: probabilistic inference, heuristics for combinatorial problems, knowledge representation and reasoning
- **MSc+BSc in Computer Science, Charles University**, Prague, Czech Republic (1998 - 2004)
  - GPA: 3.9 (out of 4.0)
  - Thesis title: *Simulation Based Analytical Tools for Mobile Communications*
  - Advisor: Roman Neruda (roman@cs.cas.cz)
  - Concentration: Non-Procedural Programming and Artificial Intelligence
  - Very solid foundation in programming, computer science and mathematics (89 classes in 6 years)

Involvement in Industry and Research Projects

I have developed a set of core skills during my industrial and research experiences, which seamlessly integrate to help me successfully tackle new challenges.

1) innovative thinking resulting in new insights and state-of-the-art techniques (counts of solutions and clusters of solutions, integration of systematic and local search),
2) interaction with experts from different communities (physics and coding theory), comprehension of their approaches, and application to other problems (Survey Propagation and Loop Calculus), and
3) collaborative work, including large-scale software design and development (SimCore simulation framework) and leadership (I Can Do Math!, Automated internet information processing)

- **I Can Do Math!** (2009-present) www.icandomath.org
  - Software/hardware platform for remedial math in elementary and middle school, developed as a volunteer activity with middle school teachers. Currently used in 15 classes.
  - Role: technical lead, designer and implementer. (**PHP, HTML, JavaScript, C#, MySQL**)
- **SimCore** (2004-present)
  - Large-scale, distributed simulation framework and engine. Started during my internship at Los Alamos National Lab, still used for development of large scale social-technological simulations.
  - Role: designer and main implementer. (**C++, MPI, Boost, Python**)
- **Siemens Business Services,** Prague, Czech Republic (2004)
  - Design and implementation of a database system and automatic report generation tool. (**Visual Basic, Oracle, Perl**)
- **Automated Internet Information Processing,** Charles University, Prague, Czech Republic (2001-2002)
  - Designer of the project and the project manager of a team of five students.
  - Original idea, design and implementation of a system used to automate information extraction and processing from the internet. (**Prolog, PHP, C++**)

Research Experiences

- **Visiting researcher at NASA Ames Research Center**, CA (2011)
  - Reasoning about automated planning tasks, automated plan model revisions.
- **Post-doctoral researcher at Los Alamos National Laboratory**, NM (2009-2010)
  - Design, development and analysis of agent-based economy simulation tool
  - Supervisor: Stephan Eidenbenz (eidenben@lanl.gov)
- **Graduate Research Assistant, Cornell University,** NY (2005-2009)
  - Investigating properties of algorithms for probabilistic inference on combinatorial problems
  - Combining complete and local search paradigms for optimization problems
  - Mentor: Bart Selman (selman@cs.cornell.edu)
- **Graduate Research Assistant in Los Alamos National Laboratory**, NM (Jul-Aug 07, Apr-Jun 08)
  - Probabilistic reasoning for satisfiability using graphical models
  - Improving the performance of Belief Propagation using Loop Calculus
  - Mentor: Misha Chertkov (chertkov@lanl.gov)
- **Graduate Research Assistant in Los Alamos National Laboratory**, NM (2004-2005)
  - Design and development of a large-scale simulation tool to be used for realistic urban- to national-size socio-technological modeling
  - Simulations and performance analysis of parametric probabilistic routing protocol for ad-hoc and sensor networks
  - Mentor: Stephan Eidenbenz (eidenben@lanl.gov)
- **Research in Industrial Projects for Students, Institute for Pure and Applied Mathematics at UCLA**, CA (summer 2002)
  - Analysis of Extremal Optimization Algorithm. Both analytical and empirical study, resulting in better understanding of its properties compared to other optimization schemes, such as Metropolis Algorithm, with focus on MAX-k-SAT problem
  - Mentor: Allon Percus (percus@ipam.ucla.gov)

Teaching

My teaching experiences have taught me that patience and empathy are the basic building blocks of the incredibly subtle skill and art called `good teaching'. Empathy to understand the needs, strengths and challenges of each individual student, and patience to keep searching for the right teaching approach. And all this must be done in a very dynamic environment, where the ability to listen and adapt quickly to circumstances is essential.

- **Instructor at Claremont Graduate University**, CA (2011-2012)
  - Classes taught: Mathematical Foundation for Data-intensive Algorithms, Statistics.
  - Research Project Supervised: Hardware/Software Co-design student research clinic.
- **Tutorial Presenter** at the 3rd Learning and Intelligent Optimization Workshop, Trento, Italy, January 2009
  - Tutorial title: *Satisfied by Message Passing: Probabilistic Techniques for Combinatorial Problems*
- **Instructor at Johns Hopkins University's Center for Talented Youth**, LaFayette College, PA (2008)
  - Teaching an intensive summer course on Fractals and Chaos to junior- and high-school students
  - Contact: Bill Crum (academicdean.easton@gmail.com)
- **Tutorial Presenter** at the tutorial forum of 23rd AAAI Conf. on Artificial Intelligence, Chicago, July 2008
  - Tutorial title: *Satisfied by Message Passing: Probabilistic Techniques for Combinatorial Problems*
  - Web page: http://www.cs.cornell.edu/~sabhar/tutorials/AAAI08-BPSP/
- **Teaching Assistant** at Cornell University:
  - Mathematical Foundations for the Information Age (spring 2007); Instructor: Prof. John Hopcroft
  - Uncertainty and Multi-Agent Systems (spring 2006); Instructor: Prof. Bart Selman

Outreach and Volunteering

- **Capshaw Middle School,** Santa Fe, NM (2009-2010)
  - In-class math tutor in a student remediation program
- **Housing Assistance Corporation**, Cape Cod, MA (spring 2009)
  - Volunteer manual work in housing development for low-income families in the Cape Cod area
- **Outreach Program for Cornell Theory Center**, Ithaca, NY (spring 2007)
  - leading Virtual World sessions for children from local social housing establishment
- **Pediatric Section of Motol Hospital**, Prague, Czech Republic (spring - summer 2004)
  - helping with group sessions and activities, regular visits to children with long-term hospitalization, one-on-one tutoring of children
- **Nacel Open Door Student Exchange Orientation**, San Francisco (summers 2000-2007)
  - helping to run an orientation for foreign high school students, as they come to spend a year attending a high school in the USA

Selected Publications

- L. Kroc, A. Sabharwal, B. Selman: *Leveraging Belief Propagation, Backtrack Search, and Statistics for Model Counting*. Annals of Operations Research, vol. 184, no. 1, pp. 209-231 (2011)
- M. Chertkov, L. Kroc, F. Krzakala, M. Vergassola, L. Zdeborova: *Inference in particle tracking experiments by passing messages between images*. In Proc. of the Nat'l Academy of Sciences, PNAS 107(17):7663-7668 April 2010
- L. Kroc, A. Sabharwal, B. Selman: *An Empirical Study of Optimal Noise and Runtime Distributions in Local Search*, SAT-10. 13th Int. Conf. on Theory and Applications of Satisfiability Testing, Scotland, U.K., Jun 2010 (short paper)
- L. Kroc, S. Eidenbenz, J. P. Smith: *Sessionsim: Activity-based Session Generation for Network Simulation*, WSC-09, Winter Simulation Conference, Austin, TX, Dec 2009
- L. Kroc, A. Sabharwal, C. P. Gomes, B. Selman: *Integrating Systematic and Local Search Paradigms: A New Strategy for MaxSAT*, IJCAI-09. 21st Int. Joint Conf. on Artificial Int., Pasadena, CA, Jul 2009
- L. Kroc, A. Sabharwal, B. Selman: *Relaxed DPLL Search for MaxSAT*, SAT-09. 12th International Conf. on Theory and Applications of Satisfiability Testing, Swansea, Wales, U.K., Jun 2009 (short paper)
- L. Kroc, A. Sabharwal, B. Selman: *Counting Solution Clusters in Graph Coloring Problems Using Belief Propagation*, NIPS-08. 22nd Annual Conf. on Neural Inf. Processing Sys., Vancouver, Canada, Dec 2008
- L. Kroc, M. Chertkov: *Loop Calculus for Satisfiability*, Proc. of 23rd AAAI Conference on Artificial Intelligence, AAAI'08, Chicago, Jul 2008 (extended abstract)
- L. Kroc, A. Sabharwal, B. Selman: *Survey Propagation Revisited*, Proc. of the 23rd Conf. on Uncertainty in Artificial Intelligence (UAI), Vancouver, Canada, Jul 2007.
- R. Waupotitsch, S. Eidenbenz, L. Kroc, J. P. Smith: *Multi-Scale Integrated Information and Telecommunications System (MIITS): First Results from a Large-Scale End-to-End Net. Sim.*, Proc. of WSC'06, Monterey, USA, Dec 2006
- C. L. Barrett, S. Eidenbenz, L. Kroc, M. V. Marathe, and J. P. Smith: *Parametric Probabilistic Sensor Network Routing*, Proc. of WSNA, San Diego, CA, USA, Sep 2003

References

- Prof. Bart Selman (PhD advisor) Phone: 1-607-255-5643 Email: selman@cs.cornell.edu
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- Prof. Allon Percus (mentor) Phone: 1-909-607-0744 Email: allon.percus@cgu.edu
  - School of Mathematical Sciences, Claremont Graduate U., 710 N. College, Claremont, CA 91711
- Prof. John Hopcroft (PhD co-advisor) Phone: 1-607-255-1179 Email: jeh@cs.cornell.edu
  - Department of Computer Science, Cornell University, 5144 Upson Hall, Ithaca, NY 14853
- Dr. Stephan Eidenbenz (supervisor) Phone: 1-505-667-3742 Email: eidenben@lanl.gov
  - Los Alamos National Laboratory, CCS-3, P.0. Box 1663, MS M997, Los Alamos, NM 87545
- Dr. Misha Chertkov (mentor) Phone: 1-505-665-8119 Email: chertkov@lanl.gov
  - Los Alamos National Laboratory, T-13, P.0. Box 1663, MS B213, Los Alamos, NM 87545