

## Moshe Looks

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### Employment

#### Senior Software Engineer

Nov 2007 - Mar 2017

Google Inc.

Researched deep learning, generative models, active and semi-supervised learning, and program induction, with applications in search to web-ranking and knowledge graph curation. Was technical lead for a team of 3 engineers working on program induction and of 7 engineers working on generative models. Hosted 7 interns, conducted ~100 technical interviews.

#### Software Engineer

Jan 2002 - Oct 2007<sup>1</sup>

Novamente LLC

Researched probabilistic-evolutionary learning, knowledge representation, AI algorithm integration, and data clustering. Applications included bioinformatics and intelligent virtual agents.

#### Software Engineer

Aug 2003 - Jun 2007<sup>2</sup>

Integrated Intelligence Solutions Operation

SAIC

Developed and applied a probabilistic-evolutionary learning system for time-series prediction, supervised categorization, and unsupervised pattern discovery. Applied natural language processing.

#### Research Assistant

Sep 2005 - Aug 2006

Ron Loui and John Lockwood

Washington University in St. Louis

Developed machine learning algorithms for text mining and natural language processing.

#### Research Assistant

Sep 2002 - Aug 2003

Weixiong Zhang

Washington University in St. Louis

Designed and experimentally validated local search algorithms, in collaboration with adviser.

#### Developer

Aug 2000 - Mar 2001

Wireless Mobile Advanced Push

Collaborated on the design and implementation of a web-based SMS broadcast management system.

#### Developer

Mar 2000 - Aug 2000

GoldNames Ltd.

Built a web-based system handling page generation, traffic analysis, etc., for >35,000 domain names.

#### Undergraduate Assistant

Jan 1999 - Mar 2000

Haim Levanon, Physical Chemistry

Hebrew University of Jerusalem

Assisted in experiments, data collection and analysis, and preparation of results for publication.

### Degrees

**Doctorate in Computer Science**, Washington University in St. Louis, Dec 2006

Dissertation: Competent Program Evolution

**Master's Degree in Computer Science**, Washington University in St. Louis, May 2005

Thesis: Learning Computer Programs with the Bayesian Optimization Algorithm

**Bachelor's Degree in Computer Science**, The Hebrew University of Jerusalem, Jul 2002

Magna Cum Laude, Dean's List, 2000-2002, Senior Project: "Optimal Stereo Mosaicing"

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<sup>1</sup>part-time before Jun 2007

<sup>2</sup>on leave of absence Sep 2005 - Aug 2006

## Moshe Looks

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### Research Area

Currently, deep learning and artificial general intelligence. Previously, generative models, program induction, statistical natural language processing, data clustering, and stochastic local search.

### Software Development Skills

Generic, functional, object-oriented, and procedural paradigms, multiparadigm design, TDD  
Awk, C, C++, Common Lisp, Java, JavaScript, Matlab, Perl, PHP, Python, Prolog, Scheme  
*primary languages are C++ and Python, primary development environment is Emacs*  
TensorFlow, Protocol Buffers, Google Flume (aka Cloud Dataflow), Eigen, SQL, NumPy, Bazel

### Refereed Papers

1. Moshe Looks, Marcello Herreshoff, DeLesley Hutchins, and Peter Norvig “Deep Learning with Dynamic Computation Graphs”, *International Conference on Learning Representations (ICLR)*, 2017. Conference Track.
2. Viktoriya Krakovna and Moshe Looks “A Minimalistic Approach to Sum-Product Network Learning for Real Applications”, *International Conference on Learning Representations (ICLR)*, 2016. Workshop Track.
3. Cassio Pennachin, Moshe Looks, and João de Vasconcelos “Improved Time Series Prediction and Symbolic Regression with Affine Arithmetic”, *Genetic Programming Theory and Practice (GPTP)*, 2011.
4. Cassio Pennachin, Moshe Looks, and João de Vasconcelos “Robust Symbolic Regression with Affine Arithmetic”, *Genetic and Evolutionary Computation Conference (GECCO)*, 2010.
5. Moshe Looks, “Compression Progress, Pseudorandomness, & Hyperbolic Discounting”, *Conference on Artificial General Intelligence (AGI)*, 2010.
6. Moshe Looks and Ben Goertzel, “Program Representation for General Intelligence”, *Conference on Artificial General Intelligence (AGI)*, 2009.
7. Ben Goertzel, Cassio Pennachin, Nil Geisweiller, Moshe Looks, Andre Senna, Welter Silva, Ari Heljakka, and Carlos Lopes “An Integrative Methodology for Teaching Embodied Non-Linguistic Agents”, *Conference on Artificial General Intelligence (AGI)*, 2008.
8. Moshe Looks, “Scalable Estimation-of-Distribution Program Evolution”, *Genetic and Evolutionary Computation Conference (GECCO)*, 2007.
9. Moshe Looks, “On the Behavioral Diversity of Random Programs”, *Genetic and Evolutionary Computation Conference (GECCO)*, 2007.
10. Moshe Looks, “Meta-Optimizing Semantic Evolutionary Search”, *Genetic and Evolutionary Computation Conference (GECCO)*, 2007.
11. Moshe Looks, Ben Goertzel, Lúcio de Souza Coelho, Mauricio Mudado, and Cassio Pennachin, “Clustering Gene Expression Data via Mining Ensembles of Classification Rules Evolved Using MOSES”, *Genetic and Evolutionary Computation Conference (GECCO)*, 2007.
12. Moshe Looks, Ben Goertzel, Lúcio de Souza Coelho, Mauricio Mudado, and Cassio Pennachin, “Understanding Microarray Data through Applying Competent Program Evolution”, *Genetic and Evolutionary Computation Conference (GECCO)*, 2007.
13. Moshe Looks, Andrew Levine, Adam Covington, Ron Loui, John Lockwood, and Young Cho, “Streaming Hierarchical Clustering for Concept Mining”, *IEEE Aerospace Conference (AERO)*, 2007.
14. Moshe Looks, “Program Evolution for General Intelligence”, *Artificial General Intelligence Research Institute Workshop (AGIRI)*, 2006.

15. Moshe Looks, “Levels of Abstraction in Modeling and Sampling: The Feature-Based Bayesian Optimization Algorithm”, *Genetic and Evolutionary Computation Conference (GECCO)*, 2006.
16. Ben Goertzel, Ari Heljakka, Stephan Vladimir Bugaj, Cassio Pennachin, and Moshe Looks, “Exploring Android Developmental Psychology in a Simulation World”, *International Cognitive Science Society, Android Science Workshop*, 2006.
17. Ben Goertzel, Moshe Looks, Ari Heljakka, and Cassio Pennachin, “Toward a Pragmatic Understanding of the Cognitive Underpinnings of Symbol Grounding”, *Semiotics and Intelligent Systems Development*, Ricardo Gudwin and João Queiroz, Eds., 2006.
18. Moshe Looks and Ben Goertzel, “Mixing Cognitive Science Concepts with Computer Science Algorithms and Data Structures: An Integrative Approach to Strong AI”, *AAAI Spring Symposium, Cognitive Science Principles Meet AI-Hard Problems*, 2006.
19. Moshe Looks, Ron Loui, and Barry Cynamon, “Dynamics of Rule Revision and Strategy Revision in Legislative Games”, *Conference on Legal Knowledge and Information Systems (JURIX)*, 2005.
20. Moshe Looks and Ron Loui, “On Game Mechanisms and Procedural Fairness: Preliminary Framework”, *Conference on Legal Knowledge and Information Systems (JURIX)*, 2005.
21. Weixiong Zhang and Moshe Looks, “A Novel Local Search Algorithm for the Traveling Salesman Problem that Exploits Backbones”, *International Joint Conference on AI (IJCAI)*, 2005.
22. Moshe Looks, Ben Goertzel, and Cassio Pennachin, “Learning Computer Programs with the Bayesian Optimization Algorithm”, *Genetic and Evolutionary Computation Conference (GECCO)*, 2005.
23. Moshe Looks, Ben Goertzel and Cassio Pennachin, “Novamente: An Integrative Architecture for General Intelligence”, *AAAI Fall Symposium, Achieving Human-Level Intelligence*, 2004.
24. Weixiong Zhang, Ananda Rangan, and Moshe Looks, “Backbone Guided Local Search for Maximum Satisfiability”, *International Joint Conference on AI (IJCAI)*, 2003.

## Books

1. Jürgen Schmidhuber, Kristinn Thorisson, and Moshe Looks (editors), “Artificial General Intelligence. Proceedings of the 4th International Conference”, *Springer Lecture Notes in Artificial Intelligence (LNAI)*, 2011.

## Invited Talks

1. “Artificial Intelligence – Potential and Risks”, *ACG Silicon Valley*, panel discussion, September 24th, 2015.
2. “Probabilistic Inference and Knowledge Graphs”, *AI+TECH, Institute for the Future*, February 25th, 2015.
3. “Mid-term Prospects for Machine Intelligence: Simple Statistical Models and Beyond”, *Winter Intelligence Conference, Future of Humanity Institute*, January 16th, 2011.
4. “Automated Program Learning for AGI”, *Conference on Artificial General Intelligence (AGI)*, tutorial, March 5th, 2010.
5. “Automated Program Learning for AGI”, *Conference on Artificial General Intelligence (AGI)*, tutorial, March 6th, 2009.
6. “Catalyzing the Coming AGI Renaissance”, *Conference on Artificial General Intelligence (AGI)*, panel discussion, March 3rd, 2008.
7. “The Future of Automated Program Learning”, *Washington DC Future Salon*, December 6th, 2006.
8. “Towards Competent Genetic Programming: What are the Missing Ingredients?”, *Missouri Estimation of Distribution Algorithms Laboratory (MEDAL) Gathering on Evolutionary Computation*, July 24th, 2006.

9. “Probabilistic Model-Building for Program Learning: The Challenge and Opportunity of a Complex Representation”, *Workshop on Optimization by Building and Using Probabilistic Models (OBUPM)*, July 9th, 2006.
10. “Contemporary Approaches to Symbol Grounding”, *Artificial General Intelligence Research Institute Workshop (AGIRI)*, May 21st, 2006.
11. “Frontiers of Evolutionary Computation”, *Artificial General Intelligence Research Institute Workshop (AGIRI)*, May 21st, 2006.

### **Open-Source Software**

TensorFlow Fold, 2017.

Probabilistic Learning of Programs, 2008 - 2011.

Treetree library, 2008.

MOSES, 2007 - 2008.

### **Activities**

#### **Conference chair**

*Conference on Artificial General Intelligence (AGI)*, 2011.

#### **Editorial board member**

*Journal of Artificial General Intelligence (JAGI)*, 2008 - 2014.

#### **Reviewer**

*Journal of Machine Learning Research (JMLR)*, 2011.

*IEEE Transactions on Evolutionary Computation (IEEE-TEC)*, 2008 and 2011.

#### **Program committee member**

*International Joint Conference on AI (IJCAI)*, 2011.

*Conference on Artificial General Intelligence (AGI)*, 2008 - 2016.

*Genetic and Evolutionary Computation Conference (GECCO)*, 2007 - 2011.

*Bio-Inspired Computing: Theories and Applications (BIC-TA)*, 2007.