Dr Nir Piterman

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Research Interests

My research area is formal verification. I am especially interested in model checking and design synthesis. A major part of my work is on the automata-theoretic approach to verification and especially to model checking. I am also working on applications of formal methods to biological modeling.

Qualifications

Oct. 2000 – Mar. 2005 **Ph.D.** in the department of Computer Science and Applied Mathematics at the Weizmann Institute of Science, Rehovot, Israel.

- **Research Area:** Formal Verification.
- **Thesis:** Verification of Infinite-State Systems.
- **Supervisor:** Prof. Amir Pnueli.

Oct. 1998 – Oct. 2000 **M.Sc.** in the department of Computer Science and Applied Mathematics at the Weizmann Institute of Science, Rehovot, Israel.

- **Research Area:** Formal Verification.
- **Thesis:** Extending Temporal Logic with ω-Automata.
- **Supervisor:** Prof. Amir Pnueli and Prof. Moshe Vardi.

Oct. 1994 – June 1997 **B.Sc.** in Mathematics and Computer Science in the Hebrew University, Jerusalem, Israel.

Academic Employment

Oct. 2010 – Present **Lecturer** in the department of Computer Science in University of Leicester.

Aug. 2007 – Sep. 2010 **Research Associate** in the department of Computing in Imperial College London.
Host: Dr. Michael Huth

Oct. 2004 – July 2007 **PostDoc** in the school of Computer and Communication Sciences at the Ecole Polytechnique Fédérale de Lausanne.
Host: Prof. Thomas A. Henzinger

Industry Employment

2000 – 2004 Intel Design Center, Haifa, Israel. Member of the Formal Property Verification team. Design and implementation of extensions to Intel's property language:

- Vacuity detection - provide useful feedback upon successful verification.
- FSM - modelling layer for the verification engineer.

1996 – 1997 Digital Technical Center, Har Hotzvim, Jerusalem (Today Intel Development Center, Jerusalem). Member of the design and tools team.
Specification and implementation of a module automating equivalence checking for hardware.

Academic Activities

Program Committee:	YR-Concur 2010, FORMATS 2010, YR-Concur 2009, MFCS 2009, LICS 2009, AVOCS 2008, YR-Concur 2008.
Journal Editor:	Logical Methods in Computer Science, guest editor of special issue for LICS 2009.
Workshop Chair:	Formal Methods for Robotics and Automation 2011.
Conference Referee:	CMSB 2010, Concur 2010, ICALP 2010, LICS 2010, CAV 2010, STACS 2010, VMCAI 2010, HVC 2009, FMCAD 2009, FM 2009, Concur 2009, CAV 2009, TACAS 2009, FOSSACS 2009, STACS 2009, VMCAI 2009, FSTTCS 2008, LPAR 2008, CMSB 2008, MFCS 2008, Concur 2008, FMSB 2008, LICS 2008, TACAS 2008, FOSSACS 2008, VMCAI 2008, LPAR 2007, CAV 2007, LICS 2007, TACAS 2007, POPL 2007, FSTTCS 2006, ATVA 2006, FMCAD 2006, CSL 2006, ICALP 2006, LICS 2006, CAV 2006, FOSSACS 2006, CAV 2005, FME 2005, CAV 2004, TACAS 2004, STOC 2004, FSTTCS 2003, SWSTE 2003, CAV 2003, TACAS 2003, LICS 2002, Concur 2002, CAV 2002, ICALP 2002, Concur 2001, FME 2001, FMCAD 2000.
Journal Referee:	ACM Transactions in Embedded Computing Systems, ACM Transactions on Programming Languages and Systems, Formal Methods in System Design, Information and Computation, Information Processing Letters, Journal of Logic and Computation, Logical Methods in Computer Science, Theoretical Computer Science, Theory of Computing Systems, Transactions on Design Automation of Electronic Systems, Transactions on Computational Biology and Bioinformatics.
Grant Referee:	Israel Science Foundation 2010. Microsoft Research PhD Scholarship 2009.

Visiting Positions

August 2009	Scientific consultant in Microsoft Research, Redmond, WA, USA.
April 2009	Visiting researcher in department of Computer Science, Weizmann Institute of Science, Israel.
October-December 2008	Visiting researcher (directeur de recherche) in Verimag, CNRS, Grenoble, France.
2008-2010	Visiting Fellow in the Computing Laboratory, Cambridge University, UK.
August 2005	Visiting researcher in department of Computer Science, Weizmann Institute of Science, Israel.

Teaching Experience

Lecturing

- Lecturer in course "Synthesis from Temporal Specifications with Applications in Robotics and Model-driven Development". University of Buenos Aires, 2010.
- Lecturer in course "Models of Computation". Imperial College London, 2010.
- Lecturer in course "Computability and Complexity". Imperial College London, 2008.
  New course format.
- Lecturer in course "Advanced Topics in Automata Theory". Weizmann Institute of Science, 2003.
  New course format. Master level course.

Teaching assistant or Tutor:

- Tutor in course "Reasoning about Programs". Imperial College London, 2008.
- Tutor in course "Mathematical Methods in Computer Science". Imperial College London, 2007.
- Teaching assistant in course "Computer Aided Verification". EPFL, 2006.

- Teaching assistant in course "Theoretical Computer Science III". EPFL, 2005, 2006.
- Teaching assistant in course "Problem Solving in Computer Science". EPFL, 2005.
- Teaching assistant in course "Advanced Topics in Computability". Weizmann Institute of Science, 2002.

Supervised Students

- Jim Kuo, PhD student (co-supervised by M. Huth), Imperial College London, 2010-2013.
  Project: Synthesis of Reactive Systems.
- Nicolas D'Ippolito , PhD student (co-supervised by S. Uchitel), Imperial College London, 2009-2012.
  Project: Applications of Synthesis in Model Driven Development.
- Huaxin Wang, PhD student (supervised by M. Huth), Imperial College London, 2009-2012.
  Project: Heuristics for Solving Parity Games.
- Daniel Wagner, PhD student (supervised by M. Huth), Imperial College London, 2008–2010.
  Project: Abstraction of Probabilistic Systems.
- Gosia Gabriel, Master project, Imperial College London, 2008 (joint with M. Huth).
  Project: Efficient Approximations of Value Functions in Stochastic Parity Games.
- Hicham Tahiri, Master project, Imperial College London, 2008.
  Project: Synthesis of Hardware Designs.
- Vaibhav Rajan, EPFL, semester project, EPFL, 2007.
  Project: Visualization of Mocha Code.
- Luvish Satija, IIT Kanpur, summer intern[1] EPFL, 2006.
  Project: Visualization of Mocha Executions.
- Sudeep Juvekar, IIT Bombay, summer intern[1], EPFL, 2005.
  Project: Minimization of Generalized Büchi Automata.
- Susmit Kumar Jha, IIT Kharagpur, summer intern[1], EPFL, 2005.
  Project: Equivalence of Biological Systems.

Patent

- USPTO Application #20050278153. *Detecting vacuously satisfied specifications in model checking.*

Personal Interests

Hiking, rock climbing, classical music.

[1]Similar to UK master degree but without thesis. Three months of full time work.

References

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Talks

Doctoral School Teaching

1. "Synthesis from Temporal Specifications" in Escuela de Ciencias Informáticas, Summer School, Buenos Aires, Argentina, July 23-28, 2010.

Invited Talks

1. "p-Automata: Acceptors of Markov Chains" in Amir Pnueli Memorial Symposium, New York, NY, UK, May 8-9, 2010.
2. "Bounded Asynchrony" in 1st meeting on Formal Methods in Systems Biology, Cambridge, UK, June 4-5, 2008.

Conference Talks

1. "Lower Bounds on Witnesses for Nonemptiness of Universal co-Büchi Automata" in 12th conference on Foundations of Software Science and Computation Structures, York, UK, March 23-25, 2009.
2. "Strategy Logic" in 18th international conference on Concurrency Theory, Lisbon, Portugal, September 3-8, 2007.
3. "Solving Games without Determinization" in 15th Conference on Computer Science Logic, Szeged, Hungary, September 25-29, 2006.
4. "Minimizing Generalized Büchi Automata" in 18th international conference on Computer Aided Verification, Seattle, WA, USA, August 17-20, 2006.
5. "Safraless Compositional Synthesis" in 18th international conference on Computer Aided Verification, Seattle, WA, USA, August 17-20, 2006.
6. "Faster Solutions of Rabin and Streett Games" in 21st IEEE symposium on Logic in Computer Science, Seattle, WA, USA, August 12-15, 2006.
7. "From Nondeterministic Büchi and Streett Automata to Deterministic Parity Automata" in 21st IEEE symposium on Logic in Computer Science, Seattle, WA, USA, August 12-15, 2006.
8. "Global Model Checking for Infinite-State Systems" in 16th international conference on Computer Aided Verification, Boston, MA, USA, July 13-17, 2004.
9. "Bridging the Gap Between Fair Simulation and Trace Inclusion" in 15th international conference on Computer Aided Verification, Boulder, CO, USA, July 8-12, 2003.
10. "Enhanced Vacuity Detection in Linear Temporal Logic" in 15th international conference on Computer Aided Verification, Boulder, CO, USA, July 8-12, 2003.
11. "Pushdown Specifications" in 9th international conference on Logic, Programming, Artificial Intelligence, and Reasoning, Tbilisi, Georgia, October 14-18, 2002.

12. "Model Checking Linear Properties of Prefix-Recognizable Systems" in 14th international conference on Computer Aided Verification, Copenhagen, Denmark, August July 27-31, 2002. CAV 2002.
13. "From Bidirectionality to Alternation" in 26th international Symposium on Mathematical Foundations of Computer Science, Marianske Lazne, Czech Republic, August 27-31, 2001.
14. "Extended Temporal Logic Revisited", in 12th international conference on Concurrency Theory, Aalborg, Denmark, August 20-25, 2001.
15. "Fair Equivalence Relations" in 20th conference on Foundations of Computer Science and Theoretical Computer Science, New Delhi, India, December 11-13, 2000.

Publications

Electronic versions are available at www.cs.le.ac.uk/∼npiterman/publications.

In all papers, except for 4, 8, 11, and 18 authors are listed alphabetically.

Journal Papers

1. P. Godefroid and N. Piterman. LTL generalized model checking revisited. *Software Tools for Technology Transfer*, 2010. To appear. Full version of VMCAI09 paper.
2. K. Chatterjee, T.A. Henzinger, and N. Piterman. Strategy logic. *Information and Computation*, 208(6):677–693, June 2010. Full version of Concur 07 paper.
3. H. Fecher, M. Huth, N. Piterman, and D. Wagner. Hintikka games for PCTL on labeled Markov chains. *Performance Evaluation*, 67(9):858–872, September 2010. Full version of QEST 08 paper.
4. J. Fisher and N. Piterman. The executable pathway to biological networks. *Briefings in Functional Genomics*, 9(1):79–92, January 2010.
5. D.Y.Q. Wang, L. Cardelli, A. Phillips, N. Piterman, and J. Fisher. Computational modelling of the EGFR network elucidates control mechanisms regulating signal dynamics. *PLoS Computational Biology*, 3(1):118, December 2009.
6. O. Kupferman, N. Piterman, and M.Y. Vardi. From liveness to promptness. *Formal Methods in System Design*, 34(2):83–103, 2009. Full version of CAV07 paper.
7. N. Piterman. From nondeterministic Büchi and Streett automata to deterministic parity automata. *Logical Methods in Computer Science*, 3(3):5, 2007. Full version of LICS06 paper.
8. J. Fisher, N. Piterman, A. Hajanl, and T.A. Henzinger. Predictive modeling of signaling crosstalk during *C. elegans* vulval development. *PLoS Computational Biology*, 3(5):e92, May 2007.
9. Y. Fang, N. Piterman, A. Pnueli, and L. Zuck. Liveness with invisible ranking. *Software Tools for Technology Transfer*, 8(3):261–279, June 2006. Full version of VMCAI04 and TACAS04 papers.
10. Y. Kesten, N. Piterman, and A. Pnueli. Bridging the gap between fair simulation and trace inclusion. *Information and Computation*, 200(1):35–61, July 2005. Full version of CAV03 paper.
11. J. Fisher, N. Piterman, E.J.A. Hubbard, M.J. Stern, and D. Harel. Computational insights into *C. elegans* vulval development. *Proceedings of the National Academy of Sciences*, 102(6):1951–1956, February 2005.
12. N. Piterman and M.Y. Vardi. From bidirectionality to alternation. *Theoretical Computer Science*, 295(1-3):295–321, February 2003. Full version of MFCS01 paper.

Invited Papers

13. J. Fisher, T.A. Henzinger, M. Mateescu, and N. Piterman. Bounded asynchrony: A notion of concurrency tailored for modeling cell-cell interactions. In *1st International Meeting on Formal Methods in Systems Biology*, volume 5054 of *Lecture Notes in Computer Science*, pages 17–32, Cambridge, UK, 2008. Springer-Verlag.

Book

14. N. Piterman. *Extending Temporal Logic with Omega-automata.* Lambert Academic Publishing, 2010.

Book Chapters

15. O. Kupferman, N. Piterman, and M.Y. Vardi. An automata-theoretic approach to infinite-state systems. In *Time for Verification: Essays in Memory of Amir Pnueli*, volume 6200 of *Lecture Notes in Computer Science*, pages 202–259. Springer-Verlag, 2010. Full version of CAV02 paper.
16. O. Kupferman, N. Piterman, and M.Y. Vardi. Fair equivalence relations. In *Verification - Theory and Practice, Festschrift celebrating Zohar Manna's 64th Birthday*, volume 2772 of *Lecture Notes in Computer Science*, pages 702–732. Springer-Verlag, 2003. Full version of FSTTCS00 paper.

Conference Papers

17. B. Cook, J. Fisher, E. Krepska, and N. Piterman. Proving stabilization for biological systems. In *12th International Conference on Verification, Model Checking, and Abstract Interpretation*, Lecture Notes in Computer Science, Austin, TX, USA, January 2011. To appear.
18. N. D'Ippolito, V. Braberman, N. Piterman, and S. Uchitel. Synthesis of live behavior models. In *18th International Symposium on Foundations of Software Engineering*, Santa Fe, NM, USA, November 2010. ACM. To appear.
19. D. Nickovic and N. Piterman. From MTL to deterministic timed automata. In *8th International Conference on Formal Modelling and Analysis of Timed Systems*, volume 6246 of *Lecture Notes in Computer Science*, pages 152–167, Vienna, Austria, September 2010. Springer-Verlag.
20. M. Huth, N. Piterman, and D. Wagner. Weak p-automata: Acceptors for markov chains. In *7th International Conference on Quantitative Evaluation of SysTems*, pages 161–170, Williamsburg, VA, USA, September 2010. IEEE press.
21. M. Huth, N. Piterman, and D. Wagner. Three-valued abstractions of Markov chains: Completeness for a sizeable fragment of PCTL. In *17th International Symposium on Fundamentals of Computation Theory*, volume 5699 of *Lecture Notes in Computer Science*, pages 205–216, Wroclaw, Poland, September 2009. Springer-Verlag.
22. O. Kupferman and N. Piterman. Lower bounds on witnesses for nonemptiness of universal co-Büchi automata. In *12th Conference on Foundations of Software Science and Computation Structures*, volume 5504 of *Lecture Notes in Computer Science*, pages 182–196, York, UK, March 2009. Springer-Verlag.
23. P. Godefroid and N. Piterman. LTL generalized model checking revisited. In *10th International Conference on Verification, Model Checking, and Abstract Interpretation*, volume 5403 of *Lecture Notes in Computer Science*, pages 89–103, Savannah, GA, USA, January 2009. Springer-Verlag. Chosen for special issue of STTT.
24. H. Fecher, M. Huth, N. Piterman, and D. Wagner. Hintikka games for PCTL on labeled Markov chains. In *5th International Conference on the Quantitative Evaluation of Systems*, pages 169–178, Saint Malo, France, September 2008. IEEE press. Chosen for special issue of PEVA.
25. K. Chatterjee, T.A. Henzinger, and N. Piterman. Strategy logic. In *18th International Conference on Concurrency Theory*, volume 4703 of *Lecture Notes in Computer Science*, pages 59–73, Lisbon, Portugal, September 2007. Springer-Verlag. Chosen for special issue of I&C.
26. O. Kupferman, N. Piterman, and M.Y. Vardi. From liveness to promptness. In *18th Conference on Computer Aided Verification*, volume 4590 of *Lecture Notes in Computer Science*, pages 411–424, Berlin, Germany, July 2007. Springer-Verlag. Chosen for special issue of FMSD.
27. R. Bloem, S. Galler, B. Jobstmann, N. Piterman, A. Pnueli, and M. Weiglhofer. Automatic hardware synthesis from specifications: A case study. In *Design Automation and Test in Europe*, Nice, France, April 2007. ACM.
28. K. Chatterjee, T.A. Henzinger, and N. Piterman. Generalized parity games. In *10th In-*

ternational Conference on Foundations of Software Science and Computation Structures, volume 4423 of *Lecture Notes in Computer Science*, pages 153–167, Braga, Portugal, April 2007. Springer-Verlag.

29. T.A. Henzinger and N. Piterman. Solving games without determinization. In *15th conference on Computer Science Logic*, volume 4207 of *Lecture Notes in Computer Science*, pages 394–410, Szeged, Hungary, September 2006. Springer-Verlag.
30. O. Grinchtein, M. Leucker, and N. Piterman. Inferring network invariants automatically. In *3rd International Joint Conference on Automated Reasoning*, volume 4130 of *Lecture Notes in Computer Science*, pages 31–44, Seattle, WA, USA, August 2006. Springer-Verlag.
31. N. Piterman. From nondeterministic Büchi and Streett automata to deterministic parity automata. In *25th IEEE Symposium on Logic in Compuer Science*, pages 255–264, Seattle, WA, USA, August 2006. IEEE press. Chosen for special issue of LMCS.
32. N. Piterman and A. Pnueli. Faster solutions of Rabin and Streett games. In *25th IEEE Symposium on Logic in Computer Science*, pages 275–284, Seattle, WA, USA, August 2006. IEEE press.
33. S. Juvekar and N. Piterman. Minimizing generalized Büchi automata. In *18th Conference on Computer Aided Verification*, volume 4144 of *Lecture Notes in Computer Science*, pages 45–58, Seattle, WA, USA, August 2006. Springer-Verlag.
34. O. Kupferman, N. Piterman, and M.Y. Vardi. Safraless compositional synthesis. In *18th Conference on Computer Aided Verification*, volume 4144 of *Lecture Notes in Computer Science*, pages 31–44, Seattle, WA, USA, August 2006. Springer-Verlag.
35. N. Piterman, A. Pnueli, and Y. Sa'ar. Synthesis of reactive(1) designs. In *7th International Conference on Verification, Model Checking and Abstract Interpretation*, volume 3855 of *Lecture Notes in Computer Science*, pages 364–380, Charleston, SC, USA, January 2006. Springer-Verlag.
36. J. Fisher, D. Harel, E.J.A. Hubbard, N. Piterman, M.J. Stern, and N. Swerdlin. Combining state-based and scenario-based approaches in modeling biological systems. In *2nd International Workshop on Computational Methods in Systems Biology*, volume 3082 of *Lecture Notes in Computer Science*, pages 236–241, Paris, France, May 2004. Springer-Verlag.
37. N. Piterman and M.Y. Vardi. Global model-checking for infinite-state systems. In *16th International Conference on Computer Aided Verification*, volume 3114 of *Lecture Notes in Computer Science*, pages 387–400, Boston, MA, USA, July 2004. Springer-Verlag.
38. Y. Fang, N. Piterman, A. Pnueli, and L. Zuck. Liveness with incomprehensible ranking. In *10th International Conference on Tools and Algorithms for the Construction and Analysis of Systems*, volume 2988 of *Lecture Notes in Computer Science*, pages 482–496, Barcelona, Spain, March 2004. Springer-Verlag. Chosen for special issue of STTT.
39. Y. Fang, N. Piterman, A. Pnueli, and L. Zuck. Liveness with invisible ranking. In *5th International Conference on Verification, Model Checking and Abstract Interpretation*, volume 2937 of *Lecture Notes in Computer Science*, pages 223–238, Venice, Italy, January 2004. Springer-Verlag.
40. Y. Kesten, N. Piterman, and A. Pnueli. Bridging the gap between fair simulation and trace inclusion. In *15th International Conference on Computer Aided Verification*, volume 2725 of *Lecture Notes in Computer Science*, pages 381–393, Boulder, CO, USA, July 2003. Springer-Verlag.
41. R. Armoni, L. Fix, A. Flaisher, O. Grumberg, N. Piterman, A. Tiemeyer, and M.Y. Vardi. Enhanced vacuity detection in linear temporal logic. In *15th International Conference on Computer Aided Verification*, volume 2725 of *Lecture Notes in Computer Science*, pages 368–380, Boulder, CO, USA, July 2003. Springer-Verlag.
42. N. Piterman and M.Y. Vardi. Micro-macro stack systems: A new frontier of elementary decidability for sequential systems. In *18th IEEE Symposium on Logic in Computer Science*, pages 381–390, Ottawa, Canada, June 2003. IEEE press.
43. O. Kupferman, N. Piterman, and M.Y. Vardi. Pushdown specifications. In *9th International Conference on Logic for Programming Artificial Intelligence and Reasoning*, volume 2514 of *Lecture Notes in Computer Science*, pages 262–277, Tbilisi, Georgia, October 2002. Springer-Verlag.

44. O. Kupferman, N. Piterman, and M.Y. Vardi. Model checking linear properties of prefix-recognizable systems. In *14th International Conference on Computer Aided Verification*, volume 2404 of *Lecture Notes in Computer Science*, pages 371–385, Copenhagen, Denmark, July 2002. Springer-Verlag.
45. N. Piterman and M.Y. Vardi. From bidirectionality to alternation. In *26th International Symposium on Mathematical Foundations of Computer Science*, volume 2136 of *Lecture Notes in Computer Science*, pages 598–610, Marianske Lazne, Czech Republic, August 2001. Springer-Verlag. Chosen for special issue of TCS.
46. O. Kupferman, N. Piterman, and M.Y. Vardi. Extended temporal logic revisited. In *12th International Conference on Concurrency Theory*, volume 2154 of *Lecture Notes in Computer Science*, pages 519–535, Aalborg, Denmark, August 2001. Springer-Verlag.
47. O. Kupferman, N. Piterman, and M.Y. Vardi. Fair equivalence relations. In *20th Conference on the Foundations of Software Technology and Theoretical Computer Science*, volume 1974 of *Lecture Notes in Computer Science*, pages 151–163, New Delhi, India, December 2000. Springer-Verlag.

Workshop Papers

48. M. Huth, N. Piterman, and H. Wang. A workbench for preprocessor design and evaluation: toward benchmarks for parity games. In *9th International Workshop on Automated Verification of Critical Systems*, Swansea, UK, September 2009.
49. R. Bloem, S. Galler, B. Jobstmann, N. Piterman, A. Pnueli, and M. Weiglhofer. Specify, compile, run: Hardware from PSL. In *6th International Workshop on Compiler Optimization Meets Compiler Verification*, pages 1188–1193, Braga, Portugal, April 2007.
50. K. Chatterjee, T.A. Henzinger, and N. Piterman. Algorithms for Büchi games. In *3rd Workshop on Games in Design and Verification*, Electronic Notes in Theoretical Computer Science, Seattle, WA, USA, August 2006. Elsevier.
51. R. Armoni, L. Fix, R. Fraer, S. Huddleston, N. Piterman, and M.Y. Vardi. Sat-based induction for temporal safety properties. In *2nd International Workshop on Bounded Model Checking*, volume 119 of *Electronic Notes in Theoretical Computer Science*, pages 3–16, Boston, MA, USA, July 2004. Elsevier.