

George Konidakis

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Education

- **Postdoctoral Research** Jan. 2011–present.
MIT Computer Science and Artificial Intelligence Laboratory.
Research on hierarchical robot learning and planning with Professors Leslie Kaelbling and Tomas Lozano-Perez.
- **Doctor of Philosophy**, Computer Science. Sep. 2004–Dec. 2010.
Computer Science Department, University of Massachusetts Amherst.
Dissertation: *Autonomous Robot Skill Acquisition*, advisor: Prof. Andrew G. Barto.
- **Master of Science**, Artificial Intelligence (with distinction). Sep. 2002–Sep. 2003.
School of Informatics, University of Edinburgh.
Dissertation: *Behaviour-Based Reinforcement Learning*, supervisor: Dr. Gillian Hayes.
- **Bachelor of Science with Honours**, Computer Science (with distinction). Jan. 2001–Dec. 2001.
School of Computer Science, University of the Witwatersrand.
Research Report: *Axial Line Placement in Deformed Urban Grids*, supervisor: Prof. Ian Sanders.
- **Bachelor of Science**. Jan. 1998–Dec. 2000.
Computer Science and Computational & Applied Mathematics (with distinction).
University of the Witwatersrand.

Teaching Experience

- **Guest Lectures**
 - *Reinforcement Learning* Dec. 1st 2011,
Massachusetts Institute of Technology, course 6.867 (Machine Learning). Nov. 27th 2012.
 - *Hierarchical Reinforcement Learning*
Brown University, course CSCI2951-F (Learning and Sequential Decision Making). Nov. 5th 2012.
 - *Reinforcement Learning for Robotics* May 7th 2013.
Massachusetts Institute of Technology, course 6.S064 (Introduction to Machine Learning).
- **External Author and Examiner** Jun. 2008–Jul. 2014
University of London, International Programmes. Developed subject guide and accompanying CD for undergraduate Artificial Intelligence (2910310/CO3310) course, and set and marked projects and final exams. This course is taken by approximately 40 correspondence students every year from around the world, who obtain credit toward a University of London degree.
- **Curriculum Design** Jun. 2011–August 2011
MIT-Singapore Alliance. Collaborated with the MIT Mechanical Engineering department to design an introductory course (and associated course notes) on numerical programming in Python. A Matlab version is now being used to teach Numerical Computation for Mechanical Engineers (2.086) at MIT.
- **Teaching Assistant** (7 semesters) Sep. 2004–Dec. 2010
Department of Computer Science, University of Massachusetts Amherst. Graded written and programming assignments, conducted discussion sections and held office consultations for courses ranging from introductory Java programming to graduate-level algorithms.

- **Teaching Assistant** Jan.– Jul. 2002
School of Computer Science, University of the Witwatersrand, Johannesburg. Co-lectured Basic Computer Organisation (first semester, first year of Computer Science) to approximately 180 students, and tutored Fundamental Algorithmic Concepts (second semester, first year) to a class of approximately 120 students.
- **Tutor** Jan.–Nov. 2001
School of Computer Science, University of the Witwatersrand, Johannesburg. Tutored and marked tests and assignments for first-year undergraduate courses.

Invited Talks at Conferences and Workshops

- *Symbols, Skills, and Robots*. IJCAI 2013 Workshop on Machine Learning for Interactive Systems: Bridging the Gap between Perception, Action and Communication, Beijing, August 4th 2013.
- *Robot Skill Acquisition*. Third EUCogIII (European Network for the Advancement of Artificial Cognitive Systems, Interaction and Robotics) Members Conference, Palma de Mallorca, April 10th 2013.
- *Symbols, Skills, and Robots*. Schloss Dagstuhl Seminar on Mechanisms of Ongoing Development in Cognitive Robotics, February 13th 2013.

Seminars and Colloquia

- Harvard University. *Autonomous Robot Skill Acquisition*, Machine Learning Tea, September 19th 2012.
- University College London, Gatsby Computational Neuroscience Unit. *Autonomous Robot Skill Acquisition*, seminar, December 9th 2011.
- Rutgers. *Autonomous Robot Skill Acquisition*, DCS Colloquium, December 7th 2011.
- MIT. *Skill Acquisition in Continuous Reinforcement Learning Domains*, July 27th 2010.
- Brown University. *Skill Acquisition in Continuous Reinforcement Learning Domains*, July 26th 2010.
- Williams College. *Toward Autonomous Robot Skill Acquisition*, CS Colloquium, November 21st 2008.
- Rutgers. *Toward Autonomous Robot Skill Acquisition*, DCS Colloquium, September 22nd 2008.
- University of Massachusetts Amherst. *Agent Space vs. Problem Space: Knowledge and Skill Transfer in Reinforcement Learning*, Machine Learning and Friends Lunch, December 1st 2005; *Sensorimotor Abstraction Selection for Autonomous Robot Skill Acquisition*. Machine Learning and Friends Lunch, 30th April 2008.
- University of Edinburgh. *Behavior-Based Reinforcement Learning*, December 4th 2003.
- University of the Witwatersrand. *Behavior-Based Reinforcement Learning*, 5th October 2003.
- University of Bath. *Behavior-Based Reinforcement Learning*, BAI Summer Seminar Series, September 23rd 2003.

Academic Service and Memberships

- Robotics Chair (with Prof. Gregory Dudek and Dr. Brad Knox), AAAI 2014 and AAAI 2015.
- Co-organizer, co-founder (with Stefanie Tellex, Matt Walter and Brian Scassellati), and steering committee, *Northeast Robotics Colloquium* (NERC), October 1st 2012.
- Co-organizer (with Lorenzo Riano, Alessandro Saffioti, Nick Hawes, Siddharth Srivastava, and Moritz Tenorth), *IROS 2014 Workshop on AI and Robotics*, September 14th 2014.

- Co-organizer (with Alessandro Saffioti, Nick Hawes, and Moritz Tenorth), *AAAI 2014 Workshop on AI and Robotics*, July 27–28th 2014.
- Co-organizer (with Byron Boots, Nick Hawes, Todd Hester, Tekin Meriçli, Lorenzo Riano, Benjamin Rosman and Peter Stone), *AAAI 2013 Workshop on Intelligent Robotic Systems*, July 14–15th 2013.
- Co-organizer (with Gerhard Neumann, Freek Stulp, and Jan Peters), *RSS Workshop on Hierarchical and Structured Learning for Robotics*, June 28th, 2013.
- Co-organizer (with Byron Boots, Nick Hawes, Todd Hester, Bhaskara Marthi, Lorenzo Riano and Benjamin Rosman), *Designing Intelligent Robots: Reintegrating AI II*, AAAI 2013 Spring Symposium.
- Co-organizer (with Byron Boots, Stephen Hart, Todd Hester, Sarah Osentoski and David Wingate), *Designing Intelligent Robots: Reintegrating AI*, AAAI 2012 Spring Symposium.
- Co-organizer (with Özgür Şimşek), *Abstraction in Reinforcement Learning ICML/UAI/COLT 2009 Workshop*.
- Journal Reviewing:
 - Journal of Machine Learning Research (2006, 2007, 2008, 2010, 2012, 2013).
 - Journal of Artificial Intelligence Research (2006, 2007, 2011, 2012, 2013).
 - International Journal of Robotics Research (2013).
 - Artificial Intelligence (2012, 2013, 2014).
 - IEEE Transactions on Robotics (2005, 2013, 2014).
 - Machine Learning (2009, 2011).
 - Robotics and Autonomous Systems (2010, 2011).
 - IEEE Transactions on Autonomous Mental Development (2010).
 - Computational Intelligence (2011, 2012, 2013).
 - IEEE Transactions on Neural Networks (2009, 2010).
 - South African Computer Journal (2011, 2012).
- Conference Reviewing:
 - Neural Information Processing Systems (2011, 2012, 2013, 2014).
 - International Conference on Machine Learning (2009, 2012, 2013, 2014).
 - Robotics: Science and Systems (2013, 2014).
 - International Joint Conference on Artificial Intelligence (2009, 2011, 2013).
 - AAAI Conference on Artificial Intelligence (2010, 2013).
 - IEEE International Conference on Robotics and Automation (2010, 2011, 2012, 2013).
 - IEEE/RSJ International Conference on Intelligent Robots and Systems (2012, 2013, 2014).
 - ACM/IEEE International Conference on Human-Robot Interaction (2010).
 - IEEE Conference on Development and Learning (2010, 2011, 2012).
 - North East Student Colloquium on Artificial Intelligence (2006, 2007, 2008).
 - SAICSIT Annual Research Conference (2009, 2010, 2011, 2012, 2013).
- Senior Program Committee Member:
 - International Joint Conference on Artificial Intelligence (2013).
- Membership of Professional Societies:
 - Association for the Advancement of Artificial Intelligence (since 2006).
 - International Society for Adaptive Behavior (2004–2007).
 - South African Institute for Computer Scientists and Information Technologists (since 2001).
- Departmental Service: Graduate Student Representative (September 2007–December 2008).
- Maintainer (with Chris Vigorito), Reinforcement Learning Repository (2005–2010).

Honors and Awards

- MIT Intelligence Initiative (I²) Postdoctoral Fellowship, April 2013.
- Best Student Video, AAAI 2011 Video Competition, for *Autonomous Robot Skill Acquisition*, Scott Kuindersma and George Konidaris. August 2011.
- The Rank Xerox Prize for the best Artificial Intelligence MSc dissertation, University of Edinburgh, 2003.
- Commonwealth Scholarship (ref. ZACS-2002-344), Association of Commonwealth Universities, for study at the University of Edinburgh, 2002–2003.
- The Liberty Life Gold Medal for outstanding performance in Computer Science Honours, University of the Witwatersrand, 2001.
- The Altech Systems Prize for the best Computer Science Honours Research Report, University of the Witwatersrand, 2001.
- The Colin James Young Award for the best project in any area of the Mathematical Sciences, University of the Witwatersrand, 2001.
- The Computer Science Alumni Medal for the Best Student Tutor, University of the Witwatersrand, 2001.
- Wits Interactive Computing Group (ICG): President (2001), Head of Programming (1999 and 2000), Programming Champion (2000 and 2001).

Publications

Journal Articles

1. S. Niekum, S. Osentoski, G.D. Konidaris, S. Chitta, B. Marthi, and Andrew G. Barto. Learning Grounded Finite-State Representations from Unstructured Demonstrations. Accepted, *International Journal of Robotics Research*, June 2014.
2. G.D. Konidaris, I. Scheidwasser and A.G. Barto. Transfer in Reinforcement Learning using Common Features. *Journal of Machine Learning Research* 13:1333–1371, May 2012.
3. E.L. Nelson, G.D. Konidaris, N.E. Berthier, M.C. Braun, M.S.F.X. Novak, S.J. Suomi and M.A. Novak. Kinematics of reaching and implications for handedness in rhesus monkey infants. *Developmental Psychobiology* 54(4), pages 460–467, May 2012.
4. G.D. Konidaris, S.R. Kuindersma, R.A. Grupen and A.G. Barto, Robot Learning from Demonstration by Constructing Skill Trees. *The International Journal of Robotics Research* 31(3), pages 360–375, March 2012.
5. G.D. Konidaris and G.M. Hayes. An Architecture for Behavior-Based Reinforcement Learning. *Adaptive Behavior* 13(1), pages 5–32, March 2005.

Highly Refereed Conference Papers

6. G.D. Konidaris, L. Kaelbling and T. Lozano-Perez. Constructing Symbolic Representations for High-Level Planning. In *Proceedings of the Twenty-Eighth Conference on Artificial Intelligence*, pages 1932–1940, July 2014.
7. N. Hollingsworth, J. Meyer, R. McGee, J. Doering, G.D. Konidaris and L. Kaelbling. Optimizing a Start-Stop Controller using Policy Search. In *Twenty-Sixth Annual Conference on Innovative Applications of Artificial Intelligence*, pages 2984–2989, July 2014.
8. B.C. da Silva, G.D. Konidaris, and A.G. Barto. Active Learning of Parameterized Skills. In *Proceedings of the Thirty First International Conference on Machine Learning*, pages 1737–1745, June 2014.

9. B.C. da Silva, G. Baldassarre, G.D. Konidaris, and A.G. Barto. Learning Parameterized Motor Skills on a Humanoid Robot. In *Proceedings of the IEEE International Conference on Robotics and Automation*, May 2014.
10. C. Amato, G.D. Konidaris and L.P. Kaelbling. Planning with Macro-Actions in Decentralized POMDPs. In *Proceedings of the 13th International Conference on Autonomous Agents and Multiagent Systems*, pages 1273–1280, May 2014.
11. G. Goretkin, A. Perez, R. Platt Jr., G.D. Konidaris. Optimal Sampling-Based Planning for Linear-Quadratic Kinodynamic System. *Proceedings of the IEEE International Conference on Robotics and Automation*, pages 2429–2436, May 2013.
12. S. Niekum, S. Osentoski, G.D. Konidaris and A.G. Barto. Learning and Generalization of Complex Tasks from Unstructured Demonstrations. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems*, pages 5239–5246, October 2012.
13. B.C da Silva, G.D. Konidaris and A.G. Barto. Learning Parameterized Skills. In *Proceedings of the Twenty-Ninth International Conference in Machine Learning*, pages 1679–1686, June 2012.
14. A. Perez, R. Platt, G.D. Konidaris, L. Kaelbling and T. Lozano-Perez. LQR-RRT*: Optimal Sampling-Based Motion Planning with Automatically Derived Extension Heuristics. In *Proceedings of 2012 IEEE International Conference on Robotics and Automation*, pages 2537–2542, May 2012.
15. G.D. Konidaris, S. Niekum and P.S. Thomas. TD_{γ} : Re-evaluating Complex Backups in Temporal Difference Learning. *Advances in Neural Information Processing Systems 24*, pages 2402–2410, December 2011.
16. G.D. Konidaris, S.R. Kuindersma, R.A. Grupen and A.G. Barto. Autonomous Skill Acquisition on a Mobile Manipulator. In *Proceedings of the Twenty-Fifth Conference on Artificial Intelligence*, pages 1468–1473, August 2011.
17. G.D. Konidaris, S. Osentoski and P.S. Thomas. Value Function Approximation in Reinforcement Learning using the Fourier Basis. In *Proceedings of the Twenty-Fifth Conference on Artificial Intelligence*, pages 380–385, August 2011.
18. G.D. Konidaris, S.R. Kuindersma, A.G. Barto and R.A. Grupen. Constructing Skill Trees for Reinforcement Learning Agents from Demonstration Trajectories. In *Advances in Neural Information Processing Systems 23*. pages 1162–1170, December 2010.
19. G.D. Konidaris and A.G. Barto. Skill Discovery in Continuous Reinforcement Learning Domains using Skill Chaining. In *Advances in Neural Information Processing Systems 22*, pages 1015–1023. December 2009.
20. G.D. Konidaris and A.G. Barto. Efficient Skill Learning Using Abstraction Selection. In *Proceedings of the Twenty First International Joint Conference on Artificial Intelligence*, pages 1107–1112, July 2009.
21. G.D. Konidaris and A.G. Barto. Sensorimotor Abstraction Selection for Efficient, Autonomous Robot Skill Acquisition. In *Proceedings of the 7th IEEE International Conference on Development and Learning*, pages 151–156, August 2008.
22. L. Georgopoulos, G.M. Hayes and G.D. Konidaris. A Forward Model of Optic Flow for Detecting External Forces. In *Proceedings of the IEEE/RSJ 2007 International Conference on Intelligent Robots and Systems*, pages 913–918, October 2007.
23. G.D. Konidaris and A.G. Barto. Building Portable Options: Skill Transfer in Reinforcement Learning. In *Proceedings of the Twentieth International Joint Conference on Artificial Intelligence*, pages 895–900, January 2007.
24. G.D. Konidaris and A.G. Barto. An Adaptive Robot Motivational System. In *From Animals to Animats 9: Proceedings of the 9th International Conference on the Simulation of Adaptive Behavior*, pages 346–356, September 2006.
25. G.D. Konidaris and A.G. Barto. Autonomous Shaping: Knowledge Transfer in Reinforcement Learning. In *Proceedings of the Twenty Third International Conference on Machine Learning*, pages 489–496, June 2006.

26. S. Rauchas, B. Rosman, G.D. Konidaris and I.D. Sanders. Language Performance at High School and Success in First Year Computer Science. In *Proceedings of the SIGCSE 2006 Technical Symposium on Computer Science Education*, pages 398–402, March 2006.
27. F.J. Stewart, T. Taylor and G.D. Konidaris. METAMorph: Experimenting with Genetic Regulatory Networks for Artificial Development. In *Proceedings of the VIIIth European Conference on Artificial Life*, pages 108–117, September 2005.
28. G.D. Konidaris and G.M. Hayes. Estimating Future Reward in Reinforcement Learning Animats using Associative Learning. In *From Animals to Animats 8: Proceedings of the 8th International Conference on the Simulation of Adaptive Behavior*, pages 297–304, July 2004.
29. G.D. Konidaris, T. Taylor and J.C.T. Hallam. HydroGen: Automatically Generating Self-Assembly Code for Hydron Units. In *Proceedings of the Seventh International Symposium on Distributed Autonomous Robotic Systems*, pages 33–42, June 2004.

Chapters in Books

30. A.G. Barto, G.D. Konidaris, and C.M. Vigorito. Behavioral Hierarchy: Exploration and Representation. In *Computational and Robotic Models of the Hierarchical Organization of Behavior*, Baldassarre, Gianluca; Mirolli, Marco (Eds.), pages 13–46, Springer, Berlin, October 2013.

Lightly Refereed Conference Papers, Workshops, Symposia and Posters

31. C. Amato, G.D. Konidaris, G. Cruz, C.A. Maynor, J.P. How and L.P. Kaelbling. Planning for Decentralized Control of Multiple Robots Under Uncertainty. In *Proceedings of the 2014 ICAPS Workshop on Planning and Robotics*, June 2014.
32. C. Treweek, P. Ranchod and G.D. Konidaris. Preferential Targeting of HIV Infected Hubs in a Scale-free Sexual Network. In the *Annual Conference of the Computational Social Science Society of the Americas*, August 2013.
33. G.D. Konidaris. Robots, Skills, and Symbols (Extended Abstract). In *Proceedings of the 2013 Workshop on Machine Learning for Interactive Systems*, August 2013.
34. G.D. Konidaris, L.P. Kaelbling and T. Lozano-Perez. Symbol Acquisition for Task-Level Planning. In the *AAAI 2013 Workshop on Learning Rich Representations from Low-Level Sensors*, July 2013.
35. G.D. Konidaris, S. Kuindersma, S. Niekum, R.A. Grupen and A.G. Barto. Robot Learning: Some Recent Examples. In *Proceedings of the Sixteenth Yale Workshop on Adaptive and Learning Systems*, pages 71–76, Center for Systems Science, Dunham Laboratory, Department of Electrical Engineering, Yale University, New Haven CT, June 2013.
36. F. Doshi-Velez and G.D. Konidaris. Transfer Learning by Discovering Latent Task Parametrizations. In the *NIPS 2012 Workshop on Bayesian Nonparametric Models For Reliable Planning And Decision-Making Under Uncertainty*, December 2012.
37. G.D. Konidaris, S.R. Kuindersma, R.A. Grupen and A.G. Barto. Acquiring Transferrable Mobile Manipulation Skills. In the *RSS 2011 Workshop on Mobile Manipulation: Learning to Manipulate*, June 2011.
38. G.D. Konidaris, S.R. Kuindersma, R.A. Grupen and A.G. Barto. CST: Acquiring Skill Trees by Demonstration. In the *ICML 2011 Workshop on New Developments in Imitation Learning*, July 2011.
39. S. Kuindersma, G. Konidaris, R. Grupen, A. Barto. Learning from a Single Demonstration: Motion Planning with Skill Segmentation (poster abstract). In the *NIPS Workshop on Learning and Planning in Batch Time Series Data*, Vancouver, December 2010.
40. G.D. Konidaris and A.G. Barto. Towards the Autonomous Acquisition of Robot Skill Hierarchies (poster abstract). In the *Robotics: Science and Systems Workshop on Bridging the Gap Between High-Level Discrete Representations and Low-Level Continuous Behaviors*, Seattle, June 2009.
41. G.D. Konidaris and S. Osentoski. Value Function Approximation using the Fourier Basis (extended abstract). In the *Multidisciplinary Symposium on Reinforcement Learning*, Montreal, Canada, June 2009.

42. G.D. Konidaris and A.G. Barto. Skill Chaining: Skill Discovery in Continuous Domains (extended abstract). In the *Multidisciplinary Symposium on Reinforcement Learning*, Montreal, Canada, June 2009.
43. G.D. Konidaris. *Autonomous Robot Skill Acquisition (thesis summary)* Doctoral Symposium, 23rd National Conference on Artificial Intelligence (AAAI 2008), July 2008.
44. E.L. Nelson, G.D. Konidaris and N.E. Berthier. *Using Real-Time Motion Capture to Measure Handedness in Infants*. Poster presentation at the XVIth Biennial International Conference on Infant Studies, Vancouver, Canada, March 2008.
45. G.D. Konidaris. A Framework for Transfer in Reinforcement Learning. In the *ICML-06 Workshop on Structural Knowledge Transfer for Machine Learning*, Pittsburgh PA, June 2006.
46. A. Stout, G.D. Konidaris and A.G. Barto. Intrinsically Motivated Reinforcement Learning: A Promising Framework for Developmental Robot Learning. In *Proceedings of the 2005 AAAI Spring Symposium on Developmental Robotics*, March 2005.
47. G.D. Konidaris and G.M. Hayes. Anticipatory Learning for Focusing Search in Reinforcement Learning Agents. In the *Second Workshop on Anticipatory Behavior in Adaptive Learning Systems*, Los Angeles CA, July 2004.
48. G.D. Konidaris, D.A. Shell and N. Oren. Evolving Neural Networks to Play the Capture Game. In *Proceedings of the SAICSIT 2002 Postgraduate Symposium*, September 2002.
49. J. Adler, G.D. Christelis, J.A. Deneys, G.D. Konidaris, G. Lewis, A.G. Lipson, R.L. Phillips, D.K. Scott-Dawkins, D.A. Shell, B.V. Strydom, W.M. Trakman and L.D. Van Gool. Finding Adjacencies in Non-Overlapping Polygons. Electronic Paper, *Proceedings of the 2001 SAICSIT Conference*, September 2001.

Dissertations and Technical Reports

50. F. Doshi-Velez and G.D. Konidaris. *Hidden Parameter Markov Decision Processes: A Semiparametric Regression Approach for Discovering Latent Task Parametrizations*. ArXiv preprint arXiv:1308.3513, August 2013.
51. G.D. Konidaris. *Autonomous Robot Skill Acquisition*. PhD Thesis, Department of Computer Science, University of Massachusetts, May 2011.
52. G.D. Konidaris and S. Osentoski. *Value Function Approximation in Reinforcement Learning using the Fourier Basis*. Technical Report UM-CS-2008-19, Department of Computer Science, University of Massachusetts Amherst, June 2008.
53. G.D. Konidaris. *Behaviour-Based Reinforcement Learning*. Master's Thesis, School of Informatics, University of Edinburgh, 2003.
54. G.D. Konidaris. *Axial Line Placement in Deformed Urban Grids*. Honours Dissertation, School of Computer Science, University of the Witwatersrand, 2001.

References

References available upon request.