Alexander C. Shkolnik

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SUMMARY

- **PhD in Computer Science from MIT;** broad range of experience in industry, academia and start-ups
- Affinity towards tackling the most complicated problems requiring innovative solutions
- Research expertise in **High Dimensional Motion Planning, Control**
- Experience modeling complex dynamic systems, ranging from living **neuronal networks**, to **robots** to **combustion engines**, with 12 peer-reviewed publications and 3 patents pending across these fields
- Cofounded a combustion engine company, managed a team to write an **award winning business plan**, wrote a winning Army SBIR proposal, **raised venture financing**

WORK EXPERIENCE (NON-ACADEMIC)

LiquidPiston, Inc. West Hartford, CT
Asst. Chief Technology Officer, Cofounder 2003 - Present

- Co-invented a small, efficient rotary diesel combustion engine
- Working with a team to engineer and optimize a prototype
- Coauthored award winning business plan, with top-4 finishes in MIT $50k Competition (2004); MIT Enterprise Forum Clean Energy Competition (2005); GE/Dow Clean Energy Competition (2006)
- Wrote winning Army SBIR Phase I proposal (2007), Helped raise $3.75M of VC financing (2007, 2008)

Emory University Atlanta, GA
Computer Lab Coordinator, Graduate School of Psychology 15 hrs/wk, 1999 - 2003

Agency Management Services (AMS) Windsor, CT
ASP Programmer and Systems Engineer Summers, 1999 – 2001

Quest Systems, Inc. West Hartford, CT
General Manager, Computer Consultant, System Integrator 1993-2000

Invention Machine Corporation Boston, MA
Engineering Intern Summer 1998

- Received training in TRIZ: Theory of Inventive Problem Solving
- Designed a micro-valve for use in refrigerators made by a company in Germany

RESEARCH & TEACHING

Massachusetts Institute of Technology Cambridge, MA
Postdoctoral Research Scientist, Robot Locomotion Group 2010 - Present

- Studying identification and control of the dynamics of a living neuronal network; part of 2008 NSF EFRI

Research Assistant, Robot Locomotion Group 2005 – 2009

- Developed planning methods and control algorithms for the DARPA "Learning Locomotion" project using the LittleDog quadruped robot developed by Boston Dynamics, Inc.;
- Primary contributions in the area of fast motion planning by integrating ideas from task space control, and intelligent sampling methods for randomized planning algorithms

Teaching Assistant, Course 6.881: Underactuated Robotics Spring 2007

- TA'd the first offering of this course, and assisted in course development.

Research Assistant (and NSF Graduate Research Fellow), CBCL 2003 – 2004

- Applied machine learning techniques (SVMs) to decode visual stimuli from electrical recordings in IT cortex in macaque monkeys

National Inst. of Advanced Industrial Science and Technology (AIST) Tsukuba, Japan
NSF / JSPS EAPSI Research Fellow Summer 2007

- Studied foot-roll and toe-off in humanoid robot walking, advised by Shuuji Kajita

Georgia Institute of Technology, Neuroengineering Lab Atlanta, GA
Research Fellow (SURE, Center For Behavioral Neuroscience) 2002 - 2003

- Studied plasticity in cultured neural networks of dissociated cortical rat brain tissue. For masters thesis researched and developed a neuronally controlled robot that follows a reference object (or another robot) and maintains a given distance (similar to a car on autopilot).
- Worked with the University of Western Australia to develop MultiElectrode array ART (MEART). Data from a cultured neural network was processed in real-time and was used to control a robotic drawing arm.

Emory University Atlanta, GA
Research Fellow (SURE) 2001 – 2002

- Studied the role of the medial nucleus of the amygdala in social memory in mice; research included electrolytic and excitotoxin brain lesioning, behavioral testing, histology, etc.

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EDUCATION

Massachusetts Institute of Technology (MIT) — Cambridge, MA
PhD in Computer Science, focus on motion planning for robotics — December 2009
Advisor: Russ Tedrake, Robot Locomotion Group

Emory University, 4.0 / 4.0 GPA in CS / Math major, 3.8 overall — Atlanta, GA
M.S. in Computer Science/Mathematics (thesis research done at GA Tech) — August 2003
B.S. in Computer Science/Mathematics, Summa Cum Laude — May 2003
2nd major in Neuroscience and Behavioral Biology

ACADEMIC HONORS

NSF / JSPS EAPSI Fellowship, summer 2007
National Science Foundation Graduate Research Fellowship, 2003-2006
Graduated with Highest Honors (Summa Cum Laude) in CS / Math, Emory, 2003
Accelerated 4 yr B.S. / M.S. program in Computer Science / Mathematics, Emory
Summer Undergraduate Research at Emory (SURE) Fellowship, 2001 and 2002
Barry M. Goldwater Scholarship for Excellence in Science - honorable mention, 2002

Honor Societies: *Phi Beta Kappa* (academic), *Golden key* (top 15% of class, academic), *Omicron Delta Kappa* (Economics), *Nu Rho Psi*, (Neuroscience)

SELECTED PEER REVIEWED PUBLICATIONS IN ROBOTICS

Shkolnik, A., et al., "Bounding on Rough Terrain with the LittleDog Robot." Submitted to International Journal of Robotics Research.

Shkolnik, A., and Tedrake, R., "Path Planning in 1000+ Dimensions Using a Task-Space Voronoi Bias." IEEE International Conference on Robotics and Automation (ICRA), 2009, Kobe Japan.

Shkolnik, A., Walter, M., Tedrake, R., "Reachability-Guided Sampling For Planning Under Differential Constraints." IEEE International Conference on Robotics and Automation (ICRA), 2009, Kobe Japan.

Shkolnik, A., and Tedrake, R. "High-dimensional underactuated motion planning via task space control." IEEE/ Intnl. Conf. on Intelligent Robots and Systems (IROS). September 22-28, 2008, Nice, France.

Byl, K., Shkolnik, A., Prentice, S., Roy, N., and Tedrake, R. "Reliable dynamic motions for a stiff quadruped." 11th International Symposium on Experimental Robotics (ISER), July 14-17, 2008, Athens, Greece. **Winner, IFRR Student Fellowship Award (Best Paper / Presentation by Katie Byl)**

Doshi, F., et al. "A Supervised Learning Approach for Collision Detection in Legged Locomotion." Submitted to 2007 IEEE International Conference on Intelligent Robots and Systems (IROS).

Shkolnik A., Tedrake, R. "Inverse Kinematics for a Point-Foot Quadruped Robot with Dynamic Redundancy Resolution." 2007 IEEE International Conference on Robotics and Automation (ICRA).

SELECTED PEER REVIEWED PUBLICATIONS IN NEURO-SCIENCE AND NEURAL ROBOTICS

Kreiman G., Chou, H., Shkolnik, A., Poggio, T., and DiCarlo, J. (2004). "Object recognition by selective spike and LFP data in inferior temporal cortex." (San Diego: Society for Neuroscience)

Potter, S., et al. (2004). "Hybrots: Hybrids of living neurons and robots for studying neural computation," in Proc. Brain Inspired Cognitive Systems BICS2004, Scotland, UK.

Bakkum, D. J., Shkolnik, A. C., Ben-Ary, G., Gamblen, P., DeMarse T. D., and Potter, S. M. (2004) "Removing the 'A' from AI: Embodied Cultured Networks" in Embodied Artificial Intelligence, Luc Steels and Rolf Pfeiffer, editors, Springer.

Shkolnik A., (2003). "Neurally controlled simulated robot: applying cultured neurons to handle an approach / avoidance task in real time, and a framework for studying learning in vitro." Masters Thesis, Department of Computer Science, Emory University. Advisor Steve Potter, GA Tech.

PUBLICATIONS IN COMBUSTION ENGINES

Shkolnik N., Shkolnik A. Rotary High Efficiency Hybrid Cycle Engine. SAE Paper 2008-01-2448. Proceedings of the SAE Powertrains, Fuels, and Lubricants Meeting, October 2008, Chicago, IL.

Shkolnik N., Shkolnik A. "High Efficiency Hybrid Cycle Engine." Proc. ASME Internal Combustion Engine Conference, ASME paper ICEF2005-1221, 2005

PATENTS

Shkolnik, N., Shkolnik, A. (2007). "Hybrid Cycle Combustion Engine" (Pending)
Shkolnik, N., Shkolnik, A. (2006). "Hybrid Cycle Rotary Combustion Engine and Methods." (Pending)
Shkolnik, N., Shkolnik, A. (2004). "Hybrid Cycle Combustion Engine." (Pending)

MISC.

Programming experience in Matlab, C/C++, Java, ASP, JavaScript, Pascal, Eosys
A+ certified computer technician (Comptia) – 100% customer satisfaction rating
Born in U.S., conversational in Russian; Enjoy Scuba Diving -- Master Diver (NAUI) certified, skiing, travel