

Kaushik Subramanian

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RESEARCH OBJECTIVES	To perform research in the field of Interactive Machine Learning with the goal of designing learning algorithms that can efficiently interact with humans and/or utilize information from them to solve real-world problems.	
ACADEMIC QUALIFICATIONS	Georgia Institute of Technology, USA Doctor of Philosophy in Computer Science	August 2010 - Present
	Rutgers, The State University of New Jersey, USA Master of Science in Electrical and Computer Engineering	August 2008 - May 2010
	Anna University, India Bachelor of Engineering in Electrical and Communication Engineering	July 2004 - May 2008
RESEARCH EXPERIENCE	<i>Intern</i> in the CUE research group at Microsoft Research, Redmond, USA Completed a 3 month internship on applying machine learning algorithms to large scale datasets on human muscle activity.	June 2011 - August 2011
	<i>Research Assistant</i> in the pFunk Machine Learning Lab, GAtech.	August 2010 - Present
	<i>Research Assistant</i> in the Socially Intelligent Machines Lab (SIM), GAtech.	August 2010 - Present
	<i>Adjunct Member</i> of the Real Life Reinforcement Learning Lab (RL ³), Rutgers.	January 2009 - May 2010
	<i>Intern</i> at RWTH Aachen University, Germany Completed a 3 month internship on robot learning from demonstration using gaussian mixture models.	June 2009 - August 2009
	<i>Intern</i> at Texas Instruments, India Completed a 3 month internship focusing on data compression algorithms in video encoding standards.	May 2008 - July 2008
	<i>Research Trainee</i> at WArAn Research FoundaTion, India Completed a 2 year research training program with specialization in signal processing.	June 2006 - May 2008
TEACHING EXPERIENCE	<i>Teaching Assistant</i> for CS4641, Machine Learning by Prof. Charles Isbell	Spring 2012
MASTERS DISSERTATION	“ <i>HELP - Human assisted Efficient Learning Protocols</i> ” - an analysis into the effect of human interactions on learning algorithms, with focus on methods like learning by demonstration and apprenticeship learning. <i>Advisor - Prof. Michael Littman</i>	
PUBLICATIONS	Monica Babes, Vukosi Marivate, Kaushik Subramanian, Michael L. Littman: <i>Apprenticeship Learning about Multiple Intentions</i> . Appeared in ICML 2011, Bellevue, Washington, USA, June 2011.	
	Thomas J. Walsh, Kaushik Subramanian, Michael L. Littman, Carlos Diuk: <i>Generalizing Apprenticeship Learning across Hypothesis Classes</i> . Appeared in ICML 2010, Haifa, Israel, June 2010.	
WORKSHOPS	Kaushik Subramanian, Andrea Thomaz, Charles Isbell: <i>Learning Options through Human Interaction</i> . Appeared in the ALIHT Workshop, IJCAI 2011, Barcelona, Spain, July 2011.	
	Kaushik Subramanian: <i>Task Space Behavior Learning for Humanoid Robots using Gaussian Mixture Regression</i> . Appeared in AAAI 2010, Atlanta, USA, July 2010.	
TECHNICAL REPORTS	Baris Akgun, Kaushik Subramanian, Jaeun Shim, Andrea Thomaz : <i>Learning Tasks and Skills Together From a Human Teacher</i> . Appeared in AAAI 2011, San Francisco, USA, August 7th 2011.	
	Kaushik Subramanian and Michael Littman: <i>Efficient Apprenticeship Learning with Smart Humans</i> . Appeared in AAAI 2010, Atlanta, USA, July 2010.	

PROJECTS IN PROGRESS	<i>Automatic Feature Construction</i> (GAtch)	January 2012
	Using neural networks to extract non-linear relationships present in data to generate features useful for supervised learning algorithms. This is achieved by modifying the cost function of the network to account for the characteristics of the chosen learner. An exploration into such methods will greatly enhance the learning algorithm and also reduce the burden on the human to design useful features. <i>Advisor - Prof. Charles Isbell and Prof. Andrea Thomaz</i>	
COMPLETED PROJECTS	<i>Using Action Abstractions to enhance Monte Carlo Tree Search</i> (GAtch)	September 2011
	Developed an automatic way of leveraging human input to acquire task decompositions. These can be used as pruning heuristics and rollout policies to assist Monte Carlo Tree Search. They were applied to game-based domains - PacMan. The enhanced MCTS approach outperforms standard approaches in terms of optimality of the solution by 35%. <i>Advisor - Prof. Charles Isbell and Prof. Andrea Thomaz</i>	
	<i>Learning Task Attributes from Human Interaction</i> (GAtch)	April 2011
	Used supervised learning algorithms like kNN and GMMs, to learn relevant attributes for a simulated animal classification and a robot table clean-up task. The algorithm utilized human interaction to instantiate the attributes that aided complex concept learning and increased overall task efficiency. <i>Advisor - Prof. Andrea Thomaz</i>	
	<i>AAAI 2010 Learning by Demonstration Challenge</i> (GAtch)	July 2010
	A live demonstration was performed of the "Taxi Task" using Apprenticeship Learning. A Mindstorms TM Lego robot was navigated through a discrete world and it was allowed to build a model of the environment. The robot was able to learn the optimal policy from a single demonstration. <i>Advisor - Prof. Michael Littman</i>	
	<i>Interactive Learning with the Highway Car Domain</i> (RL ³ Lab)	December 2009
	A novel approach was developed where the humans provides high-level state abstractions to learn the task of navigating on a simulated highway. The criteria used by the human was - "states are similar if the same optimal action is to performed in both the states". The interactive abstraction significantly sped-up the performance of the agent. <i>Advisor - Prof. Michael Littman</i>	
	<i>Best Narration Award - Introduction to Reinforcement Learning</i> (RL ³ Lab)	April 2009
	The Lego Mindstorms was programmed to learn real-time in a deterministic environment and to build a model of the world using concepts of Graph Search and Dynamic Programming. A video tutorial was submitted to IJCAI 2009. <i>Advisor - Prof. Michael Littman</i>	
	<i>Autonomous Object Recognition using Corner Detection</i> (Rutgers)	December 2008
	Object Recognition implemented using corner descriptors and geometric point matching methods. The advantage of the system was the reduced number of descriptor points as compared to the traditional approaches (SIFT algorithm). <i>Advisor - Prof. Lawrence Rabiner</i>	
	<i>Parallel Particle Swarm Optimization</i> (Rutgers)	December 2008
	Parallel implementation of the Particle Swarm Optimization (PSO) algorithm using MPI. Performed a comparative analysis with the sequential algorithm and evaluated its application for multi-agent systems. <i>Advisor - Prof. Manish Parashar</i>	
	<i>Mobile Video Reference Data Compression</i> (TI)	July 2008
	Developed signal transform based techniques using <i>C</i> to compress the videos captured using mobile phones. This technique was implemented in the H.264 standard. <i>Advisor - Mr. Ajit Gupte</i>	
COMPUTING SKILLS	<i>Programming</i> - Python, Matlab, C++, Java <i>Softwares</i> - Weka, R Statistical toolkit, OpenCV, ROS <i>Operating Systems</i> - Unix and Windows	