

Ajinkya Jain

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INTERESTS	Robot Learning, Robot Manipulation Planning and Control, Reinforcement Learning	
EDUCATION	Doctor of Philosophy , Mechanical Engineering, Advisor: Prof. Scott Niekum (2015 - 2020) <i>Specialization: Robotics, Dynamics Systems and Controls</i> The University of Texas at Austin	
	Master of Technology , Mechanical Engineering (2014 - 2015) <i>Specialization: Robotics</i> Indian Institute of Technology Kanpur	
	Bachelor of Technology , Mechanical Engineering (2010 - 2014) Indian Institute of Technology Kanpur	
WORK EXPERIENCE	Robotacist, Vicarious May'18 - Aug'18 Project Title: <i>Task Agnostic High Precision Assembly using Visual Servoing</i> <ul style="list-style-type: none">• Implemented state-of-the-art visual servoing algorithms to do high precision ($\leq 2mm$) assembly tasks• Ensured Fast convergence (≤ 20 s) to target features with High repeatability ($\geq 90\%$ success)• Developed interfaces to ensure a Task and Platform-agnostic implementation	
RESEARCH EXPERIENCE	Graduate Research Assistant, Computer Science, UT Austin Jan'16 - present Advised By Prof. Scott Niekum, Department of Computer Science, UT Austin Project Title: <i>Learning Object Interactions using Human Demonstration and Robot Self-Explorations</i> <ul style="list-style-type: none">• Studying efficient robot learning algorithms for modelling physical interactions of objects• Developed POMDP Motion planner that leverages such knowledge to improve performance on manipulation tasks involving noisy feedback and highly nonlinear dynamics [paper]• Implemented for Contact-Rich toy airplane assembly task on a 7 DOF Kinova Jaco2 Arm	
	Graduate Research Assistant, Mechanical Engineering, IIT Kanpur Feb'14 - June'15 Advised by Prof. Bishakh Bhattacharya, Dept. of Mechanical Engineering Thesis: <i>Two Design Challenges in Exoskeleton Systems: Optimal Gripper Design and Optimal Bipedal Gait Controller</i> [Github] [paper] <ul style="list-style-type: none">• Modeled Dynamics of Piezoelectric actuator using a novel minimalistic model• Optimized Piezoelectric actuator driven gripper design using genetic algorithm• Designed a Time-Varying Optimal Controller (LQR) for Bipedal locomotion of Exoskeletons	
	Undergraduate Research Assistant, Aerospace Engineering, TAMU May'13 - July'13 Advised by Prof. Suman Chakravorty, Dept. of Aerospace Engineering Title: <i>Motion planning for MAVs using Feedback Information based RoadMaps</i> [GitHub] <ul style="list-style-type: none">• Implemented Motion Planning Library FIRM on robots including mobile manipulator Kuka youBot• Interfaced robotic simulator, V-Rep, with the library in MATLAB• Features: Robot Dynamics Models, Customizable work environment, Synchronized communication	
PRODUCT DEVELOPMENT EXPERIENCE	Team Austin Villa, Robocup@Home, SSPL March'17 - July'17 <i>Third Place Worldwide, Nagoya Japan</i> <ul style="list-style-type: none">• Developed Manipulation pipeline for Toyota Human Support Robot• Implemented fast tabletop perception based common household object grasping and manipulation	
	Boeing IIT-K Autonomous Navigation System (Abhyast) Phase-III May'12 - Jan'13 <i>Funded by Boeing Corporation, US and Dean, R&D, IIT Kanpur</i> <ul style="list-style-type: none">• Built navigation planner for a jumping robot capable of navigating in cluttered environment	
	Project: Humanoid Robot, Phase-I Sep'11 - April'12 <i>Funded by Dean, Resource Planning & Generation, IIT Kanpur</i> <ul style="list-style-type: none">• Designed navigation system for an omnidirectional movable robot featuring obstacle avoidance and path planning	

TECHNICAL SKILLS	<p>Languages: C, C++, Python, MATLAB</p> <p>Softwares/Other Tools: Robot Operating System, Moveit, Drake Toolbox for Planning, Control and Analysis, Autodesk Inventor, V-REP Simulator</p> <p>Hardware: Toyota Human Support Robot, Kinova Jaco-2 6-DOF and 7-DOF Arms, Microsoft Kinect SDK, Hokuyo 3D laser Scanner, Atmel AVR, Arduino, Bluetooth Modules, IR sensors, IC Engines</p>	
ACADEMIC PROJECTS	<p>Learning Optimal Policy under Spatially-Varying Dynamics Aug'16-Dec'16 <i>Reinforcement Learning: Theory and Practice, Course Project, UT Austin</i></p> <ul style="list-style-type: none"> • Developed learning agents executing optimal policy on domains with spatially-varying dynamics • Stochastic dynamics modeled as POMDP; Implemented SARSA update rule with Eligibility traces <p>Stochastic Motion Planning for State-Dependent Dynamics Aug'16-Dec'16 <i>Robot Learning from Demonstration and Interaction, Course Project, UT Austin</i></p> <ul style="list-style-type: none"> • Modeled state-dependent dynamics as hybrid dynamics; Motion planning under uncertainty as POMDP • Implemented and Extended Belief-space LQR algorithm to Hybrid systems <p>Analysis of Optimal Control Schemes for Car Active Suspension Assembly Jan'17-May'17 <i>Modern Control, Course Project, UT Austin</i></p> <ul style="list-style-type: none"> • Designed and Implemented a Reduced-order observer with an Optimal finite time tracker <p>A case study of Passivity-based control of 6-DOF arm Jan'16-May'16 <i>Nonlinear Dynamics and Control, Course Project, UT Austin</i></p> <ul style="list-style-type: none"> • Designed and Implemented a Passivity-based feedback linearization controller for 6-DOF arm <p>Classification of Human Actions in Video Jan'14-Apr'14 <i>Course Project, Computer Vision, IIT Kanpur</i></p> <ul style="list-style-type: none"> • Implemented multiclass SVM and SCHM for classifying Human Actions in Videos. • Improved SCHM by focusing on characteristic histogram bins; <i>Accuracy increased by 20%</i> 	
RELEVANT COURSES	<p>Robotics: Introduction to Robotics, Robot Motion Planning, Robot Manipulators: Dynamics and Control, Robot Mechanism Design</p> <p>Machine Learning: Reinforcement Learning, Robot Learning from Demonstration and Interaction, Computer Vision and Image Processing</p> <p>Controls: Optimal Control, Nonlinear Dynamics & Control, Modern Control, Automation & Control</p> <p>Miscellaneous: Optimization Methods in Engineering, Theory of Mechanisms and Machines, Finite Element Methods, Programming and Numerical Analysis, Introduction to Cognitive Science</p>	
PUBLICATIONS	<p>A. Jain and S. Niekum, Efficient Hierarchical Robot Motion Planning Under Uncertainty and Hybrid Dynamics, <i>Conference on Robot Learning (CoRL)</i>, Oct 2018. [paper]</p> <p>A. Jain and S. Niekum, Belief Space Planning under Approximate Hybrid Dynamics, <i>Robotics: Science and Systems (R:SS) Workshop on POMDPs in Robotics</i>, July 2017.</p> <p>M. Ahmadi, A. Jain, S. Niekum and U. Topcu, Reachable Belief Space Estimation in POMDPs via Lyapunov Functions, <i>submitted in Hybrid Systems: Computation and Control (HSCC) 2019</i></p> <p>R. Datta, A. Jain & B. Bhattacharya, "A Piezoelectric Model based Multi-Objective Optimization of Robot Gripper Design", <i>Structural and Multidisciplinary Optimization, Springer 2015</i> [paper]</p> <p>A. Jain, R. Datta & B. Bhattacharya, "Unified Minimalistic Modelling of Piezoelectric Stack Actuators for Engineering Applications", <i>Advances in Intelligent Systems and Computing, Springer 2014</i> [paper]</p>	