

# Ajinkya Jain

The University of Texas at Austin

Web: [jainajinkya.github.io](http://jainajinkya.github.io)  
E-mail: [ajinkya@utexas.edu](mailto:ajinkya@utexas.edu)  
Phone: (512) 508-9869

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

TECHNICAL SKILLS	<p><b>Languages:</b> C, C++, Python, MATLAB</p> <p><b>Softwares/Other Tools:</b> Robot Operating System, Moveit, Drake Toolbox for Planning, Control and Analysis, AGILE Grasp, Autodesk Inventor, V-REP Simulator</p> <p><b>Hardware:</b> 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><b>Learning Optimal Policy under Spatially-Varying Dynamics</b> Aug'16-Dec'16  <i>Reinforcement Learning: Theory and Practice, Course Project, UT Austin</i></p> <ul style="list-style-type: none"> <li>• Developed learning agents executing optimal policy on domains with spatially-varying dynamics</li> <li>• Stochastic dynamics modeled as POMDP; Implemented <b>SARSA</b> update rule with Eligibility traces</li> </ul> <p><b>Stochastic Motion Planning for State-Dependent Dynamics</b> Aug'16-Dec'16  <i>Robot Learning from Demonstration and Interaction, Course Project, UT Austin</i></p> <ul style="list-style-type: none"> <li>• Modeled state-dependent dynamics as hybrid dynamics; Motion planning under uncertainty as POMDP</li> <li>• Implemented and Extended Belief-space LQR algorithm to Hybrid systems</li> </ul> <p><b>Optimal Controller for Car Active Suspension Assembly</b> Jan'17-May'17  <i>Modern Control, Course Project, UT Austin</i></p> <ul style="list-style-type: none"> <li>• Designed and Implemented a Reduced-order observer with an Optimal finite time tracker</li> </ul> <p><b>A case study of Passivity-based control of 6-DOF arm</b> Jan'16-May'16  <i>Nonlinear Dynamics and Control, Course Project, UT Austin</i></p> <ul style="list-style-type: none"> <li>• Designed and Implemented a Passivity-based feedback linearization controller for 6-DOF arm</li> </ul> <p><b>Classification of Human Actions in Video</b> Jan'14-Apr'14  <i>Course Project, Computer Vision, IIT Kanpur</i></p> <ul style="list-style-type: none"> <li>• Implemented multiclass SVM and SCHM for classifying Human Actions in Videos.</li> <li>• Improved SCHM by focusing on characteristic histogram bins; <i>Accuracy increased by 20%</i></li> </ul>	
RELEVANT COURSES	<p><b>Robotics:</b> Introduction to Robotics, Robot Motion Planning, Robot Manipulators: Dynamics and Control, Robot Mechanism Design</p> <p><b>Machine Learning:</b> Reinforcement Learning, Learning from Demonstration and Interaction, Computer Vision and Image Processing</p> <p><b>Controls:</b> Optimal Control, Nonlinear Dynamics &amp; Control, Modern Control, Automation &amp; Control</p> <p><b>Miscellaneous:</b> Optimization Methods in Engineering, Theory of Mechanisms and Machines, Finite Element Methods, Programming and Numerical Analysis, Introduction to Cognitive Science</p>	
PUBLICATIONS	<p><b>A. Jain</b> and S. Niekum, Efficient Hierarchical Robot Motion Planning Under Uncertainty and Hybrid Dynamics, <i>Conference on Robot Learning (CoRL)</i>, Oct 2018. <a href="#">[paper]</a></p> <p><b>A. Jain</b> 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>R. Datta, <b>A. Jain</b> &amp; B. Bhattacharya, "A Piezoelectric Model based Multi-Objective Optimization of Robot Gripper Design", <i>Structural and Multidisciplinary Optimization, Springer 2015</i> <a href="#">[paper]</a></p> <p><b>A. Jain</b>, R. Datta &amp; B. Bhattacharya, "Unified Minimalistic Modelling of Piezoelectric Stack Actuators for Engineering Applications", <i>Advances in Intelligent Systems and Computing, Springer 2014</i> <a href="#">[paper]</a></p>	
AWARDS AND ACHIEVEMENTS	<ul style="list-style-type: none"> <li>• Awarded <b>Certificate of Merit for Academic Excellence</b> for the terms 2011-12 and 2012-13</li> <li>• Recipient of <b>Robotics Scholarship</b> by <b>Boeing Corporation</b> for Abhyast Phase-III project</li> <li>• Selected for <b>TAMU-IITK Student Exchange Program at Texas A&amp;M University</b>, 2013</li> </ul>	