

# Ajinkya Jain

The University of Texas at Austin

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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>AI Researcher (Intern), Samsung AI Research Center-Robotics, NYC</b> May'19 - Aug'19 Project Title: <i>Zero Shot Learning to Grasp using Single RGB-D image</i> <ul style="list-style-type: none"><li>• Objective: Optimal grasp selection for an object in the scene without human supervision</li><li>• Developing a data-efficient end-to-end autonomous learning system for object-category level grasping</li></ul>	
	<b>Robotician (Intern), 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 s</math>) 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>• Proposed an Algorithm for Learning Object Kinematics Models for complex objects from a single human demonstration</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>	
PUBLICATIONS	<b>A. Jain</b> and S. Niekum, Efficient Hierarchical Robot Motion Planning Under Uncertainty and Hybrid Dynamics, <i>Conference on Robot Learning (CoRL)</i> , 2018. [paper]	
	<b>A. Jain</b> and S. Niekum, Learning Hybrid Object Kinematics for Efficient Hierarchical Planning Under Uncertainty, Submitted to the <i>IEEE Robotics and Automation Letters (RA-L)</i> , 2020	

R. Datta, **A. Jain** & B. Bhattacharya, “A Piezoelectric Model based Multi-Objective Optimization of Robot Gripper Design”, *Structural and Multidisciplinary Optimization, Springer 2015* [paper]

**A. Jain**, R. Datta & B. Bhattacharya, “Unified Minimalistic Modelling of Piezoelectric Stack Actuators for Engineering Applications”, *Advances in Intelligent Systems and Computing, Springer 2014* [paper]

#### WORKSHOPS AND POSTERS

- Belief Space Planning under Approximate Hybrid Dynamics, *Robotics: Science and Systems (R:SS) Workshop on POMDPs in Robotics*, 2017.
- Efficient Robot Motion Planning Under Uncertainty, *UT Robotics Consortium* 2019
- Robot Motion Planning Under Uncertainty for Tasks Involving Contacts, *UT Graduate Student Industry Networking Symposium*, 2019
- Belief Space Planning for Robot Manipulation with Hybrid Dynamics, *UT Robotics Consortium* 2018

#### PRODUCT DEVELOPMENT EXPERIENCE

**Team Austin Villa, Robocup@Home, SSPL**  
*Third Place Worldwide, Nagoya Japan*

March'17 - July'17

- 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**  
*Funded by Boeing Corporation, US and Dean, R&D, IIT Kanpur*

May'12 - Jan'13

- Built navigation planner for a jumping robot capable of navigating in cluttered environment

**Project: Humanoid Robot, Phase-I**

*Funded by Dean, Resource Planning & Generation, IIT Kanpur*

Sep'11 - April'12

- Designed navigation system for an omnidirectional movable robot featuring obstacle avoidance and path planning

#### TECHNICAL SKILLS

**Languages:** C, C++, Python, MATLAB

**Softwares/Other Tools:** ROS, Moveit, Drake Toolbox, Autodesk Inventor, V-REP Simulator

**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

#### AWARDS AND ACHIEVEMENTS

- Awarded **UT AI-lab travel grant** for attending conferences in 2017 and 2018
- Awarded **Certificate of Merit for Academic Excellence** at IITKanpur for 2011-12 and 2012-13
- Recipient of **Robotics Scholarship** by **Boeing Corporation** for Abhyast Phase-III project
- Selected for **TAMU-IITK Student Exchange Program at Texas A&M University**, 2013

#### ACADEMIC PROJECTS

**Learning Optimal Policy under Spatially-Varying Dynamics**

Aug'16-Dec'16

*Reinforcement Learning: Theory and Practice, Course Project, UT Austin*

- Developed learning agents executing optimal policy on domains with spatially-varying dynamics
- Stochastic dynamics modeled as POMDP; Implemented **SARSA** update rule with Eligibility traces

**Stochastic Motion Planning for State-Dependent Dynamics**

Aug'16-Dec'16

*Robot Learning from Demonstration and Interaction, Course Project, UT Austin*

- Modeled state-dependent dynamics as hybrid dynamics; Motion planning under uncertainty as POMDP
- Implemented and Extended Belief-space LQR algorithm to Hybrid systems

**Analysis of Optimal Control Schemes for Car Active Suspension Assembly**

Jan'17-May'17

*Modern Control, Course Project, UT Austin*

- Designed and Implemented a Reduced-order observer with an Optimal finite time tracker

**A case study of Passivity-based control of 6-DOF arm**

Jan'16-May'16

*Nonlinear Dynamics and Control, Course Project, UT Austin*

- Designed and Implemented a Passivity-based feedback linearization controller for 6-DOF arm