

Ajinkya Jain

PhD, UT Austin

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EDUCATION

The University of Texas at Austin

Ph.D., Mechanical Engineering (*Robotics, Dynamic Systems and Controls*)

2015–2021

Advisor: Prof. Scott Niekum, Prof. Ashish Deshpande

Indian Institute of Technology Kanpur

B.Tech. - M.Tech. (Dual Degree), Mechanical Engineering (*Robotics and Automation*)

2010–2015

Advisor: Prof. Bishakh Bhattacharya

WORK EXPERIENCE

Robotics Engineer-III (Research), Intrinsic AI | Alphabet (Mountain View, CA)

Nov'22-Current

Intelligent Robot Manipulation for Industrial Applications [[RL](#), [Imitation Learning](#), [AI/ML](#)]

- Researching and developing advanced robot manipulation methods (RL, IL, AI, ML) for industrial applications
- Devised and implemented multiple (>10) high fidelity, high precision rigid body assembly, object manipulation, and insertion applications for industrial tasks

Robotics Engineer-III, Vicarious FPC, Inc. (Union City, CA)

Oct'21-Nov'22

Robot Behavior Planning for Constrained Object Manipulation [[Motion Planning](#), [Perception](#)]

- Developed intelligent robot manipulation approaches for warehouse automation with a focus on constrained object manipulation and tight-fit insertions
- Implemented robot motion planning algorithms to minimize planning and trajectory execution times while successfully accomplishing tasks with high success rates ($\geq 95\%$)
- Devised data-driven robot perception algorithms for accurate object pose estimation with high fidelity

RESEARCH EXPERIENCE

Graduate Research Assistant, Dept. of Computer Science, UT Austin

2015-2021

Robot Motion Planning Under Uncertainty and Hybrid Dynamics [[Manipulation Planning](#)]

- Developed a POMDP motion planner that leverages object interactions to generate efficient plans (via trajectory optimization; 5x faster) to perform long-horizon manipulation tasks with high accuracy ($\geq 90\%$) under uncertainty

Learning Object Kinematics Models from Observations [[Model Learning](#), [Manipulation Planning](#)]

- Developed a novel method for learning planning-compatible hybrid kinematics models for articulated objects from human demonstrations (improved up to 3x in accuracy over the state-of-the-art method)

Object Articulation Model Estimation From Raw Depth Images [[Deep Learning](#), [Robot Perception](#)]

- Developed a novel deep learning based method (using CNNs) to estimate articulation models for objects directly from raw depth images without knowing their articulation type a priori using screw theory (2x data efficient)

Graduate Research Assistant, Dept. of Mechanical Engineering, IIT Kanpur

2014-2015

Thesis: Two Design Challenges in Exoskeleton Systems: Optimal Gripper Design and Optimal Bipedal Gait Controller [[Optimal Control](#), [System Modeling](#)]

- Developed a simple, computationally-cheap, yet effective model for piezoelectric stack actuators as a replacement of black-box models used in engineering design optimization problems
- Optimized design of a piezoelectric actuator driven gripper using the proposed model with NSGA-II algorithm
- Designed a time-varying optimal controller (LTV-LQR controller) for exoskeleton bipedal locomotion

INTERNSHIPS

AI (Robotics) Researcher, Samsung AI Research Center-Robotics (New York City, NY) May'19-Aug'19

GrAB-Net: Grasping with optimal Approach Behavior [Deep Learning, Grasp Planning]

- Developed a fully autonomous training pipeline to train networks for generating category-level optimal grasping behaviors given a single RGB-D image of the scene via imitation learning
- Achieved high success rate ($\sim 70\%$) in grasping 40 different objects belonging to two object categories

Robotician, Vicarious FPC, Inc. (Union City, CA)

May'18-Aug'18

Task Agnostic High Precision Assembly using Visual Servoing [Perception, Motion Planning]

- 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 python-based interfaces ensuring a task and platform-agnostic implementation

Undergraduate Researcher, Texas A&M University (College Station, TX)

May'13-Aug'13

Robot Motion Planning using Feedback Information Based RoadMaps [Motion Planning]

- Modeled dynamics of 5 different holonomic and non-holonomic mobile robot platforms and implemented motion planning library FIRM to perform navigation tasks under uncertainty
- Interfaced robotic simulator, V-Rep, with the library with added features including customizable work environments and synchronized communication for real-time control

SELECTED PUBLICATIONS

A. Jain, S. Giguere, R. Lioutikov, and S. Niekum, *Distributional Depth-Based Estimation of Object Articulation Models*, Conference on Robot Learning (CoRL), 2021

A. Jain, R. Lioutikov, C. Chuck, and S. Niekum, *ScrewNet: Category-Independent Articulation Model Estimation From Depth Images Using Screw Theory*, IEEE International Conference on Robotics and Automation (ICRA), 2021

A. Jain and S. Niekum, *Learning Hybrid Object Kinematics for Efficient Hierarchical Planning Under Uncertainty*, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2020

A. Jain and S. Niekum, *Efficient Hierarchical Robot Motion Planning Under Uncertainty and Hybrid Dynamics*, 2nd Conference on Robot Learning (CoRL), 2018

TECHNICAL SKILLS

- **Languages/Frameworks:** Python, C++, MATLAB/R, PyTorch, Tensorflow, Kubernetes
- **Robotics Software:** ROS, MuJoCo, Gazebo, V-Rep, PyBullet, OMPL, MoveIt!, GraspIt!, ViSP (Visual Servoing Platform), SNOPT, IPOPT, Solidworks, PCL, OpenCV
- **Robot Platforms:** Universal Robotics UR5, Toyota Human Support Robot, Kinova Jaco2 6-DOF, 7-DOF, Gen-3 arms, Rethink Robotics Sawyer, Robotiq grippers

AWARDS

- Second Runner-up Worldwide (Team Austin Villa), RobotCup@Home SSPL league, Nagoya, Japan 2017
- UT AI-lab travel grant 2017, 2018
- Certificate of Merit for Academic Excellence at IIT Kanpur 2011-12, 2012-13
- Robotics Scholarship, Boeing Corporation 2012-13

TEACHING

- **Guest Lecturer** at UT Austin Spring 2016
Mechatronics (ME 340), Topic: Introduction to Python
- **Teaching Assistant** at UT Austin 2015-16
Dynamics Systems and Controls Lab (ME 144L)
- **Teaching Assistant** at IIT Kanpur 2014-15
• Optimization Methods in Engineering Design (ME 752); Mechanical Engineering Lab-II (ME 471N)