

# Chang Shi

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## EDUCATION

<b>The University of Texas at Austin</b>	Austin, TX
<i>Ph.D. Mechanical Engineering (Advisor: Prof. Amy Zhang)</i>	Aug 2021 - Present
<i>Research focus: Machine Learning, Imitation Learning, Reinforcement Learning, Robotics</i>	
<b>Carnegie Mellon University</b>	Pittsburgh, PA
<i>M.S. Robotics System Development (Advisor: Prof. John Galeotti and Prof. Howie Choset)</i>	Aug 2019 - May 2021
<i>Selected Coursework: Deep RL and Control; Robot Autonomy; Computer Vision; Multimodal ML; SLAM; Manipulation, Estimation and Control</i>	
<b>Renmin University of China</b>	Beijing, China
<i>B.S. Computer Science (Advisor: Prof. Xinqi Gong)</i>	Sept 2015 - June 2019
<i>Selected Coursework: Computer Vision; Computer Graphics; Image Processing; Deep Learning; Game Theory</i>	

## PUBLICATIONS

TP-PPO: Non-Myopic 3D Bin Packing with Tree Search Guided Online Planning

**Chang Shi**, Amy Zhang | Underreview for RA-L.

FLAM: Scaling Latent Action World Models with Factorization

**Chang Shi**<sup>\*</sup>, Zizhao Wang<sup>\*</sup>, Jiaheng Hu, Roberto Martin-Martin, Amy Zhang, Peter Stone | NeurIPS 2025 Embodied World Models for Decision Making Workshop, Underreview for ICLR 2026.

FastDP: Deployable Diffusion Policy for Fast Inference Speed

**Chang Shi**, Amy Zhang | RLC 2025 RL for Real System Workshop, Underreview for ICRA 2026.

Null Counterfactual Factor Interactions for Goal-Conditioned Reinforcement Learning

Caleb Chuck, Fan Feng, Carl Qi, **Chang Shi**, Amy Zhang, Scott Niekum | ICLR 2025.

Robot Air Hockey: A Manipulation Testbed for Robot Learning with Reinforcement Learning

Caleb Chuck<sup>\*</sup>, Carl Qi<sup>\*</sup>, Michael J Munje<sup>\*</sup>, Shuzhe Li<sup>\*</sup>, Max Rudolph<sup>\*</sup>, **Chang Shi**<sup>\*</sup>, Siddhant Agarwal<sup>\*</sup>, Harshit Sikchi<sup>\*</sup>, Abhinav Peri, Sarthak Dayal, Evan Kuo, Kavan Mehta, Anthony Wang, Peter Stone, Amy Zhang, Scott Niekum | ICRA 2024 Agile Robotics Workshop, Manipulation Skills Workshop.

Haptic Guidance Using a Transformer-Based Surgeon-Side Trajectory Prediction Algorithm for Robot-Assisted Surgical Training

**Chang Shi**, Jonathan Madera, Heath Boyea, Ann Majewicz Fey | RO-MAN 2023.

Recognition and Prediction of Surgical Gestures and Trajectories Using Transformer Models in Robot-Assisted Surgery

**Chang Shi**<sup>\*</sup>, Zheng Yi<sup>\*</sup>, Ann Majewicz Fey | IROS 2022.

Non-rigid cutaneous tissue deformation estimation with iterative RANSAC and TPS from digital images over semi-ambiguous artificial markings

**Chang Shi**, Dustin P DeMeo, Emma L. Larson, John M. Galeotti, Bryan T. Carroll | CARS 2021.

Uncertainty quantification for semi-supervised multi-class classification in image processing and ego-motion analysis of body-worn videos

Yiling Qiao, **Chang Shi**, Chenjian Wang, Hao Li, Matt Haberland, Xiyang Luo, Andrew M. Stuart, Andrea L. Bertozzi | EI 2019.

## ACADEMIC EXPERIENCE

**Machine Intelligence through Decision-making and Interaction Lab, UT Austin**

*Advisor: Prof. Amy Zhang*

Austin, TX

Aug 2023 - present

- Designing factorized world model for multi-agent dynamics learning on robotics demonstration videos without action labels
- Exploring the application of state space models and diffusion models for efficient and multi-modal robot policy learning
- Used object-centric representation and neural-symbolic methods to identify the actual cause of physical interactions to increase goal-conditioned RL efficiency

**Austin Villa Robocup@Home Team, UT Austin**

*Advisor: Prof. Peter Stone, Prof. Justin Hart*

Austin, TX

Jan 2022 - Jan 2025

- Trained object detection, human tracking models and integrated speech-to-text module for home service robot

- Wrote solutions for robot as receptionist and restaurant waiter tasks

**Human-Enabled Robotic Technology Lab, UT Austin**

*Advisor: Prof. Ann Majewicz Fey*

Austin, TX

Aug 2021 - Dec 2023

- Developed an optical flow-based method for surgical tool tracking on operation videos and conducted motion analysis
- Implemented transformer-based model for predicting da Vinci robot manipulator trajectories during surgical operations
- Designed haptic guidance for assistive autonomy on surgical tasks and conducted human subject study

#### **Biomedical Image Guidance Lab, CMU**

*Advisor: Prof. John Galeotti*

Pittsburgh, PA

May 2020 - May 2021

- Tuned customized calibration on Realsense depth camera to get point cloud data for dermatological tissue samples
- Developed iterative bidirectional blob matching and thin plate spline warping for 2D non-rigid tissue image registration

#### **Biorobotics Lab, CMU**

*Advisor: Prof. Howie Choset*

Pittsburgh, PA

Sept 2019 - Jan 2021

- Designed a stiffness-based automatic tumor localization system for minimally invasive surgery on da Vinci Surgical System
- Used motion estimation and sensor fusion to reconstruct organ surface with depth camera and laser sensor data
- Developed customized dVRK robot control code under limited workspace and wrist joint constraints
- Implemented a dynamic collision avoidance module with motion compensation
- Designed an online palpation path planner based on stiffness updates, largely reduced misclassification rate of tissue health conditions

#### **Applied Mathematics Lab, UCLA | CSST Undergraduate Research Program**

*Advisor: Prof. Andrea Bertozzi*

Los Angeles, CA

June 2018 - Sept 2018

- Optimized feature extraction and change point detection based on video motion on LAPD body-worn camera videos
- Applied uncertainty quantification on graph-based semi-supervised multi-class image classification problem
- Designed a human-in-the-loop relabeling system to improve classification accuracy

### **INDUSTRIAL EXPERIENCE**

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#### **Amazon Robotics**

*Applied Scientist Intern*

Boston, MA

May 2023 - Aug 2023, May 2024 - Oct 2024

- Designed an MCTS and RL-based bin packing solutions for online multi-bin assembly lines
- Optimized the robot-automated package consolidation planning procedure
- Validated the optimized solution both in simulation and on real robots

#### **NEC Laboratories America**

*Research Intern*

Princeton, NJ

May 2021 - Aug 2021

- Operated object tracking and key frame detection on collision event video dataset
- Designed a transformer style model for inter-object counterfactual reasoning and video question answering on collision events

#### **Cisco**

*Research Intern*

San Jose, CA

Sept 2018 - July 2019

- Developed novel sensory fusion algorithms to combine AP data with phone IMU data to do path-matching for Connected Mobile Experiences Indoor Location, improved indoor localization accuracy
- Designed a deep learning model deepPHY and surpassed bit and package error rate of 802.11ax PHY baseline from traditional channel estimation methods, especially on low SNR cases

### **PROJECTS**

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#### **Deep Graph Network (DGN) for Multi-agent Cooperation on StarCraft II 25 vs 25 Battle Game**

UT Austin | Spring 2022

- Formulated the problem as a Decentralized Partially Observable Markov Decision Process (Dec-POMDP) and compared the performance of DGN and Deep Q Network in StarCraft II game setting

#### **Collaborative Robot Manipulation over Two-arm Handover Problem in Robosuite Simulation**

UT Austin | Fall 2021

- Formulated the problem as a Centralized Training Decentralized Execution (CTDE) reinforcement learning paradigm. Tested Independent Soft Actor-Critic (ISAC) and Multi-Agent Deep Deterministic Policy Gradient (MADDPG) algorithms

#### **May I See Your Face? Automatic Face Mask Removal using Generative Adversarial Networks**

Carnegie Mellon | Spring 2021

- Tested CycleGAN, Pixel2Pixel and several versions of StyleGAN2 on Flickr-Face-HQ (FFHQ) and MaskedFace-Net dataset. Used Poisson blending for further image generation improvement.

#### **Multimodal Graph-structured Trajectory Prediction with Spatio-temporal Attention Mechanism**

Carnegie Mellon | Fall 2020

- Explored Trajectron++ model on NuScenes autonomous vehicle trajectory prediction task, proposed improvements by fusing Lidar data, LaneGCN and Spatial-temporal attention Mechanism

**Autonomous Bin Picking in RLBench Simulation**

Carnegie Mellon | Spring 2020

- Used Grasp Quality Convolutional Neural Networks (GQCNN) for optimal grasping pose prediction, and Rapidly-exploring Random Tree (RRT) for trajectory planning.

**Arduino Car Based Auto Tracking & Guidance System for The Blind**

Renmin University | Fall 2017

- Build a small Arduino car with functionality of voice control, obstacle avoidance and path tracking using real-time video processing, voice recognition and stereo system

**TEACHING AND SERVICE**

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- Teaching Assistant, ME369P Application Programming for Engineers, UT Austin, Fall 2025.
- Teaching Assistant, M325K Discrete Mathematics, UT Austin, Spring 2025.
- Teaching Assistant, M365C Real Analysis, UT Austin, Spring 2025.
- Teaching Assistant, ECE461L Software Engineering and Design Lab, UT Austin, Spring & Fall 2024.
- Teaching Assistant, 10-716 Advanced Machine Learning: Theory and Methods, Carnegie Mellon, Spring 2021.
- Teaching Assistant, 10-708 Probabilistic Graphical Models, Carnegie Mellon, Fall 2020.
- Coorganizer of Reinforcement Learning Reading Group (RLRG) at UT Austin.
- Reviewer for ICLR, ICML, NeurIPS, AAAI, AISTATS, IROS, ICRA, CoRL, ISMR, Transaction on HRI
- Volunteer for STEM Girl Day at UT Austin 2023, 2024

**HONORS AND AWARDS**

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- AAAI Doctoral Consortium 2026
- UT Professional Development Awards 2023, 2025
- ISMR Travel Awards 2021
- Meritorious Winner of the American Mathematical Contest in Modeling, COMAP 2017
- First Prize in National Mathematical Modeling Contest, China Capital Areas 2017
- Scholarship of Academic Excellence, Renmin University 2016, 2017 & 2018

**SKILLS**

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- **Programming Languages:** Python, C/C++, MATLAB, Javascript, Scala
- **Frameworks& Libraries:** PyTorch, Keras, TensorFlow, OpenCV, ROS
- **Others& Tools:** Docker, Git, Scrapy, Django, Arduino, Raspberry Pi, Autodesk