Junyao Shi

email: junys@seas.upenn.edu | phone: +1 (774)-678-5168
junyaoshi.github.io | github.com/junyaoshi | linkedin.com/in/junyaoshi

EDUCATION

Doctor of Philosophy (Ph.D.) in Computer Science — Aug 2021 – Present
University of Pennsylvania, GRASP Lab — *Philadelphia, PA*
Advisor: Prof. Dinesh Jayaraman

Bachelor of Science (B.S.) in Computer Science — Sep 2017 – May 2021
Columbia University, magna cum laude — *New York, NY*

RESEARCH INTERESTS

I am interested in building **generalist robots** to operate **robustly** in **complex and diverse real-world environments**. My research focuses on robot learning, with a particular emphasis on leveraging **internet-scale data**, **human videos**, **foundation models**, and **simulation** for robotic manipulation. My past and ongoing research investigates open problems in these areas: distilling manipulation skills from large-scale human web videos, efficiently teaching and steering polices through a small number of human videos, using Vision-Language foundation models to orchestrate diverse robotics modules for zero-shot generalist robots and autonomous data collection, and automating simulation environment construction for simulation-based pre-training. In my recent **internship at Skild AI**, I also developed methods for **training robust ultra long-horizon end-to-end VLA policies**: cooking scramble eggs from scratch and assembling AirPods.

PREPRINTS & SUBMISSIONS

Maestro: Orchestrating Robotics Modules with Vision-Language Models for Zero-Shot Generalist Robots [Website] [PDF]
Junyao Shi*, Rujia Yang*, Kaitian Chao*, Selina Wan, Yifei Shao, Jiahui Lei, Jianing Qian, Long Le, Pratik Chaudhari, Kostas Daniilidis, Chuan Wen, Dinesh Jayaraman
Under Submission, 2026
Oral Spotlight ✨ at CoRL RoboArena Workshop & NeurIPS Workshop on SPACE in Vision, Language, and Embodied AI, 2025

OmniGuide: Universal Guidance Fields for Enhancing Generalist Robot Policies
Yunzhou Song, Long Le, Yong-Hyun Park, Jie Wang, **Junyao Shi (advisory contribution: mentorship and conceptual guidance)**, Lingjie Liu, Jiatao Gu, Eric Eaton, Dinesh Jayaraman, Kostas Daniilidis
Under Submission, 2026

EvoGen: Automatic Generation of Interaction-Ready Articulated Objects
Sagnik Anupam*, Luyang Hu*, Anh-Quan Pham*, Kaitian Chao, George Jiayuan Gao, Tianyou Wang, **Junyao Shi** (**advisory contribution: problem formulation, research direction, and mentorship**), Osbert Bastani*, Dinesh Jayaraman*
Under Submission, 2026

Points2Reward: Robotic Manipulation Rewards from Just One Video [Website] [PDF]
Junyao Shi, Joshua Smith, Jianing Qian, Dinesh Jayaraman
Under Submission, 2026

PUBLICATIONS

VLMgineer: Vision Language Models as Robotic Toolsmiths [Website] [arXiv] [PDF] [X post]
George Jiayuan Gao*, Tianyu Li*, **Junyao Shi,** Yihan Li†, Zizhe Zhang†, Nadia Figueroa, Dinesh Jayaraman
International Conference on Learning Representations (ICLR), 2026
Oral Spotlight ✨ at RSS Workshop on Robot Hardware-Aware Intelligence, 2025

ZeroMimic: Distilling Robotic Manipulation Skills from Web Videos [Website] [PDF] [arXiv] [Code] [Video]
Junyao Shi*, Zhuolun Zhao*, Tianyou Wang, Ian Pedroza†, Amy Luo†, Jie Wang, Jason Yecheng Ma, Dinesh Jayaraman
International Conference on Robotics and Automation (ICRA), 2025
Best Paper Award 🏆 at CVPR 2025 Workshop on 3D Vision Language Models for Robotic Manipulation

Composing Pre-Trained Object-Centric Representations for Robotics From "What" and "Where" Foundation Models [arXiv] [PDF] [Website] [Code] [Video]
Junyao Shi*, Jianing Qian*, Jason Yecheng Ma, Dinesh Jayaraman
International Conference on Robotics and Automation (ICRA), 2024
*Robotics: Science and Systems (RSS) Workshop on Robot Representations (**Spotlight Presentation**)*, 2023
Robotics: Science and Systems (RSS) Workshop on Generalizable Manipulation Policy Learning, 2023
International Conference on Intelligent Robots and Systems (IROS) Workshop on Robotic Perception and Mapping, 2023

Don't Yell at Your Robot: Physical Correction as the Collaborative Interface for Language Model Powered Robots [Website] [arXiv] [PDF] [Video]
Chuye Zhang*, Yifei Simon Shao*, Harshil Parekh, **Junyao Shi,** Pratik Chaudhari, Vijay Kumar, Nadia Figueroa
Robotics: Science and Systems (RSS) GenAI-HRI Workshop, 2024

Maximizing BCI Human Feedback Using Active Learning [arXiv] [PDF]
Zizhao Wang*, **Junyao Shi***, Iretiayo Akinola*, Peter Allen
International Conference on Intelligent Robots and Systems (IROS), 2020

Deep Reinforcement Learning for Snake Robot Locomotion [Paper]
Junyao Shi, Tony Dear, Scott David Kelly
International Federation of Automatic Control World Congress (IFAC), 2020

Accelerated Robot Learning via Human Brain Signals [arXiv] [PDF] [Website]
Iretiayo Akinola*, Zizhao Wang*, **Junyao Shi**, Xiaomin He, Pawan Lapborisuth, Jingxi Xu, David Watkins-Valls, Paul Sajda, Peter Allen
International Conference on Robotics and Automation (ICRA), 2020

RESEARCH AND INDUSTRY EXPERIENCE

Research Intern, Skild AI Sep 2025 - Present
Investigating training paradigms to improve the long-horizon robustness of Vision-Language Action models (VLAs), advised by Prof. Deepak Pathak
Skild's release of my preliminary internship results: long-horizon end-to-end policy for cooking scrambled eggs from scratch and assembling AirPods.

Ph.D. Student, University of Pennsylvania Aug 2021 - Present
Working on leveraging human videos and foundation models for robot manipulation. Projects include:
- Maestro: composes diverse robotics-related tool modules into programmatic policies for zero-shot generalist robots and autonomous data collection in the real world (Under submission to ICRA 2026)
- ZeroMimic: distills robot manipulation skills from large-scale in-the-wild egocentric human videos (*ICRA 2025*)
- Points2Reward: leverages vision models to construct robotic manipulation rewards, enabling efficient learning from a single human video and evaluation of robot policies (submitted to ICRA 2026)
- VLMgineer: co-designs physical robot tools and the control policies by harnessing the creativity of Vision Language Models (VLMs) with evolutionary search (submitted to ICLR 2026)
- POCR: composes pre-trained object-centric visual representations for robotics from vision foundation models (*ICRA 2024*)

Research Intern, Horizon Robotics General AI Lab May 2021 – Aug 2021
Worked on vision-language navigation, advised by Dr. Haonan Yu
- Developed a reinforcement learning algorithm leveraging Vision-Language Model (VLM) to provide feedback for visual-language multi-room navigation
- Constructed diverse navigation tasks and scenarios in iGibson to rigorously evaluate and benchmark navigation performance.

Undergraduate Research Assistant, Columbia University Oct 2018 – May 2021
Contributed to a wide range of robotics and machine learning research projects across multiple labs, including:
- Brain-signal guided robot reinforcement learning (*ICRA 2020, IROS 2020*), advised by Prof. Peter Allen
- Deep reinforcement learning for snake robot locomotion (*IFAC 2020*), advised by Dr. Tony Dear, Prof. Scott David Kelly
- Robot furniture assembly via visual subgoal generation, advised by Prof. Hod Lipson, Prof. Shuran Song
- Hierarchical learning of long-horizon grid world navigation from demonstration, advised by Prof. Shuran Song

TALKS, POSTERS, AND PRESENTATIONS

Oral Presentation NeurIPS 2025 Workshop on SPACE in Vision, Language, and Embodied AI (SpaVLE) Dec 2025
Maestro: Orchestrating Robotics Modules with Vision-Language Models for Zero-Shot Generalist Robots

Oral Presentation CoRL 2025 RoboArena Workshop Sep 2025
Maestro: Orchestrating Robotics Modules with Vision-Language Models for Zero-Shot Generalist Robots

Spotlight Talks CVPR 2025 Workshops on 3D Vision Language Models (VLMs) for Robotic Manipulation: Opportunities and Challenges; CVPR 2025 Workshops on Agents in Interactions, from Humans to Robots (**Best Paper Award** 🏆) June 2025
ZeroMimic: Distilling Robotic Manipulation Skills from Web Videos

Invited Talk NYC Computer Vision Day Feb 2025
ZeroMimic: Distilling Robotic Manipulation Skills from Web Videos
Poster NYC Computer Vision Day Apr 2024
Composing Pre-Trained Object-Centric Representations for Robotics From "What" and "Where" Foundation Models

Invited Talk Columbia University AI4ALL Jun 2019
BCI-Assisted Robot Learning

Invited Talk SIAM Conference on Applications of Dynamical Systems May 2019
Deep Reinforcement Learning for Snake Robot Locomotion

HONORS AND AWARDS

Theodore R. Bashkow Research Award, Columbia University 2021
Magna Cum Laude, Columbia University 2021
SEAS Summer Research Award, Columbia University 2019
Dean's List, Columbia University 2017-2021

SERVICE

Reviewer
International Conference on Learning Representations (ICLR) 2025
International Conference on Intelligent Robots and Systems (IROS) 2025
International Conference on Learning Representations (ICLR) 2025
Robotics: Science and Systems (RSS) GenAI-HRI Workshop 2024
Transactions on Pattern Analysis and Machine Intelligence (TPAMI) 2024
European Conference on Computer Vision (ECCV) 2024
International Conference on Robotics and Automation (ICRA) 2024
International Conference on Intelligent Robots and Systems (IROS) Workshop on Robotic Perception and Mapping 2023
Robotics: Science and Systems (RSS) Workshop on Generalizable Manipulation Policy Learning 2023
International Conference on Computer Vision (ICCV) 2023

Teaching Assistant
CIS 7000 Real-World Robot Learning, *University of Pennsylvania* Spring 2025
COMS W4701 Artificial Intelligence, *Columbia University* Fall 2019

MENTORSHIP

Tianyou Wang	M.S. Robotics, University of Pennsylvania	PhD at Oxford University
Zhuolun Zhao	M.S. Robotics, University of Pennsylvania	Member of Technical Staff, Skild AI
Joshua Smith	M.S. Robotics, University of Pennsylvania	Member of Technical Staff, Skild AI
George Gao	M.S. Robotics, University of Pennsylvania	Member of Technical Staff, Dyna Robotics
Ian Pedroza	M.S. Robotics, University of Pennsylvania	Member of Technical Staff, Dyna Robotics
Chenxi Dong	M.S. Computer and Information Science, University of Pennsylvania	TikTok
Kaitian Chao	M.S. Robotics, University of Pennsylvania	

Selina Wan M.S. Robotics, University of Pennsylvania
Anh-Quan Pham M.S. Robotics, University of Pennsylvania
Luyang Hu M.S. Robotics, University of Pennsylvania
Amy Luo M.S. Robotics, University of Pennsylvania
Rujia Yang B.S. Computer Science, Tsinghua University

SKILLS

Programming Languages Python, C++, C, C#, Java
Tools Cursor, PyTorch, Tensorflow, ROS, IsaacLab & IsaacGym, Mujoco, Unity, ManiSkill, Genesis