

JINCHEN RUAN

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EDUCATION

Columbia University

Ph.D. in Mechanical Engineering (in progress)

Advisor: Prof. Hod Lipson, Creative Machines Lab

New York, NY

Aug 2026 – Present

Columbia University

M.S. in Mechanical Engineering (Robotics and Control)

GPA: 4.07/4.00 | Advanced Master's Research Specialization

New York, NY

Sep 2024 – May 2026

Beijing University of Technology

B.Eng. in Robotics Engineering

GPA: 3.38/4.00

Beijing, China

Sep 2019 – Jun 2023

PUBLICATIONS

Continuum Robot Modeling with Action Conditioned Flow Matching

Jiong Lin*, Jinchun Ruan*, Hod Lipson

Robotics: Science and Systems (RSS), 2026

*Accepted; *equal contribution*

ArticFlow: Action-Conditioned Flow Matching for Skeleton-Free Articulated Generation

Jiong Lin, Jinchun Ruan, Hod Lipson

Conference on Robot Learning (CoRL), 2026

Accepted

RESEARCH EXPERIENCE

Creative Machines Lab, Columbia University

Research Assistant

New York, NY

Jan 2025 – Present

- **ArticFlow:** Developed a two-stage flow-matching model that couples latent-space and point-space flows to generate colored, action-conditioned 3D point clouds without predefined kinematic skeletons. Evaluated on five object and robot categories from PartNet-Mobility and MuJoCo Menagerie; reduced Earth Mover's Distance by 97.6% on eyeglasses versus action-conditioned PointFlow using the primary model configuration.
- **Continuum robot hardware and data collection:** Designed modular, 3D-printed tendon-driven continuum robots (TDCRs), corresponding MuJoCo simulations, and a multi-camera RGB-D pipeline for full-body point-cloud reconstruction. Built datasets for simulated 2-, 3-, and 5-module robots and physical 2- and 3-module robots.
- **Action-conditioned robot self-modeling:** Developed a flow-matching model to predict steady-state TDCR geometry from motor commands. The hybrid network reduced squared Chamfer Distance by approximately 64–96% relative to the strongest competing baseline in each of six simulation settings; the best model variants reduced it by 20.3–33.5% versus PointFlow on the two real-robot datasets.

Institute of Automation, Chinese Academy of Sciences

Research Assistant

Beijing, China

Oct 2023 – May 2024

- **Mobile dual-arm control:** Built a mobile platform for a dual-arm robot and implemented chassis and arm motion control in ROS 2, improving inverse-kinematics accuracy by 50% compared with the MoveIt 2-based baseline.
- **Imitation learning for test-tube manipulation:** Trained an ACT (Action Chunking with Transformers) policy on visual observations paired with demonstrated actions to predict action sequences for a robotic arm and dexterous hand, achieving a 60% success rate in test-tube grasping and insertion.
- **Teleoperation and mobile manipulation:** Reproduced ALOHA and GELLO systems and deployed and tested them on an in-house platform combining an omnidirectional AGV base with a single xArm7 manipulator. Used dynamic movement primitives (DMPs) for household tasks, achieving a 90% success rate in door opening and refrigerator retrieval.

WORK EXPERIENCE

Mech-Mind Robotics Technologies Co., Ltd.

Beijing, China

Test Engineer

Nov 2022 – Mar 2023

- Tested machine-vision software for functionality and performance; worked with developers to diagnose defects, implement fixes, and verify improvements.
- Managed industrial-camera image acquisition and evaluated image post-processing algorithms.
- Performed hand-eye calibration tests for multiple robot and camera models in third-party vision software, achieving a 100% pass rate in grasping validation tests.
- Co-developed communication protocols for collaborative robot arms to improve system efficiency and reliability.

Beijing Century TAL Education Technology Co., Ltd.

Beijing, China

New Media Operations Supervisor

Jun 2019 – Sep 2020

- Produced weekly WeChat content reaching over 100,000 students and parents; managed social media and online channels to promote departmental programs.
- Organized quarterly departmental meetings, coordinated agendas and speakers, and provided technical support for the online course platform.
- Designed posters and produced videos to promote events, courses, and departmental initiatives.

PROJECTS

Triple Inverted Pendulum: Linear and Nonlinear Control

2025

- Derived nonlinear dynamics for a cart with three pendulum links using Lagrangian mechanics; implemented a port-Hamiltonian formulation for structured simulation and comparison.
- Implemented LQR, H_∞ , and Mamdani fuzzy controllers; compared robustness under disturbances and initial-angle sweeps over $[-30^\circ, 30^\circ]^3$.
- Implemented sliding-mode control (SMC) and nonlinear model predictive control (NMPC) using RK4, CasADi, and IPOPT. Over 1,331 initial-angle configurations within $\pm 5^\circ$ per link, achieved stabilization rates of 98.6% for SMC and 83.8–84.1% for NMPC; evaluated settling time and regions of attraction.

Bipedal Dinosaur Robot — Robotics Studio, Columbia University

2024

- Designed the robot's body geometry and transmission mechanism from scratch for Columbia University's Robotics Studio course.
- Fabricated and assembled the robot at the Columbia MakerSpace using 3D printing, laser cutting, machining, and soldering.
- Built a MuJoCo simulation and implemented a running controller; the physical robot reached a measured speed of 16.1 cm/s.

Motion Planning with Multi-Sensor Information Fusion

2019

- Developed and debugged Python and C++ modules for mobile-robot navigation, visual recognition, robotic assembly, arm motion planning, and multi-sensor fusion.
- Built a Neo4j graph database using Python and Cypher to support robotic assembly tasks; authored two invention patents, both granted.

TECHNICAL SKILLS

- **Programming and Machine Learning:** Python, C, C++, MATLAB, PyTorch.
- **Robotics and Simulation:** ROS/ROS 2, MuJoCo, Open3D, point-cloud processing, motion planning, robot control.
- **Engineering Tools:** Linux (Ubuntu), Git, SolidWorks, 3D printing, laser cutting, machining, soldering.
- **Productivity and Media:** Microsoft Office; Adobe Photoshop, Premiere Pro, After Effects, Audition, Lightroom.