Jingyi Xiang

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Education

University of Illinois Urbana-Champaign
Bachelor of Science in Electrical Engineering & Minor in Computer Science *August 2020 – May 2024*

- Dean's List: Fall 2020, Spring 2021, Fall 2021, Spring 2022
- GPA: 3.88/4.0; Technical GPA: 3.86/4.0
- Relevant courses: Introduction to Robotics, Introduction to Machine Perception, Artificial Intelligence, Control Systems, Digital & Analog Signal Processing

Publications

1. **J. Xiang**, H. Dinkel, H. Zhao, N. Gao, B. Coltin, T. Smith, and T. Bretl, "TrackDLO: Tracking Deformable Linear Objects Under Occlusion with Motion Coherence", *IEEE Robotics and Automation Letters*, August 2023.
2. **J. Xiang** and H. Dinkel, "Simultaneous Shape Tracking of Multiple Deformable Linear Objects with Global-Local Topology Preservation", in *IEEE ICRA Workshop on Representing and Manipulating Deformable Objects*, May 2023.
3. H. Dinkel*, **J. Xiang***, H. Zhao, B. Coltin, T. Smith, and T. Bretl, "Wire Point Cloud Instance Segmentation from RGBD Imagery with Mask R-CNN", in *IEEE ICRA Workshop on Representing and Manipulating Deformable Objects*, May 2022.

* Equal Contribution

Research Experience

Bretl Research Group
Advisor: Timothy Bretl, Professor of Aerospace Engineering
Undergraduate Research Assistant *January 2022 – Present*

- **Tracking Deformable Linear Objects in RGB-D Imagery** *August 2022 – Present*
  - Developed a new deformable linear object tracking algorithm, TrackDLO, for robust deformable linear object tracking under occlusion without external state information or physics simulation.
  - Developed a non-rigid point set registration based method for tracking multiple deformable linear objects simultaneously.
  - Created open-source C++ ROS (Robot Operating System) packages for the tracking methods developed.
- **Automated Data Generation and Annotation for Deep Learning** *January 2022 – December 2022*
  - Implemented the Copy-Paste Augmentation method in an automated dataset generation process to scale the amount of available training data and to eliminate the time-consuming process of manual image annotation.
  - Collaborated with other researchers in the group to create COCOpen, an open-source library that automatically generates datasets of color images with objects of interest, labeled with object instance segmentation masks, bounding boxes, and category identification.
- **Eye-In-Hand Extrinsic Camera Calibration for Industrial Robots** *May 2022 – July 2022*
  - Designed and 3D printed custom camera mounts for linking the camera and the robot end-effector.
  - Calibrated our hardware system with fiducial markers and two eye-in-hand camera calibration algorithms: the Tsai-Lenz algorithm and a recently published method based on pose graph optimization.
- **Instance Segmentation of Deformable Linear Objects** *February 2022 – May 2022*
  - Identified, implemented, and evaluated two state-of-the-art deformable linear object instance segmenta-

tion algorithms.
- Used the instance segmentation masks output from Mask R-CNN to segment featureless point clouds in stereo depth imagery.

Honors and Awards

OpenCV AI Competition 2022
- *First Prize Winner (Awarded to the top 10% submissions)* — *January 2023*

UIUC Electrical and Computer Engineering Scholarships and Awards
- *Indira Gunda Saladi Engineering Research Prize* — *August 2023*
- *Ellery B. Paine Outstanding Junior Award* — *March 2023*
- *A.R. "Buck" Knight Scholarship* — *September 2022, August 2023*
- *Oakley Scholarship in Electrical and Computer Engineering* — *September 2021*

VEX Robotics Competition World Skills Standing College Division
- *Top 5 Worldwide, Top 3 in the US* — *May 2021, May 2022*

VEX Robotics Competition World Skills Standing High School Division
- *18^{th} Overall, 3^{rd} in Programming* — *May 2020*

VEX Robotics Competition Maryland State Championship
- *Excellence Award, Robot Skills Champion, Tournament Division Finalist* — *March 2020*

Projects

Tracking Deformable Linear Objects with Geodesic-Based Bayesian Coherent Point Drift
CS 498 Machine Perception Final Project — *April 2023 - May 2023*
- Implemented a recently published non-rigid registration algorithm, Geodesic-Based Bayesian Coherent Point Drift, in both Python and C++.
- Integrated the Geodesic-Based Bayesian Coherent Point Drift algorithm into existing deformable linear object tracking algorithms to improve the tracking performance in edge cases.

Skills

Operating Systems: Windows, Linux
Programming Languages: Python, C++, LaTeX, C, MATLAB
Software: Robot Operating System (ROS), Autodesk Fusion 360, PyTorch, OnShape, Autodesk Inventor
Hardware: Intel RealSense Camera, ABB IRB120 Industrial Robot Arm, UR5e Industrial Robot Arm, OnRobot 2FG7 Gripper

Mentoring and Outreach

Illinois Office of Undergraduate Research
Illinois Undergraduate Research Ambassador — *March 2023 – Present*
- Worked as a peer mentor to guide underclassmen through the process of finding research opportunities.
- Assisted workshops that aim to introduce undergraduate research to new students.
- Represented and assisted the Illinois Office of Undergraduate Research in campus-wide events to promote undergraduate research on campus.

Illini VEX Robotics at UIUC
Co-Founder & Competition Team Leadr — *December 2020 – March 2023*
- Mentored multiple high school teams in the community to help them get started in robot programming.
- Collaborated with teams from other institutions to create a knowledge base for competitive robotics.

- Created guides and documentation for new member onboarding.
- Organized and held weekly team events such as build meetings, social events, workshops, and general meetings to create team bonding.
- Oversaw robot design, manufacturing, and programming.

John Carroll School Robotics Team
Alumni Mentor *June 2020 – April 2022*
- Produced a series of tutorial videos on how to use Autodesk Fusion 360 to design robot mechanisms.
- Produced tutorial documents on basic robot programming and control algorithms.
- Created guides and documentation for new member onboarding.
- Held mentoring appointments with the current team members to provide guidance on various technical topics.

Presentations

Bretl Research Group Weekly Seminar, *UIUC*.
- 1-hour slide presentation: "Deformable Linear Object Tracking as Non-Rigid Point Set Registration" *February 2023*
- 1-hour slide presentation: "Tracking Deformable Linear Objects Under Occlusion" *September 2022*
- 15-minute slide presentation: "Wire Instance Perception from RGBD Imagery with Mask R-CNN" *April 2022*

Undergraduate Research Symposium, *UIUC*.
- Poster presentation: "TrackDLO: Tracking Deformable Linear Objects Under Occlusion with Motion Coherence" *April 2023*
- Poster presentation: "Wire Instance Perception from RGBD Imagery with Mask R-CNN" *April 2022*

Undergraduate Research Opportunity Program Symposium, *UIUC*.
- 15-minute slide presentation: "Perceiving and Tracking Deformable Linear Objects" *August 2022*