Pragna Mannam, Ph.D.

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Pragna has 10 years of experience in robotic manipulation spanning control, machine learning, sim-to-real, and sensing. She has worked with many industrial robotic arm systems including ABB120, UR5, Falcon, Franka, and xArm7.

Skills

Robotic Manipulation, Machine Learning, Feedback Control, Motion Planning, Computer Vision, Python, C++, ROS, SolidWorks

Experience

Meta AI *(April 2021 - April 2022)*

- Developed state estimation models for a soft delta robot using 90K samples of online data from magnetometer sensors and offline ground truth data from optitrack
- Resulting learned neural network models used for closed-loop control achieving a mean tracking error of < 1 mm

National Robotics Engineering Center (NREC) *(May 2018 - Dec 2018)*

- Used force-torque feedback on industrial robot arm to learn robust grasping policies for pick-and-place of deformable objects
- Learned policies allow robots to grasp objects with dexterity comparable to the human hand, retrieving, sorting and fulfilling orders at rates of more than 600 picks per robot per hour

John Deere *(May 2016 - Aug 2016)*

- Developed and tested steer-by-wire system for autonomous lawn mowers, decreasing reliance on legacy hydraulic systems

Research Projects

Learning Soft Robotic Hand Designs using Data from Simulation and Teleoperation *2022 - 2024*
Advisor: Prof. Nancy Pollard, Prof. Jean Oh, Carnegie Mellon University (*PhD thesis*)

- Optimized hand designs using data from teleoperation had 45% improvement over state-of-the-art hands on dexterous manipulation tasks **Best Oral Paper Finalist**
- Improved on previous work by massively scaling data, fine-tuning in simulation using reinforcement learning, and testing in the real-world using teleoperation to achieve a further 10% improvement **Best Demo Finalist**
- Learned grasp affordance models using imitation learning on internet-scale egocentric human-object interaction datasets resulting in policies with 30% mean improvement in success rate over naive RL policies **CoRL 2023**

Designing Soft Delta Robot Manipulators for Autonomous Manipulation *2019 - 2022*
Advisor: Prof. Zeynep Temel, Prof. Oliver Kroemer, Carnegie Mellon University

- Designed low-cost $300 modular Delta parallel manipulators with flexural hinges for teleoperated and autonomous tasks
- Learned soft robot kinematic models with < 1 mm error for control of fine motor tasks (e.g. rolling dough)

Object Pose Determination using Randomized Action Sequences *2015 - 2018*
Advisor: Prof. Matthew T. Mason, Carnegie Mellon University (*Masters thesis*)

- Developed a sensorless robotic solution to object reorientation using 2.5K real world and 600K simulated experiments

Awards and Media

- **Best Demo Finalist** at 2024 IEEE-RAS International Conference on Soft Robotics
- **Best Oral Paper Finalist** at 2023 IEEE-RAS International Conference on Humanoid Robots
- Kanaka Muira Award at 2023 IEEE-RAS International Conference on Humanoid Robots
- 2022 Intelligent Symbiotic Systems Moonshot Funding from CMU College of Engineering
- Soft Robotic Hand Design featured in New York Times Article *This Robot Can Paint. But Is It Art?*, *May 2023*
- Filmed Object Pose Determination project for WQED Series on workforce development as a result of technological changes and automation, *Aired on March 21, 2019 at 8pm EST*

Education

Ph.D. in Robotics, Carnegie Mellon University Advisors : Prof. Nancy Pollard, Prof. Jean Oh
Thesis Title: **Design Iteration of Dexterous Compliant Robotic Manipulators** *Aug 2024*

MS in Robotics, Carnegie Mellon University Advisor : Prof. Matthew T. Mason
Thesis Title: **Model-free Sensorless Manipulation** *May 2019*

BS in Electrical and Computer Engineering, Carnegie Mellon University Advisor : Prof. Matthew T. Mason
May 2017

Select Publications

Conference and Journal Publications:

- *P. Mannam*, X. Liu, D. Zhao, J. Oh, & N. Pollard.
Design and Control Co-Optimization for Automated Design Iteration of Dexterous Anthropomorphic Soft Robotic Hands.
In 7th IEEE-RAS International Conference on Soft Robotics (RoboSoft), 2024. **Best Demo Finalist**
- A. Kannan, K. Shaw, S. Bahl, *P. Mannam*, & D. Pathak.
DEFT: Dexterous Fine-Tuning for Hand Policies. In 7th Annual Conference on Robot Learning (CORL), 2023.
- *P. Mannam*, K. Shaw, D. Bauer, J. Oh, D. Pathak, and N. Pollard.
Designing Dexterous Anthropomorphic Soft Hands through Interaction.
In IEEE-RAS International Conference on Humanoid Robots, 2023. **Best Oral Paper Finalist**
- *P. Mannam*, A. Rudich, K. Zhang, M. Veloso, O. Kroemer, and F.Z. Temel.
A Low-Cost Compliant Gripper Using Cooperative Mini-Delta Robots for Dexterous Manipulation.
In Robotics: Science and Systems (RSS), 2021.
- *P. Mannam*, O. Kroemer, F.Z. Temel,
Characterization of Compliant Parallelogram Links for 3D-Printed Delta Manipulators.
In International Symposium on Experimental Robotics (ISER), 2020.
- *P. Mannam*, A. Volkov Jr., R. Paolini, G. Chirikjian, M. T. Mason.
Sensorless Pose Determination using Randomized Action Sequences. *Entropy*, 21(2), 154. 2019.

Leadership Experience and Outreach

- **SCS Dean's PhD Student Advisory Committee, CMU** *(Dec 2019 - Dec 2023)*
- **Robotics Institute Climate Committee, CMU** *(Feb 2020 - Feb 2021)*
- **Vice-President of Graduate Student Life**, Graduate Student Assembly, CMU *(Aug 2018 - May 2019)*
- **Provost Search Committee and University Student Affairs Council** *(Aug 2018 - May 2019)*
- **Department Representative and Advocate**, Graduate Student Assembly, CMU *(Aug 2017 - Jul 2018)*
- **Executive Member**, Society of Women Engineers *(Jun 2015 - May 2017)*