

# Alison Bartsch (She/Her/Hers)

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## Education

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### Carnegie Mellon University

Pittsburgh, PA

PhD Candidate in Mechanical Engineering | GPA: 3.92

Sept. 2021 – Present

Relevant Coursework: Deep Learning for Engineers, Deep RL & Control, Computer Vision, Learning for Manipulation, Robot Cognition, Math Fundamentals for Robotics, Project Management

### Stanford University

Stanford, CA

BS in Aeronautics and Astronautics | GPA: 3.78

Sept. 2017 – June 2021

Relevant Coursework: Principles of Robot Autonomy I, Principles of Robot Autonomy II, Topics in Advanced Robotic Manipulation, Feedback Control Design, Space Flight, Space Mechanics, Spacecraft Design Laboratory

## Research Experience

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### PhD Researcher | Carnegie Mellon University

Pittsburgh, PA

Mechanical and AI Lab

Sept. 2021 – Present

Reinforcement Learning: Contributed to multiple reinforcement learning projects, including the development of a novel replay buffer sampling algorithm for DDPG, and creating a trajectory augmentation strategy to seed the replay buffer with a single human demonstration to speed up training.

Deformable Dynamics: Collected a large dataset on a 7DOF arm of the robot randomly grasping plasticine with different grasp parameters. Designed a latent dynamics model to predict the plasticine deformation leveraging the pre-trained PointBERT point cloud embeddings.

3D Vision: Built a multi-camera system that can reconstruct 3D surfaces in the scene accurately and real-time. This system is instrumental for the lab's 3D deformable object manipulation projects.

Sculpting Imitation Learning: Created a novel 3D diffusion policy algorithm for imitation learning for the clay sculpting task with a parallel gripper. The diffusion policy framework is conditioned with the previous grasp action, as well as the latent embeddings of the 3D point cloud of both the current clay state observation as well as the goal.

LLMs for Sculpting Reasoning: Built a system leveraging LLMs as high-level planners for a discretized top-down sculpting task to investigate how LLMs reason about highly complex robot-object interactions.

### Undergraduate Researcher | Stanford University

Stanford, CA

Autonomous Systems Lab

Jan. 2018 – June 2021

Gecko-Adhesive Grippers: Developed a simulation to model the dynamics of the grasping scenario of a gecko-adhesive gripper to test various controllers and optimize the robot design.

Novel ReachBot Robot: Modeled the novel robot's behavior in simulation by re-factoring existing manipulation models in which the object being "manipulated" is the robot's body, and the fingers are the robot's legs for traversing lava tubes on the moon and Mars.

## Awards

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**2024 CMU Mechanical Engineering Shaw Fellowship** | In recognition of academic excellence

**2023 CMU Engineering Dowd Research Fellowship** | In recognition of cutting-edge research

## Skills

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**Programming:** Python, C/C++, Java, Matlab

**Applications:** ROS, SolidWorks, Gym, ManiSkill2, Git, Pybullet, Mujoco, PlasticineLab

**Robot Hardware:** Franka arm/parallel gripper, LEAP hand, DeltaHand, Oculus-based Teleoperation

**Libraries:** Pytorch, Tensorflow, Pytorch3d, Open3d

## Publications

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- A Bartsch**, A Car, C Avra, AB Farimani. SculptDiff: Learning Robotic Clay Sculpting from Humans with Goal Conditioned Diffusion Policy. Under review (IROS) 2024.
- A Bartsch**, C Avra, AB Farimani. SculptBot: Pre-Trained Models for 3D Deformable Object Manipulation. ICRA 2024.
- JH Park, GP Dalwankar, **A Bartsch**, A George, AB Farimani. Fluid Viscosity Prediction Leveraging Computer Vision and Robot Interaction. Engineering Applications of Artificial Intelligence 2024.
- F Zhu, S Hu, L Leng, **A Bartsch**, A George, AB Farimani. Pour Me A Drink: Robotic Precision Pouring Carbonated Beverages into Transparent Containers. arXiv preprint 2023.
- A Dikshit\*, **A Bartsch\***, A George, AB Farimani. RoboChop: Autonomous Framework for Fruit and Vegetable Chopping Leveraging Foundational Models. Under review (SN Computer Science) 2023.
- A George, **A Bartsch**, AB Farimani. Minimizing Human Assistance: Augmenting a Single Demonstration for Deep Reinforcement Learning. ICRA 2023.
- A George, **A Bartsch**, AB Farimani. OpenVR: Teleoperation for Manipulation. Under review (Robotics and Automation Systems) 2023.
- K Wang, **A Bartsch**, AB Farimani. MAN: Multi-Action Networks Learning. arXiv preprint 2022.

## Leadership Experience

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- Robotics Team Lead** | Carnegie Mellon University *Pittsburgh, PA*  
*Mechanical and AI Lab* Sept. 2022 – Present  
Lead the robotics research sub-group of the MAIL Lab consisting of over 10 masters and PhD students. Responsibilities include developing the lab's robotics research direction, creating projects, guiding methodology and experimental design, and paper writing/editing.
- Starting Central Defender** *St. Thomas, USVI*  
*US Virgin Islands National Women's Soccer Team* Sept. 2015 – Sept. 2021  
Led the defensive back line while representing the USVI on the international scale at Olympic and World Cup qualification tournaments for the Virgin Islands women's soccer team.
- Student Mentor** | Stanford University *Stanford, CA*  
*Women's Leadership Innovation Lab* Sept. 2018 – June 2020  
Conducted field studies to assist with research and analysis of women's leadership in STEM. Led a leadership class for high school girls to assist in the transition from high school to college implementing interventions previously studied by the lab proven to help students facing gender biases in STEM.

## Teaching Assistant Experience

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- Teaching Assistant** | Carnegie Mellon University *Pittsburgh, PA*  
*Introduction to Deep Learning & Intermediate Deep Learning* Jan. 2024 – May 2024  
Taught core machine learning concepts including MLPs, CNNs, RNNs, GNNs, transformers, diffusion, pretraining strategies, etc. in recitation, created homework assignments and held weekly office hours.

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**Organizations:** Society of Women Engineers | Women in Robotics | Caribbean Students Association