Charlotte Avra

cavra@andrew.cmu.edu
charlotteavra.com | github.com/charlotteavra | linkedin.com/in/charlotteavra

EDUCATION

Master of Science in Mechanical Engineering
Carnegie Mellon University | 2022 - 2024
Emphasis: Robotics & Control Systems
Cumulative GPA: 3.98/4.00
Achievements: BRIDGE Fellowship (2022 – 2024)

Bachelor of Science in Mechanical Engineering
Rensselaer Polytechnic Institute | 2018 - 2022
Cumulative GPA: 3.55/4.00
Achievements: Obtained a provisional patent from USPTO

PROJECTS

Nonprehensile Manipulation for Shelf Organization
Oct. – Dec. 2023

- Wrote an algorithm for finding efficient robot pushing motions, enabling the reorganization of boxes leaning on a shelf to create space for additional items

Path Planning and Control for Autonomous Vehicles
Oct. – Dec. 2023

- Developed Stanley and LQR controllers for lateral and longitudinal control of a Tesla Model 3 in Webots
- Wrote A* search algorithm for obstacle avoidance
- Implemented Extended Kalman Filter (EKF) for SLAM
- Adaptive control (MRAC) for DJI Mavic 2 Pro quadrotor drone in Webots with loss of thrust in one rotor

Learning Human-Like Tonal Inflections for Humanoid Robotics
Oct. - Dec. 2022

- Classified audio signals recorded from humanoid robot mouth into 4 tones using 3-layer CNN
- Performed data augmentation on robot audio and converted time signals to Mel-frequency cepstral coefficients for feature extraction

Hand Gesture Recognition for Screen Manipulation in the Operating Room
Oct. – Dec. 2022

- Developed an MRI image browser controlled using hand gestures detected using MediaPipe

Educational Typing Game for Children (6+)
Oct. – Dec. 2022

- Interactive space-themed game to improve typing and accuracy programmed in C++ using OpenGL

EXPERIENCE

Graduate Researcher
Mechanical and Artificial Intelligence Lab
Carnegie Mellon University | Aug. 2022 - present

- Learning for manipulation of soft material (e.g. robotic clay sculpting)
- TA'd for 24-780 Engineering Computation an introductory C++ programming course covering basic data structures and algorithms

Robotics Engineer, Intern
Medra.ai | May – Aug. 2023

- Wrote and tested robot policies for handling biology tools, collision avoidance in a complex environment, contour detection, and TrOCR for screen reading
- Tested and debugged in simulation (PyBullet) as well as on a physical 6 DOF manipulator

Mechanical Design Engineer, Intern
Neuralink | May - Aug. 2021, Jan. - Jun. 2022

- Neural Implant Imaging Station – Modeled and built hardware setup and wrote program for image stitching and loop detection for documenting quality of neural implant's micron-scale loops, removed four manual steps from process
- Wafer Processing Fixture – Designed and tested fixture for processing diced wafers to improve solvent flow in chemical baths, megasonic cleaning, and vapor drying processes
- Designed parts for machining and injection molding and drafted technical drawings using GD&T

SKILLS

- **Programming:** Python (incl. OpenCV), C++ (incl. OpenGL), MATLAB & Simulink, Git, CMake, Arduino
- **Robot Hardware:** Franka Emika Panda, UFACTORY xArm, Motors, Actuators, Sensors
- **Design:** Solidworks, Siemens NX, GD&T, Tolerance Stack-up, Material Selection
- **Machine Learning and Data Analysis:** PyTorch, scikit-learn, Tensorflow, keras, MediaPipe, librosa (audio analysis), Pandas, Matplotlib
- **Prototyping Processes:** SLA and FDM 3D Printing, Laser Cutting, Vacuum Forming, Woodworking
- **Fabrication:** Manual Machining, CNC Machining, Injection Molding