

# NEIL ABCOUWER

ROBOTICS SOFTWARE ENGINEER

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U.S. Citizen

NASA JET PROPULSION LABORATORY, Pasadena, CA

2014 – Present

## **Robotics Systems Engineer, Mobility and Robotic Systems**

### *Mars 2020 (Perseverance) Rover Flight Software, 2017 – Present*

- Developed new software modules and updated heritage software for Mars 2020 rover mission:
  - Backlash and torque compensation for milliradian pointing accuracy for Laser-Induced Breakdown Spectroscopy
  - JPEG, gzip, and optimized Malvar demosaicing to enable faster and more compact image and data compression
  - Queuing and blending rover arcs with progress notifications enabling continuous autonomous driving
  - Visual-odometry pose estimation while driving and sun-gaze for high-sun-elevation heading estimation
  - Frame management for tracking poses of rover mechanisms and targets on Mars surface
- Conducted code and design reviews; unit, simulation, and regression testing; and flight software mentorship
- Supporting mission operations, verification and validation activities, and hardware testing

### *COLDArm Flight Software, 2020 – Present*

- Architected flight software design to control cold-operable (-180°C) actuators for tech demo on lunar lander
- Developing F' software framework components for motor and thermal control, parameter management

### *CubeRover for Affordable, Modular, and Scalable Planetary Exploration, 2020 – Present*

- Developing compression software for Astrobotic's CubeRover platform, served as JPL lead co-investigator

### *Machine Learning based Path Planning for Improved Rover Navigation, 2019 – 2021*

- Integrating machine learning heuristics into Mars 2020 flight software navigation algorithm
- Demonstrated improved success rate (13%) and increased path efficiency (35%) in complex terrains

### *Freeclimber, 2015 – 2018*

- Designed kinematics, mobility, and autonomy algorithms for limbed rock-climbing robot with microspine grippers
- Combined high-level ROS environment and low-level QNX RTOS
- Deployed and operated robot in successful lava tube and desert field tests with science teams
- Demonstrated semi-autonomous traverses of several meters to conduct spectroscopy and X-ray lithochemistry

### *Mars On-orbit Sample Transfer Technologies, 2014 – 2017*

- Architected software to support cyber-physical simulations of sample capture event with rapidly prototyped designs
- Developed LIDAR perception algorithms for tracking objects using RANSAC, Hough transform, and sensor fusion

### *In-Space Robotic Inspection and Servicing, 2014 – 2015*

- Improved legacy climbing robot with kinematics code for new limbs and interface for gecko grippers

THE ROBOTICS INSTITUTE, Pittsburgh, PA

2012 – 2014

## **Student Researcher, Biorobotics Laboratory**

- Constructed, programmed and operated four omnidirectional co-planar manufacturing research robots
- Developed algorithms for localization, multi-robot coordination, and distributed visual servoing of large assemblies
- Designed electronics and firmware for hybrid passive-active linear manipulator tool and other mechatronic devices

CARNEGIE MELLON UNIVERSITY, Pittsburgh, PA

2012 – 2014

## **Teaching Assistant, Robotics Department, Electrical & Computer Engineering Department**

- Taught class and lab sessions, evaluated projects, tests, and team progress for classes in robotics and engineering

## **EDUCATION**

CARNEGIE MELLON UNIVERSITY, Pittsburgh, PA

**Master of Science, Robotics; Bachelor of Science, Electrical and Computer Engineering**

2014, 2013

## **SKILLS**

Robotics (Kinematics, Dynamics, Pose Estimation, Planning, Perception), Coding (C, C++, MATLAB, GoogleTest, Gcov), Middleware (ROS, F'), Safety-Critical Systems, Motor Control, Sensors (Cameras, LIDAR, Encoders, Resolvers)