

# Daniel Fitzgerald

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## Summary

An ardent roboticist, perseverant engineer, multidisciplinary maker, and intrepid teammate.

## Education

- 2017 **Massachusetts Institute of Technology**, *MS - Media Arts and Sciences*.  
Thesis: *Reveal: A Mixed Reality Robotic Tangible Interface* Advisor: Prof. Hiroshi ISHII
- 2015 **Worcester Polytechnic Institute**, *BS - Robotics Engineering / Computer Science*.  
Senior Project: *HydroDog: A Quadruped Robot Actuated by Soft Hydraulic Muscles*

## Work Experience

- 2021 - 2024 **Charge Robotics**, *Robotics Engineer*, 1st Employee, in-person (Oakland CA).
  - Made an autonomous telehandler, including drive-by-wire retrofits and autonomous software.
  - Owned the entire development of a robot workstation to pick and place various metal brackets.
  - Led field operations for delivery and installation of solar tracker hardware, including planning and testing SOPs, and improving the process on-site during pilot projects
- 2017 - 2021 **iRobot**, *Software Engineer*, SLAM Team, remote (Bedford MA).
  - Implemented set of internal python analytics tools for comparing robot logs to ground-truth data to assess localization accuracy.
  - Used the tools to characterize the performance of robot gyroscopes and find problems with factory IMU calibration and gyroscopic drift.
  - Created a cloud infrastructure (AWS Batch Jobs) integrated with Jenkins to run the analytics on PR builds to detect regressions in the SLAM system.
- 2015 - 2017 **MIT Media Lab**, *Research Assistant*, Tangible Media Group, Cambridge, MA.
  - Lead research on interactive programmable materials.
  - Teaching Assistant for MAS.834 Tangible Interfaces
  - Exhibitor for 'Radical Atoms' Main Exhibit at Ars Electronica Festival 2016
  - Competitor, TechCrunch Robotics Sessions, 2017
- Summer 2015 **Amazon Robotics**, *Software Intern*, Fulfillment Center Automation, Westborough, MA.
  - Developed a custom computer vision pipeline for object recognition and 3D pose estimation in real time in C++ with OpenCV
  - Designed datatypes for storing and retrieving 3D registration features from scanned objects.
  - Constructed a stereoscopic camera rig for 3D scanning and reconstruction.
  - Created automatic pipeline for camera calibration and relative pose estimation.
- Summer 2014 **Harvard University**, *Automation Research Engineer*, Lewis Research Group, Microrobotics Laboratory, Cambridge, MA.
  - Designed and fabricated 3D-printable soft robots and conductive circuits.
  - Created a framework for parametric design of modular microfluidic functional structures.
  - Developed software tool-chains and slicing algorithms for fabricating 3D printable electronics.
- Summer 2013 **Harvard University**, *Undergraduate Researcher*, Lewis Research Group, Wyss Institute for Biologically Inspired Engineering, Cambridge, MA.
  - Adapted open-source 3D printing software for use on custom multi-material additive manufacturing.
  - Fabricated novel hybrid ink+thermoplastic extruder and patterning processes for 3D printers.
  - Scripted automatic G-code sequences for a custom multi-material bio-printer.
- 2011 - 2013 **Worcester Polytechnic Institute**, *Teaching Assistant / Machine Shop Assistant / Lab Monitor*, Design and Manufacturing Laboratories, Worcester, MA.
  - Supervised CNC machining classes of up to 12 students.
  - Maintained machines and shop facilities and set up new equipment.
  - Assisted students with CAM designs and CNC setup and operation for manufacturing projects.

## Selected Projects

- 2017 **Reveal: A Robotic Tangible Interface for Mixed Reality**, *Master's Thesis Project*.  
A shape-changing tangible interface for dynamic interaction with room-scale virtual environments. The system consists of a mobile haptic force-controlled pin array ("Shape Display") that conforms to virtual geometry. The robot is tracked in real time by SteamVR in the Unity Engine, and integrated with projection-mapping, hand-tracking, and an HMD for AR/VR experiences.
- 2015 **Phobos First: A Mission to Settle Mars**, *Interactive Qualifying Project*.  
A proposal for a Mars colonization strategy using Phobos as a forward operating base to teleoperate construction robots on the surface.

## Selected Publications

- 2016 **An Integrated Design and Fabrication Strategy for Entirely Soft, Autonomous Robots**, *Nature*.  
Michael Wehner, Ryan Truby, Daniel Fitzgerald, Bobak Mosadegh, George Whitesides, Jennifer Lewis, Robert Wood
- 2019 **inFORCE: Bi-directional 'Force' Shape Display for Haptic Interaction**, *TEI*.  
Ken Nakagaki, Daniel Fitzgerald, Zhiyao (John) Ma, Luke Vink, Daniel Levine, Hiroshi Ishii

## Certifications

- |           |                    |       |                           |
|-----------|--------------------|-------|---------------------------|
| Forklift  | Class IV Operator. | Scuba | Open Water SDI.           |
| HAM Radio | Technician.        | OSHA  | 10-Hour General Industry. |

## Skills

- Robotics ROS1/2, SLAM, Sensor Fusion, Planning/Navigation, Computer Vision, Machine Learning, Data Analysis, 3D Transform Math, 3D Visualizations, Motor Controllers, CAN, IO-Link, ZMQ, Industrial Robot Arms, Haptic Interfaces, Series-Elastic Actuators, AR/VR.
- Software Python, C/C++, C# (Unity), CMake, Git, SCRUM, Embedded Systems.
- Hardware CAD (OnShape, Autodesk Inventor), CAM, Engineering Drawings, Design for 3D Printing.
- Prototyping 3D Printing, Laser Cutting, CNC Milling and Turning, Sheet Metal Fabrication, Hand Tools.

## Activities, MIT

- 2015 **Students for the Exploration and Development of Space (SEDS)**, *Mars City Design Team*, Member.  
Designed a city on Mars, which was a winning entry in the 2016 Mars City Design Competition.
- 2016 - 2017 **Media Lab Space Initiative**, *Leading Member*.  
Helped establish the initiative, with the goal of promoting space-related research and projects.
- 2015 - 2016 **Students for a Just and Stable Future**, *Environmental Activist*.  
Staged a student sit-in to prompt the MIT establishment to divest the institution from fossil fuels.

## Activities, WPI

- 2012-2015 **Collab-Lab Student Makerspace**, *Co-Founder, President, Lab Manager*.  
Co-founded and led a new student organization dedicated to fostering extracurricular projects and learning, and to serve as a hub for the maker community on campus.
- 2013 - 2015 **Rho Beta Epsilon Robotics Engineering Honors Society**, *Member*.
- 2013 - 2015 **Toastmasters Student Chapter**, *Secretary*.
- 2013 - 2015 **Running Club**, *Co-Founder, Secretary*.
- 2014 - 2015 **Students for a Just and Stable Future**, *Environmental Activist*.
- 2013 - 2015 **Entrepreneurship Club**, *Member*.
- 2012 - 2015 **Philosophical Society**, *Treasurer*.