

# Matthew Vernacchia, Ph.D.

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I develop software to aid the design of superconducting magnets and fusion devices for clean energy.

Previously, I led the design and testing of a solid rocket propulsion system (at MIT) and developed spacecraft software (at SpaceX). Core skills:

Programming: python (5+ years), SQL (1 year), Rust (learning), git

CAD: Solidworks, Onshape, GD&T

Fabrication: 3-axis CNC mill, CNC lathe, additive manufacturing (plastic and metal), composite layups, polymer casting, solid rocket propellant production.

## Education

Massachusetts Institute of Technology Cambridge, MA

Ph.D. in Aeronautics and Astronautics, Space Propulsion Aug 2017 – May 2020

Develop a transonic rocket propelled UAV. Design, produce and test ultra-slow-burn solid rocket motors. Manage a team of undergraduate research assistants.

Key classes: 22.611 Intro to Plasma Physics I, 2.s998 Additive Manufacturing, 18.6501 Statistics.

S.M. in Aeronautics and Astronautics Feb 2015 – June 2017

5.0/5.0 GPA. Thesis focus: solid rocket propulsion for small UAVs.

S.B. in Aeronautics and Astronautics with Information Tech. Aug 2011 - Feb 2015

4.9/5.0 GPA. Led student Rocket Team in building a liquid engine, grow team membership from 3 to ~40.

## Work Experience

Commonwealth Fusion Systems Cambridge, MA

Material Properties Database Engineer May 2020 – Present

Develop optimization software to support the design and manufacture of the world's most powerful high-temperature superconductor magnets. Help define the startup's software engineering workflows.

Space Exploration Technologies Hawthorne, CA

Dragon Propulsion Intern July – Sept 2017

Develop propulsion FDIR algorithms. Automate flight-critical propulsion component tests. Model thermal response of spacecraft thrusters. Design & build pneumatic test hardware.

Guidance, Navigation and Control Intern June - Aug 2015, 2014, 2013

Model uncertainty in spacecraft docking maneuvers. Simulate human interactions for control interface testing. Integrate a flight simulator in C++. Train NASA astronauts to fly a simulator and collect feedback on UI/UX and handling qualities. Simulate lighting conditions using ray tracing. Design and execute tests for a LiDAR sensor. Program and operate a large (400 kg) robot arm.

NASA Jet Propulsion Laboratory Advanced Robotics Controls Group Pasadena, CA

Robotics Intern June - Aug 2012

Develop a hand gesture UI for human-robot interaction in MATLAB and C. Decode hand gestures from muscle activity signals using machine learning in MATLAB. Publish in IEEE International Conference on Robotics and Automation.

## Publications and Conferences

International Astronautical Congress Bremen, Germany October 2018

Present paper comparing system architectures for re-use of launch vehicle first stages. [IAC-18-D2.4.3](#)

Caltech Space Challenge Pasadena, CA March 2017

Develop system architecture for a lunar propellant depot in an intense weeklong hackathon with top students from around the globe. Conceptualize a spacecraft to ferry propellant from lunar surface to orbital depot. Present concept to Caltech Faculty and JPL engineers. [DOI: 10.2514/6.2017-5376](#)