# Daniel **Pastor**

Robotics Engineer

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## Summary

Broad experience in applying estimation and control techniques for robotic applications, covering algorithms, software implementation and hardware prototyping. My current interests are efficient control techniques using modern learning methods. Currently finishing a PhD at Caltech, estimated graduation June 2020.

## Education

### CALTECH(California Institute of Technology) — *Pasadena, USA*

Doctor of Philosophy degree in Space Engineering — *Sept. 2015 - PRESENT*

- Thesis: Learning Aerodynamic Interactions for Quadrotors, advisor: Joel Burdick
- Development of Data-Driven Spectral Methods for dynamics systems, applied to multirotor landing
- Development of miniature pressure-sensor array to enhance multirotor control algorithms

### Cranfield University — *Cranfield, UK*

Master of Science in Autonomous Vehicle Dynamics & Control — *Sept. 2013 - Aug. 2014*

- Master Thesis: Visual Odometry in Hardware. Analysis of the performance of computer vision techniques for very agile platforms. Development of new SLAM framework called OFLAAM, presented at ICUAS'15
- Group Project: Flight Tests using BAE Jetstream 31

### Universidad Politécnica de Madrid (UPM) — *Madrid, Spain*

Bachelor of Science in Aerospace Engineering — *Sept. 2008 - Aug. 2014*

- Group Project: Low-orbit satellite control using gravity gradient

## Research Experience

### Jet Propulsion Laboratory (JPL) — *Pasadena, USA*

Affiliate — *July 2015 - PRESENT*

- Heterogeneous Sensor Fusion via Confidence-rich 3D Grid Mapping for the Subterranean (SubT) Challenge
- Design of a Ballistically-Launched Foldable Multirotor
- Verification of open-source Visual Inertial algorithms for Mars Helicopter mission

### Space Dynamics Group, UPM — *Madrid, Spain*

GNC Engineer — *Sept. 2014 - Aug. 2015*

- Analysis of the navigation and control techniques for contact-less space debris removal mission LEOSWEEP

### Tokyo Tech Institute of Technology, Okuma Laboratory — *Tokyo, Japan*

Software Engineer Trainee — *June. 2013 - Aug. 2013*

- Development of a simulation model for gossamer structures (solar sails with booms and membranes)
- Upgrade existing solar sail model to handle generic meshes for easy layout modification

### Applied Physics Department at ETSIA, UPM — *Madrid, Spain*

Software Engineer Trainee — *Feb. 2013 - May. 2013*

- Computer parallelization of plasma dynamics of Langmuir probe model with orbital speed

### GMV — *Tres Cantos, Spain*

Control Engineer Trainee — *July. 2012 - August. 2012*

- Development of the translational control model of ESA mission Lunar Lander using Robust Control techniques

### Intelliglass — *Madrid, Spain*

Software Engineer Trainee — *Nov. 2011 - May. 2012*

- Development of thermal simulator in buildings with active windows
- Integration of the window module into the rest of building simulation framework

## Skills

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| **Programming** | Python for hardware implementation using ROS and machine learning packages, C/C++ during Tokyo Tech internship, Fortran 2003 during Plasma Physics and Intelliglass internships, Matlab for quick prototyping |
| **Languages** | English, Spanish |
| **Other Skills** | Document writing using Latex, mechanical design using Solid Works, version control using GIT, PCB design using Eagle, interactive applications using Unity3D |

## Honors & Awards

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| 2017 | **Caltech Space Challenge 2017,** to design a Lunar Port concept with 32 participants |
| 2014 | ***La Caixa* Fellowship,** to study in postgraduate studies in the US |
| 2014 | **Sir Arthur Clarke Award: Space Achievement Student Award 2014,** with the team Cranspace for *Inspiration Mars* competition |
| 2011 | **2$^{nd}$ Place,** Optimula contest by ETSII-UPM |
| 2008 | **Silver Medal,** XIX Spanish National Physics Olympiad |
| 2008 | **Scholarship Aula de Verano,** by UIMP (Universidad Internacional Menéndez Pelayo). |

## Selected Research Publications

- Carl Folkestad*, **Daniel Pastor***, and Joel Burdick *"Extended Dynamic Mode Decomposition with Learned Koopman Eigenfunctions for Prediction and Control"*, submitted to ICRA 2020
- Carl Folkestad*, **Daniel Pastor***, Igor Mezic, Ryan Mohr, Maria Fonoberova, and Joel Burdick *"Episodic Koopman Learning of Nonlinear Robot Dynamics with Application to Fast Quadrotor Landing"*, submitted to ACC 2020
- Amanda Bouman, Paul Nadan, Matthew Anderson, **Daniel Pastor**, Jacob Izraelevitz, Joel Burdick, and Brett Kennedy, *"Design and Autonomous Stabilization of a Ballistically Launched Multirotor"*, submitted to ICRA 2020
- **Daniel Pastor** , Jacob Izraelevitz, Paul Nadan, Amanda Bouman, Joel Burdick, and Brett Kennedy, *"Design of a Ballistically-Launched Foldable Multirotor"*, International Conference on Intelligent Robots and Systems (IROS), Macao
- **Daniel Pastor** , Jacob Izraelevitz, Paul Nadan, Amanda Bouman, Joel Burdick, and Brett Kennedy, *"Design of a Ballistically-Launched Foldable Multirotor"*, International Conference on Intelligent Robots and Systems (IROS), Macao
- **Daniel Pastor***, Eric Heiden*, Pradyumna Vyshnav, Aliakbar Aghamohammadi, *"Heterogeneous Sensor Fusion via Confidence-rich 3D Grid Mapping: Application to Physical Robots"*, International Conference of Experimental robotics(ISER) 2018, Buenos Aires
- **Daniel Pastor**, Hyo S. Shin *"Optical Flow Localization And Appearance Mapping (OFLAAM) For Long-term Navigation"*, ICUAS'15, Denver
- Gonzalo Sanchez-Arriaga, **Daniel Pastor**, *"Direct Vlasov Simulations of Electron Attracting Cylindrical Langmuir Probes in Flowing Plasmas"* Physics of Plasmas, 2014, vol. 21, no 7 073504