

Federico Rossi

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Education

Stanford University Sept. 2013-Expected Mar. 2018
Ph.D. Candidate, Aeronautics and Astronautics. Advisor: Prof. Marco Pavone

Politecnico di Milano and Politecnico di Torino Sept. 2010-Jul. 2013
M.Sc. (double degree) in Space Engineering GPA: 110/110 cum laude

ISAE-SUPAERO Sept. 2011-Apr. 2012
Erasmus exchange program (Admis sur titre) GPA: 16.54/20

Alta Scuola Politecnica, Milan-Turin, Italy Sept. 2010-Dec. 2012
Diploma

Politecnico di Milano Sept. 2007- Sept. 2010
B.Sc. in Aerospace Engineering GPA: 110/110 cum laude

Research experience

Visiting Researcher, NASA Jet Propulsion Laboratory, Maritime and Aerial Perception Systems Group Jun.-Sept. 2017

Collective Behavior in Autonomous Robotic Systems

- Compiled a survey of algorithms for spatial organization, exploration, and decision-making in autonomous multi-robot systems
- Assessed the performance of collective behavior algorithms with respect to scalability, robustness, bandwidth utilization, and maturity in support of JPL's Maritime Swarm project

Graduate Research Assistant, Stanford Autonomous Systems Laboratory Sept. 2012-present

Autonomous Mobility on Demand

- Developed network flow and queueing models for fleets of self-driving vehicles in Autonomous Mobility-on-Demand (AMoD) systems
- Proposed network flow, mixed-integer linear programming and randomized approximation algorithms for real-time congestion-aware control of AMoD systems
- Demonstrated the performance of the proposed algorithms with large-scale agent-based simulations (MATLAB/MATSim)
- Co-author of three peer-reviewed papers and three papers currently under review

Distributed Decision-Making in Robotic Networks

- Proved analytical lower bounds on execution time, bandwidth usage, and robustness for distributed optimization and decision-making problems in robotic networks, and identified optimal algorithms
- Designed a novel distributed decision-making algorithm that trades off time complexity for bandwidth utilization and energy use in wireless networks
- Designed and implemented an efficient C++ multiagent simulator and message-passing system
- First author of three peer-reviewed papers

Selected engineering projects

Multi-UAV patrolling (GalapagosUAV)

Jul. 2013 -Jun. 2015

- Implemented geometric deployment algorithms (C++/CGAL) for fleets of UAVs to deter poaching in the Galapagos Islands, in collaboration with Stanford University and Universidad San Francisco de Quito
- Implemented communication protocols to transmit images and videos over unreliable IP and serial data links (C++/MAVLINK)

Stanford Space Robotics Facility

Jun. 2014-Aug. 2014

- Led a team of 3 developing embedded software (C++/Simulink) for a fleet of robots
- Designed a real-time multithreaded architecture for estimation, control and motion planning
- Designed, implemented, and tested an embedded on-board position and attitude controller

Capstone project: Martian moons sample return mission

Mar. 2012-Jul. 2012

- Phase A feasibility study (up to Preliminary Design Review) of a sample return mission to Martian moons Phobos and Deimos.
- Led a team of 12 during the final phase of the project
- Designed the attitude determination and control system for all components of the mission

Relevant teaching experience

School of Engineering, Stanford University

Teaching assistant

Apr.-Jun. 2015, 2016, and 2017

AA203, *Introduction to Optimal Control and Dynamic Optimization*

- Advised graduate students conducting research projects on optimal control and motion planning
- Taught lectures on combinatorial motion planning (Dijkstra, A*, elements of computational complexity theory)
- Led discussion on nonlinear optimization, dynamic programming and variational formulations, numerical methods, mixed-integer linear programming, and motion planning

Selected publications

- [1] **F. Rossi**, R. Iglesias, M. Alizadeh, and M. Pavone. “On the interaction between Autonomous Mobility-on-Demand systems and the power network: models and coordination algorithms”. In: *Proc. IEEE Conf. on Robotics and Automation*. Submitted. 2018.
- [2] **F. Rossi**, R. Zhang, Y. Hindy, and M. Pavone. “Routing autonomous vehicles in congested transportation networks: structural properties and coordination algorithms”. In: *Autonomous Robots* (2017). Submitted.
- [3] **F. Rossi** and M. Pavone. “On the Fundamental Limitations of Performance for Distributed Decision-Making in Robotic Networks”. In: *Proc. IEEE Conf. on Decision and Control*. 2014.

A full list of publications is available at <http://www.federico.io>

Technical skills

Programming languages and software

MATLAB; Python; C++; ROS; Simulink; QGIS;