

PROFILE

Alan Turing Fellow - Researcher Associate at University of Edinburgh.
Strong background in numerical optimization and control, and significant hands-on experience on legged robots.

RESEARCH INTERESTS

Robotics motion planning and control, legged robotics, and rigid-body dynamics.
Artificial Intelligence model predictive control, numerical optimization, and machine learning.

EDUCATION

Ph.D. in Bioengineering and Robotics January 2014 - April 2017
Istituto Italiano di Tecnologia & Università degli Studi di Genova.

- Thesis: [Planning and Execution of Dynamic Whole-Body Locomotion on Challenging Terrain](#).
- Advisor: Dr. Ioannis Havoutis, Dr. Claudio Semini and Prof. Darwin G. Caldwell

M.Sc. in Mechatronic Engineering GPA 4.85/5 September 2009 - June 2013
Mechatronic Group at Simón Bolívar University, Venezuela (2-year program)

- Thesis: [Learning from Demonstration using Dynamic Movement Primitives in Excavator Robots](#) (Outstanding Mention).
- Advisor: Prof. Gerardo Fernández-López

WORK EXPERIENCE

University of Edinburgh - Alan Turing Institute
Research Associate

October 2019 - to date

- Direct-indirect hybridization of differential dynamic programming algorithms.
- Model predictive control on legged robots.
- Project manager of Crocoddyl team (EU MEMMO partners).
- Learning gait policies in legged locomotion.
- Working on EU MEMMO and ORCA projects.

LAAS - CNRS**Postdoc Researcher**

November 2017 - October 2019

- Highly efficient multi-contact optimal control.
- Learning a memory of motion to warm-start optimal control solvers.
- Fastest multi-contact optimal control library called [Crocoddyl](#).
- Whole-body control using passivity paradigm.
- Working on EU MEMMO project.

Istituto Italiano di Tecnologia**Research Fellow**

January 2014 - November 2017

- Simultaneous gait and motion planning through mixed-integer optimization.
- Footstep and motion planning through stochastic search.
- Framework for quadrupedal locomotion on challenging terrain.
- Software architecture designer for perception, planning and control on the HyQ team.
- Mechatronic support on robot design.

Simon Bolivar University**Lecturer**

April 2012 - March 2014

- Teaching control system for undergraduate students.
- Developing of a general purpose software for Model Predictive Control.

SKILLS	Robotics and Computer Science	
	<ul style="list-style-type: none"> • Motion planning, trajectory optimization and optimal control. • Numerical optimization: nonlinear, stochastic, convex and mixed-integer optimization. • Whole-body control, rigid-body dynamics and torque control. • Machine learning, robot learning and reinforcement learning. • State estimation, terrain mapping and computer vision. 	
	Mechatronics and Software	
	<ul style="list-style-type: none"> • C++, Python and Matlab (more than 10 years of experience). • Robot middle-wares (ROS, LCM, YARP) and real-time systems (Xenomai). • Open-source (Boost, OpenCV, PCL, Octomap, Pinocchio, Gazebo, and Bullet). • Revision control tools (GIT, SVN and HG). • Linux and OSX development environment. 	
	Soft-skills	
	<ul style="list-style-type: none"> • Self-motivation, self-confidence, optimism and divergent thinking. • Questioning, introspection and organization. • Open to feedback, idea exchange and persuasion. • Mentoring, public speaking and humour. 	
LANGUAGES	English (fluent), Spanish (native), Italian (fluent), French (beginner)	
ACADEMIC VISITS	Visiting researcher Agile and Dexterous Robotics Lab (ADRL), ETH Zurich, Switzerland.	2016
INVITED TALKS	RSS'19 workshop Workshop on Numerical optimization for Online Multi-Contact Motion Planning and Control, Freiburg, Germany	June 22nd 2019
	<ul style="list-style-type: none"> • <u>Title</u>: Highly dynamic maneuvers computed by feasible-prone DDP. 	
	Oxford Research Institute University of Oxford, Oxford, UK	December 1st 2017
	<ul style="list-style-type: none"> • <u>Title</u>: Motion planning for legged locomotion on challenging terrain. 	
	Gepetto Team LAAS, CNRS, Toulouse, France	April 28th 2017
	<ul style="list-style-type: none"> • <u>Title</u>: Planning and execution of dynamic whole-body locomotion on challenging terrain. 	
AWARDS	<ul style="list-style-type: none"> • Master thesis with Outstanding Mention. Simón Bolívar University. 2013. 	

PUBLICATIONS

- [1] **C. Mastalli**, I. Havoutis, M. Focchi, D. G. Caldwell and C. Semini, [Motion Planning for Quadrupedal Locomotion: Coupled Planning, Terrain Mapping and Whole-Body Control](#). IEEE Transactions on Robotics (T-RO), 2020.
- [2] **C. Mastalli**, R. Budhiraja, W. Merkt, G. Saurel, B. Hammoud, M. Naveau, J. Carpentier, S. Vijayakumar and N. Mansard, [Crocoddyl: An Efficient and Versatile Framework for Multi-Contact Optimal Control](#). IEEE International Conference on Robotics and Automation (ICRA), 2020.
- [3] T.S. Tembono, **C. Mastalli**, P. Fernbach, N. Mansard and S. Calinon, [Learning How to Walk: Warm-starting Optimal Control Solver with Memory of Motion](#). International Conference on Robotics and Automation (ICRA), 2020.
- [4] K. Giraud, P. Fernbach, **C. Mastalli** and O. Stasse, [Motion Planning with Multi-Contact and Visual Servoing on Humanoid Robots](#). International Symposium on System Integration (SII), 2020.
- [5] **C. Mastalli***, S Fahmi*, M. Focchi, C. Semini, [Passivity Based Whole-body Control for Quadruped Robots: Experimental Validation over Challenging Terrain](#). IEEE Robotics and Automation Letters (RAL), 2018.
- [6] R. Budhijara, J. Carpentier, **C. Mastalli**, N. Mansard, [Differential Dynamic Programming for Multi-Phase Rigid Contact Dynamics](#). IEEE International Conference on Humanoid Robots (ICHR), 2018.
- [7] M. Focchi, R. Orsolino, V. Barasuol, **C. Mastalli**, D. G. Caldwell and C. Semini, [Heuristic Planning for Rough Terrain Locomotion in Presence of External Disturbances and Variable Perception Quality](#). Springer Tracts in Advanced Robotics (STAR), 2018.
- [8] **C. Mastalli**, M. Focchi, I. Havoutis, Buchli, Jonas D. G. Caldwell and C. Semini, [Trajectory and Foothold Optimization using Low-Dimensional Models for Rough Terrain Locomotion](#). IEEE International Conference on Robotics and Automation (ICRA), 2017.
- [9] B. Aceituno-Cabezas, **C. Mastalli**, H. Dai, M. Focchi, A. Radulescu, D. G. Caldwell, J. Cappelletto, J. C. Grieco, G. Fernandez-Lopez and C. Semini, [Simultaneous Contact, Gait and Motion Planning for Robust Multi-Legged Locomotion via Mixed-Integer Convex Optimization](#). IEEE Robotics and Automation Letters (RAL), 2017.
- [10] R. Orsolino, M. Focchi, **C. Mastalli**, H. Dai, D. G. Caldwell, and C. Semini, [Application of Wrench based Feasibility Analysis to the Online Trajectory Optimization of Legged Robots](#). IEEE Robotics and Automation Letters (RAL), 2018.
- [11] **C. Mastalli**, I. Havoutis, M. Focchi, D. G. Caldwell and C. Semini, [Hierarchical Planning of Dynamic Movements without Scheduled Contact Sequences](#). IEEE International Conference on Robotics and Automation (ICRA), 2016.
- [12] **C. Mastalli**, I. Havoutis, A. W. Winkler, D. G. Caldwell and C. Semini, [On-line and On-board Planning and Perception for Quadrupedal Locomotion](#). IEEE International Conference on Technologies for Practical Robot Applications (TEPRA), 2015.
- [13] A. W. Winkler, **C. Mastalli**, I. Havoutis, M. Focchi, D. G. Caldwell and C. Semini, [Planning and Execution of Dynamic Whole-Body Locomotion for](#)

a Hydraulic Quadruped Robot on Challenging Terrain. IEEE International Conference on Robotics and Automation (ICRA), 2015.

- [14] **C. Mastalli** and G. Fernandez-Lopez, [A Proposed Architecture for Autonomous Operations in Backhoe Machines](#). International Conference on Intelligent Autonomous Systems (IAS), 2015.
- [15] R. Jamisola and **C. Mastalli**, [Bio-inspired holistic control through modular relative Jacobian for combined four-arm robots](#). International Conference on Advanced Robotics (ICAR), 2017.
- [16] N. Certad, **C. Mastalli**, J. Cappelletto and J. C. Grieco, [Extracting Points Features from Laser Rangefinder Data Based on Hough Transform](#). IEEE Andean Regional Conference (ANDESCON), 2014.
- [17] **C. Mastalli**, D. Ralev, N. Certad and G. Fernández-López, [Asymptotic Stability Method for PID Controller Tuning in a Backhoe Machine](#). Dynamic and System Conference, 2013.
- [18] **C. Mastalli**, J. Cappelletto, R. Acuña, A. Terrones and G. Fernández-López, [An Imitation Learning Approach for Truck-Loading Operations in Backhoe Machines](#). International Conference on Climbing and Walking Robots and The Support Technologies for Mobile Machines (CLAWAR), 2012.

**PEER-REVIEW
ACTIVITIES**

T-RO, TMECH, RA-L, ICRA, IROS, Humanoids, ASME Dynamic and System Conference.

**WORKSHOP
ORG.**

Robotics: Science and Systems 2019

R. Orsolino, **C. Mastalli**, M. Focchi and N. Mansard. [Workshop on Numerical optimization for Online Multi-Contact Motion Planning and Control](#)