

PROFILE	Researcher at Gepetto Team, LAAS-CNRS. Strong background in optimization and control, and significant hands-on experience on torque-controlled legged robots.
RESEARCH INTERESTS	<p>Robotics multi-contact planning and control, legged locomotion and perception for motion planning and control (results on legged locomotion).</p> <p>Artificial Intelligence optimal control, trajectory optimization, and machine learning. (watch this couple of videos (results of optimal control solvers)).</p>
EDUCATION	<p>Ph.D. in Bioengineering and Robotics January 2014 - April 2017 Istituto Italiano di Tecnologia & Università degli Studi di Genova.</p> <ul style="list-style-type: none"> ■ Thesis: Planning and Execution of Dynamic Whole-Body Locomotion on Challenging Terrain. ■ Advisor: Dr. Ioannis Havoutis, Dr. Claudio Semini and Prof. Darwin G. Caldwell <p>M.Sc. in Mechatronic Engineering GPA 4.85/5 September 2009 - June 2013 Mechatronic Group at Simón Bolívar University, Venezuela (2-year program)</p> <ul style="list-style-type: none"> ■ Thesis: Learning from Demonstration using Dynamic Movement Primitives in Excavator Robots (Outstanding Mention). ■ Advisor: Prof. Gerardo Fernández-López <p>B.Sc. in Mechanical Engineering GPA 7.49/9 September 2003 - December 2008 Antonio José de Sucre National Experimental Polytechnic University, Venezuela, (5-year program) Graduated rank 1st/34. Acknowledgements as the best internship thesis.</p>
WORK EXPERIENCE	<p>LAAS - CNRS</p> <p>Postdoc Researcher November 2017 - to date</p> <ul style="list-style-type: none"> • Efficient differential dynamic programming algorithm for multi-contact motion control in humanoid robots [3]. • Using memory of motion for real-time multi-contact motion control. • Force feedback in optimal control [2]. <p>Istituto Italiano di Tecnologia</p> <p>Research Fellow January 2014 - November 2017</p> <ul style="list-style-type: none"> • Novel motion planning and control methods for legged locomotion on challenging terrain [1,5-10]. • Envisioning the software framework for perception, planning and control for quadrupedal robots [1]. • Developing of a software toolbox (called DWL) for easy prototyping (c++ with Python bindings) optimization, robotics, planning, control and visualization. <p>Simon Bolivar University</p> <p>Lecturer April 2012 - March 2014</p> <ul style="list-style-type: none"> • Teaching control system for undergraduate students. • Developing of a general purpose software for Model Predictive Control.

Academic Assistant

September 2009 - April 2012

- Teaching and preparation activities in control system lab for undergraduate engineering students.
- A learning from demonstration approach for backhoe operations [11,14-15].

Industrias Climáticas**Design Engineer**

March 2009 – September 2009

- Designing of air-conditioned machines, e.g. evaporative, condenser, compact and chillers units.

SKILLS**Robotics and Computer Science**

- Motion planning, trajectory optimization and optimal control.
- Whole-body control, rigid-body dynamics and torque-control.
- Non-linear, stochastic, convex and mixed-integer optimization.
- Supervised learning, learning from demonstration and reinforcement learning.
- State estimation, terrain mapping and computer vision.

Mechatronics and Software

- Hydraulic and pneumatic systems, mechanical design.
- Signal processing, digital electronics, IO, and computer architecture.
- C++, Python and Matlab (more than 8 years of experience).
- Robot middle-wares (ROS, LCM, YARP) and real-time systems (Xenomai).
- Open-source (OpenCV, PCL, Octomap, Pinocchio, Gazebo, Bullet, etc).
- Revision control tools (GIT, SVN and HG).
- CAD tools (SolidWorks, Inventor, AutoCAD, MSC Nastran, ANSYS)
- Linux and OSX development environment.

Soft-skills

- 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 (basic)

**PROJECT
PORTFOLIO****Dynamic legged locomotion**

2014 - 2017

- Motion planning for legged locomotion on challenging terrain.
- Terrain mapping for legged motion planning and control.

Software framework for locomotion

2014 - 2018

- Envisioned DLS lab software framework: simulation, control, planning, perception and communication.
- Legged locomotion toolbox: “[Dynamic Whole-body Locomotion \(DWL\)](#)” library.
- Real-time control interface with ROS and Xenomai.
- Visualization tools (e.g. [whole-body state plugin](#)).

MPC for robotics

2013

- [Contact Robot Control by Differential DYnamic programming Library \(Cro-coddyl\)](#) (read this article).
- Open-source library for Model Predictive Control (MPC) over ROS.

Autonomous backhoe machines

2010 - 2012

- Learning from Demonstration for autonomous execution of backhoe tasks.
- Control and state estimator.
- 3D terrain mapping and perception.

	Design a waste compactor machine <ul style="list-style-type: none"> ■ Mechanical and hydraulic circuit design. ■ Machine automation. 	2008
ACADEMIC VISITS	Visiting researcher Agile and Dexterous Robotics Lab (ADRL), ETH Zurich, Switzerland.	2016
INVITED TALKS	Oxford Research Institute University of Oxford, Oxford, UK <ul style="list-style-type: none"> ■ <u>Title</u>: Motion planning for legged locomotion on challenging terrain. Gepetto Team LAAS, CNRS, Toulouse, France <ul style="list-style-type: none"> ■ <u>Title</u>: Planning and execution of dynamic whole-body locomotion on challenging terrain. 	December 1st 2017 April 28th 2017
AWARDS	<ul style="list-style-type: none"> ■ Master thesis with Outstanding Mention. Simón Bolívar University. 2013. ■ Best internship thesis. Antonio José de Sucre National Experimental Polytechnic University. 2008. 	
PEER-REVIEW ACTIVITIES	TMECH, RAL, ICRA, IROS, Humanoids, ASME Dynamic and System Conference.	
PUBLICATIONS	<ol style="list-style-type: none"> [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. (under-review). [2] S Fahmi*, C. Mastalli*, M. Focchi, C. Semini, Passivity Based Whole-body Control for Quadruped Robots: Experimental Validation over Challenging Terrain. IEEE Robotics and Automation Letters (RAL), 2018. [3] 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. [4] 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. [5] 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. [6] 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. [7] 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. 	

- [8] **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.
- [9] **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 (TE-PRA), 2015.
- [10] 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.
- [11] **C. Mastalli** and G. Fernandez-Lopez, [A Proposed Architecture for Autonomous Operations in Backhoe Machines](#). International Conference on Intelligent Autonomous Systems (IAS), 2015.
- [12] 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.
- [13] 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.
- [14] **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.
- [15] **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.

EXTRA-CURRICULAR ACTIVITIES

- Member of the international group SGAC-Latin “Latin Space Generation” attached to a program of the United Nations UN (since 2008 until 2012).
- Founder and Head of Technical of the F-SAE Group of Antonio José de Sucre National Experimental Polytechnic University UNEXPO (since 2007 until 2008).