



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

**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 Nastram, 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

- 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** 2008
- Mechanical and hydraulic circuit design.
  - Machine automation.
- ACADEMIC VISITS** **Visiting researcher** 2016  
Agile and Dexterous Robotics Lab (ADRL), ETH Zurich, Switzerland.
- INVITED TALKS** **Oxford Research Institute** December 1st 2017  
University of Oxford, Oxford, UK
- Title: Motion planning for legged locomotion on challenging terrain.
- Gepetto Team** April 28th 2017  
LAAS, CNRS, Toulouse, France
- Title: Planning and execution of dynamic whole-body locomotion on challenging terrain.
- AWARDS**
- 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**
- [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 Quadrupedal Locomotion on Challenging Terrains. (under-review).
  - [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, *Online 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).