Maria Bauza Villalonga
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Research interests and vision

My research focuses on making robots capable of solving many tasks without compromising on their performance and reliability. I develop algorithms that learn general probabilistic models for perception and interaction. This results in robots that can accurately manipulate their environment and thrive in diverse task requirements.

Education

2016–present **Massachusetts Institute of Technology (MIT)**, *Cambridge*, United States.

- PhD student at the Mechanical Engineering department of MIT. GPA: 5.0.
- Advisor: Prof. Alberto Rodriguez.

2015–2016 **Massachusetts Institute of Technology (MIT)**, *Cambridge*, United States.

- Visiting student at the MCube Lab supervised by Prof. Alberto Rodriguez.

2011–2016 **Polytechnic University of Catalonia (UPC)**, *Barcelona*, Spain.

- Dual Bachelors in **Mathematics** and **Engineering Physics**/

Fellowships

2018 **Facebook Emerging Scholar Award**. Full funding for 2 years, only 21 awardees among more than 900 applications.

2018 **NVIDIA Graduate Fellowship**. Awarded to 10 PhD students from more than 230 applications. Declined in favour of Facebook Award.

2016 **"La Caixa" Graduate Fellowship**. Recipient of 1 out of the 45 prestigious "La Caixa" scholarships for graduate studies across all Spain. Full funding for 2 years in any graduate program of my choosing.

2012 **CFIS Fellowship**. Awarded to only 40 of the top technical students from Spain to simultaneously study two bachelor's degrees.

Work Experience

Summer 2016 **Google Zurich** intern at the SafeSearch team.
Software engineer for three months. Research and implementation of deep learning algorithms for a large-scale computer vision problem.

Selected Awards

2021 **Rising Stars in Computer Science.** Awarded to 89 graduate and postdoctoral women worldwide in EECS disciplines.

2021 **RSS pioneers** Selected to attend the 2021 RSS Pioneers Workshop which brings together a cohort of the world's top early-career researchers in robotics.

2021 **Best Paper Finalist Award** on Service Robotics at ICRA 2021 for the work "Real-time shape and pose estimation from planar pushing using implicit surfaces".

2019 **Rising Stars in Mechanical Engineering.** Awarded to 30 graduate and postdoctoral women worldwide doing research any area related to Mechanical Engineering.

2018 **Best Paper Award on Cognitive Robotics** at IROS 2018 for the work "Augmenting Physical Simulators with Stochastic Neural Networks: Case Study of Planar Pushing and Bouncing".

2018 Amazon Robotics **Best Systems Paper Award** for the submission "Robotic pick-and-place of novel objects in clutter with multi-affordance grasping and cross-domain image matching".

2017 **1st Place Winners** (Stow Task) at the international competition **Amazon Robotics Challenge** (ARC) 2017 with the MIT-Princeton team.

2016 **Best Paper Finalist Award** at IROS 2016 for the work "More than a Million Ways to Be Pushed. A High-Fidelity Experimental Data Set of Planar Pushing".

Peer-reviewed Publications

[16] F. Alet, **M. Bauza**, K. Kawaguchi, N. Kuru, T. Lozano-Perez, L. Kaelbling. "Tailoring: Encoding Inductive Biases by Optimizing Unsupervised Objectives at Prediction Time", *NeurIPS 2021*.

[15] S. Suresh, **M. Bauza**, A. Rodriguez, J. Mangelson, M. Kaess."Real-time shape and pose estimation from planar pushing using implicit surfaces", *ICRA 2021*.

[14] **M. Bauza**, E. Valls, B. Lim, T. Sechopoulos, A. Rodriguez. "Tactile Object Pose Estimation from the First Touch with Geometric Contact Rendering", *CoRL 2020*.

[13] A. Kloss, **M. Bauza**, J. Wu, J. Tenenbaum, A. Rodriguez, J. Bohg. "Accurate Vision-based Manipulation through Contact Reasoning", *ICRA 2020*.

[12] Y. Lin, **M. Bauza**, P. Isola. "Experience-Embedded Visual Foresight", *CoRL 2019*.

[11] F. Alet, A. Jeewajee, **M. Bauza**, A. Rodriguez, T. Lozano-Perez, L. Kaelbling. "Graph Element Networks: adaptive, structured computation and memory", *ICML 2019*.

[10] **M. Bauza**, O. Canal, A. Rodriguez, "Tactile Mapping and Localization from High-Resolution Tactile Imprints", *ICRA 2019*.

[9] **M. Bauza**, F. Alet, Y. Lin, T. Lozano-Perez, L. Kaelbling, P. Isola, A. Rodriguez. "Omnipush: accurate, diverse, real-world dataset of pushing dynamics with RGB-D video", *IROS 2019*.

[8] A. Ajay, **M. Bauza**, J. Wu, N. Fazeli, J. Tenenbaum, A. Rodriguez, L. Kaelbling et. al. . "Combining Physical Simulators and Object-Based Networks for Control", *ICRA 2019*.

[7] **M. Bauza**, A. Rodriguez. "GP-SUM. Gaussian Processes Filtering of non-Gaussian Beliefs", *WAFR 2018*.

[6] **M. Bauza***, F. Hogan*, A. Rodriguez. "Learning vs. physics-based control of a planar push system", *CoRL 2018*.

[5] **M. Bauza***, F. Hogan*, A. Rodriguez. "Tactile Regrasp: Grasp Adjustments via Simulated Tactile Transformations", *IROS 2018*.

[4] A. Ajay, J. Wu, N. Fazeli, **M.Bauza**, L. Kaelbling, J. Tenenbaum, A. Rodriguez. "Augmenting Physical Simulators with Stochastic Neural Networks: Case Study of Planar Pushing and Bouncing", *IROS 2018*.

[3] A Zeng, S Song, K. Yu, E. Donlon, F. Hogan, **M. Bauza**, et. al. "Active Perception of Novel Objects in Clutter with Multi-Affordance Grasping and Cross-Domain Image Matching" in *ICRA 2018, IJRR 2019*.

[2] **M. Bauza**, A. Rodriguez. "A Probabilistic Data-Driven Model for Planar Pushing", in *ICRA 2017*.

[1] K. Yu, **M. Bauza**, N. Fazeli, and A. Rodriguez. "More than a Million Ways to Be Pushed. A High-Fidelity Experimental Data Set of Planar Pushing," in *IROS 2016*.

Talks

2021 Invited talk at Washington University robotics colloquium.

2021 Invited talk at Stanford.

2021 Invited talk at CMU Manipulation Discussion Group (first external speaker).

2021 Invited talk at Cornell Robotic Seminar.

2021 Invited talk at University of Toronto, AI in Robotics Seminar.

2020 Invited talk at University of Pennsylvania, Grasp Seminar.

2020 Selected talk at SITN (Science In The News). Science talks organized by Harvard for the general public. Machine learning in Robotics: current progress and challenges ahead.

2019 Invited talk at Tec de Monterrey (Mexico).

2019 Selected presentation at the MIT College of Computing Launch.

2019 Selected talk at the ML across MIT retreat.

2018 Invited talk at IROS2018 Workshop on RoboTac: Tactile Perception and Learning in Robotics.

Advising

PhD and Master students

Antonia Bronars: implementation, development, and testing of tactile localization solutions.

Bryan Lim: implementation of a grasping pipeline in simulation and on a real system.

Undergraduate students

Shreya Skarpoor: active 3D mesh reconstruction for object manipulation.

Claudia Lozano: application of machine learning methods to process tactile information.

Meenakshi Singh: simulation of a dual-arm in Pybullet with visuo-tactile sensing.

Eric Valls: implementation and development of tactile localization methods.

Max Thomsen: learning graph neural networks to optimize the shape of robotic fingers.

Oleguer Canals: implementation and testing of tactile algorithms for grasping and localization.

Jasmine Zeng: implementation of tactile sensing in a MuJoCo multi-fingered hand.

Theo Sechopoulos: implementation and comparison of registration techniques for tactile data.

Ashay Athalye: object tracking from RGB-D by extending a single-pose estimation algorithm.

Service

2020,2021 Guest lecturer at MIT graduate course *Touching and Grasping with Soft Fingers* led by professor Ted Adelson.

2020 Program committee member of CoRL 2020

2020 Co-organized the workshop at ICRA 2020 Uncertainty in Contact-Rich Interactions (canceled due to CoVID19).

2019 Organized and lead a hands-on robotic activity for the Women's Technology Program in Mechanical Engineering.

2017 Co-organized the workshop at RSS 2017 on Data-Driven Robotic Manipulation.

2016-present Reviewer of journals: TRO, IJRR, RA-L

2016-present Reviewer of conferences: RSS, CoRL, ICRA, IROS

2011-2016 Class representative

Press Coverage and Outreach

2021 TechXplore. A technique that allows robots to estimate the pose of objects by touching them

2021 La Vanguardia (spanish newspaper). Sensitive Robots

2019 MIT news article. Pushy robots learn the fundamentals of object manipulation.

2019 ElMundo (spanish newspaper). Una mano robotica inteligente.

2019 El Iris (spanish newspaper, front page). Una ciutadellenca en el camp de la intelligencia artificial.

2018 MIT News Front page. Teaching robots how to move objects.

2018 Invited talk for broad audience (100+ attendees). First summer talk at Mercadal: Maria Bauza.

2018 MIT MechEConnects. Student Spotlight: Maria Bauza, PhD Candidate.

2018 MIT News Front page. Robo-picker grasps and packs.

2018 ExpressNews (spanish version). Maria Bauza, a spanish woman who makes history.

2018 La Vanguardia (spanish newspaper). MIT: the science paradise.

Other Awards

2019 Selected to attend **Path of professorship**. Awarded to distinguished MIT graduate students.

2019 Selected to attend the **Global Young Scientists Summit**. Awarded to no more than 5 PhD students throughout all MIT departments.

2019 **DeFlorez Travel Award in Design and Manufacturing.** Awarded to 1 MIT Mechanical Engineering Graduate Student annually.

2018 Travel Award to attend RSS 2018. The award is founded by the Women in Robotics Workshop.

2018 **Best Poster Award** at ICRA 2018 workshop on Active touch for perception and interaction.

2016 3rd Place at the 2016 Amazon Robotics Challenge with the MIT-Princeton team.

2016 IROS 2016 NSF Travel Grant.

2015 UPC-Internship Program Grant to do research during one year at MIT.

2015 Google Grace Hopper Travel Award to attend the conference with all expenses paid.

2009&2011 4th and 6th position at the regional math tests: Kangourou sans frontieres.