Juan Camilo Gamboa Higuera

Computer Vision and Robotics Engineer
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Research Interests

Vision-based navigation. Multi-object tracking. 3D computer vision and computer graphics. Learning motor control. Imitation learning from state observations. Learning from low fidelity domains for simulation-to-robot transfer. Bayesian methods in robotics.

Professional Experience

2022–present	**Machine Learning Scientist**, *Haiper.ai*
	Research on photogrammetry techniques (e.g. Neural Radiance Fields) to produce 3D models from a small set of pictures.
2020–2022	**Machine Learning Researcher**, *SPORTLOGiQ Inc.*
	Research on simulation of sporting events for motion, event and outcome predictions.
2019	**Robotics Research Intern**, *Samsung Research AI Center - Montreal*
	Learning navigation policies for home robots.
2016–2019	**Computer Vision Researcher**, *SPORTLOGiQ Inc.*
	Automated camera calibration and tracking algorithm using self-supervised learning and convolutional neural networks. Data association algorithms for real-time tracking with multiple cameras.
2015	**Computer Vision Research Intern**, *SPORTLOGiQ Inc.*
	Designed an algorithm for automated camera calibration using synthetic templates
2009	**Software Engineer**, *Unisys Colombia*
	Optimized front-end code for low bandwidth channels for a web-based banking system.

Education

2013–2019	**Ph.D. Candidate *Not finished*** in Computer Science, *McGill University*
	Thesis: Learning robot locomotion controllers using low fidelity models
	Advisors: Gregory Dudek and David Meger
	Thesis committee: Joelle Pineau, Doina Precup and Frank Ferrie
2010–2012	**M.Sc.** Computer Science, *McGill University*
	Thesis: Fair subdivision of multi-robot tasks
	Advisor: Gregory Dudek
2005–2009	**B.Eng.** Systems and Computer Engineering, *Universidad de los Andes (Colombia)*
2003–2007	**B.Eng.** Electronics Engineering, *Universidad de los Andes (Colombia)*

Publications

Refereed Conference Papers

2022	Shi, F., Marchwica, P., Gamboa Higuera, J. C., Jamieson, M., Javan, M., and Siva, P. (2022). Self-supervised shape alignment for sports field registration. In *Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision*, pages 287–296
2021	Höfer, S., Bekris, K., Handa, A., Gamboa Higuera, J. C., Golemo, F., Mozifian, M., Atkeson, C., Fox, D., Goldberg, K., Leonard, J., Liu, C. K., Peters, J., Song, S., Welinder, P., and Whit, M. (2021). "sim2real in robotics and automation: Applications and challenges". In *IEEE Transactions on Automation Science and Engineering*
2020	Manderson, T., Gamboa Higuera, J. C., Wapnick, S., Tremblay, J.-F., Meger, D., and Dudek, G. (2020). Vision-based goal-conditioned policies for underwater navigation in the presence of obstacles. In *Proceedings of Robotics: Science and Systems (R:SS '20)*
2020	Koreitem, K., Shkurti, F., Manderson, T., Chang, W.-D., Gamboa Higuera, J. C., and Dudek, G. (2020). One-shot informed robotic visual search in the wild. In *2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS '20)*

2020	Mozifian, M., Gamboa Higuera, J. C., Meger, D., and Dudek, G. (2020). Learning domain randomization distributions for training robust locomotion policies. In 2020 *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS '20)*
2019	Jiang, W., Gamboa Higuera, J. C., Angles, B., Sun, W., Javan, M., and Yi, K. M. (2020). Optimizing through learned errors for accurate sports field registration. In *The IEEE Winter Conference on Applications of Computer Vision (WACV '20)*
2019	Thakur, S., van Hoof, H., Gamboa Higuera, J. C., Precup, D., and Meger, D. (2019). Uncertainty aware learning from demonstrations in multiple contexts using bayesian neural networks. In *IEEE International Conference on Robotics and Automation (ICRA '19)*
2018	Gamboa Higuera, J. C., Meger, D., and Dudek, G. (2018). Synthesizing neural network controllers with probabilistic model based reinforcement learning. In *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS '18)*
2018	Manderson, T., Gamboa Higuera, J., Cheng, R., and Dudek, G. (2018). Vision-based autonomous underwater swimming in dense coral for combined collision avoidance and target selection. In *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS '18)*
2017	Gamboa Higuera, J. C., Meger, D., and Dudek, G. (2017a). Adapting Learned Robotics Behaviours through Policy Adjustments. In *IEEE International Conference on Robotics and Automation (ICRA '17)*
2017	Shkurti, F., Chang, W.-D., Henderson, P., Islam, M. J., Gamboa Higuera, J. C., Li, J., Manderson, T., Xu, A., Dudek, G., and Sattar, J. (2017). Underwater multi-robot convoying using visual tracking by detection. In *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS '17)*
2015	Meger, D., Gamboa Higuera, J. C., Xu, A., Giguere, P., and Dudek, G. (2015). Learning legged swimming gaits from experience. In *IEEE International Conference on Robotics and Automation (ICRA '15)*
2014	Meghjani, M., Shkurti, F., Gamboa Higuera, J. C., Kalmbach, A., Whitney, D., and Dudek, G. (2014). Asymmetric rendezvous search at sea. In 2014 *Canadian Conference on Computer and Robot Vision (CRV '14)*, pages 175–180. IEEE
2013	Gamboa Higuera, J. C. and Dudek, G. (2013). Fair Subdivision of Multi-Robot Tasks. In *IEEE International Conference on Robotics and Automation (ICRA '13)*
2012	Shkurti, F., Xu, A., Meghjani, M., Gamboa Higuera, J. C., Girdhar, Y., Giguere, P., Dey, B. B., Li, J., Kalmbach, A., Prahacs, C., Turgeon, K., Rekleitis, I., and Dudek, G. (2012). Multi-Domain Monitoring of Marine Environments Using a Heterogeneous Robot Team. In *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS '12)*
2012	Gamboa Higuera, J. C., Xu, A., Shkurti, F., and Dudek, G. (2012). Socially-driven collective path planning for robot missions. In *Canadian Conference on Computer and Robot Vision (CRV '12)*

Workshop abstracts

2022	Chang, W.-D., Gamboa Higuera, J. C., Fujimoto, S., Meger, D., and Dudek, G. (2021). Il-flow: Imitation learning from observation using normalizing flows. In *4th Robot Learning Workshop: Self-Supervised and Lifelong Learning at NeurIPS 2021*
2020	Höfer, S., Bekris, K., Handa, A., Gamboa Higuera, J. C., Golemo, F., Mozifian, M., Atkeson, C., Fox, D., Goldberg, K., Leonard, J., Liu, C. K., Peters, J., Song, S., Welinder, P., and White, M. (2020). Perspectives on sim2real transfer for robotics: A summary of the r:ss 2020 workshop
2019	Mozifian, M., Gamboa Higuera, J. C., Meger, D., and Dudek, G. (2019). Learning domain randomization distributions for transfer of locomotion controllers. In *Workshop on Multi-Task and Lifelong Reinforcement Learning at ICML 2019*
2017	Gamboa Higuera, J. C., Meger, D., and Dudek, G. (2017b). Synthesizing neural network controllers with probabilistic model-based reinforcement learning. In *2nd Bayesian Deep Learning Workshop at NIPS 2017*

Seminars and Talks

12/2018	*Synthesizing Neural Network Controllers with Model-Based RL*. NSERC Canadian Robotics Network (NCRN) Workshop on Reinforcement Learning in the Real World Huawei, Montreal, Quebec, Canada.
11/2017	*Learning locomotion controllers with low-fidelity simulation.* Microsoft Research Dissertation Grant Workshop, Redmond, Washington, USA.
09/2017	*From simulation to the field: Learning to swim with the AQUA robot.* Robot Operating System Conference (ROSCon 2017), Vancouver, British Columbia, Canada.

Teaching Experience

2011–2016	**Teaching Assistant**, *McGill University*
	Teaching assistant for Introduction to Computer Science (Winter 2011, Winter 2012), Software Development (Fall 2011), Introduction to Computer Animation (Winter 2013), Theory of Computation (Fall 2014), and Artificial Intelligence (Winter, 2016)
Fall 2014	**Course Lecturer**, *McGill University*
	Instructor for Introduction to Programming.
Fall 2009	**Course Lecturer**, *San Martin University*
	Instructor for Applied Mathematics in Software Engineering. The subject for the term was an introduction to robotics.

Academic Service

Reviewer for IROS (2014, 2015, 2016, 2017, 2018, 2019, 2020), ICRA (2015, 2016, 2017, 2018, 2019, 2020), CoRL (2018, 2020, 2022), ICLR (2020), and NeurIPS (2021).
Program Committee member for the IROS 2019 Workshop on *Informed Scientific Sampling in Large-scale Outdoor Environments*.
General and Operations Chair for the NeurIPS 2019 *LatinX in AI Workshop.*
Co-organizer for the R:SS 2020 *2nd Workshop on Closing the Reality Gap in Sim2Real Transfer for Robotics*

Technical Skills

Programming Python, C, C++, MATLAB, LaTeX, HTML, JavaScript

Robotics and Computer Vision ROS, Gazebo, OpenCV, experience with a variety of robotics related hardware

Other Embedded systems, PCB design, 3D printing.

Awards

Microsoft Research Dissertation Grant (2017).

MITACS Accelerate for research on Computer Vision at SPORTLOGiQ Inc. (2015)

Hydro-Quebec Doctoral Scholarship in Science (2013-2016).

McGill Graduate Research Mobility Award for research on marine robotics at Memorial University, under guidance of Dr. Ralf Bachmayer (2013).

McGill Graduate Excellence Award in Computer Science (2012-2013).

McGill Provost's Graduate Fellowship (2010).

Other

Native Spanish speaker. Proficient in English and French. Certified open water diver. I enjoy cycling, skateboarding and playing the ukulele. Full list of references available upon request.