Guillaume SARTORETTI

Assistant Professor, National University of Singapore, Mechanical Engineering Dpt. (2019-)

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Education

June 2018 – June 2019	**Manufacturing Futures Initiative (MFI) Postdoctoral Fellow, Robotics Institute, CMU** Project Title: *Distributed Learning for large-scale multi-robot path planning in complex environments.* Advisor: Prof. Howie Choset.
June 2016 – June 2018	**Postdoctoral Fellow, Robotics Institute, Carnegie Mellon University** Advisor: Prof. Howie Choset.
April 2016	**PhD in *Robotics, Control and Intelligent Systems*, EPFL, Switzerland** Title: *Control of Agent Swarms in Random Environments* Advisor: Prof. Max-Olivier Hongler.
March 2012	**Master of Science in Mathematics and Computer Science, University of Geneva.**
June 2010	**Bachelor of Science in Mathematics and Computer Science, University of Geneva.**

Professional and Teaching Experience

2019 - Current	**Lecturer Activities, Mechanical Engineering Department, NUS.** ▪ "Microprocessor applications", ME3241, (Bachelor, 3rd year). ▪ "Deep learning for robotics", ME5406, (Master's level course). ▪ "Machine Vision", ME5405 (Master's level course).

Student Mentoring

Postgraduate students supervised to date

2021 – 2022	*CAO Yuhong, M.Eng, Multi-robot Exploration via Deep Reinforcement learning*
2021 – 2022	*HOU Tianxiang, M.Sc, DRL-based Robot Exploration of Unknown Environments*
2021 – 2022	*WAN Yi, M.Sc, Distributed RL for Pedestrian- and Vehicle-optimized Traffic Signal Control*
2021 – 2022	*LI Hainuo, M.Sc, RL for decentralized Adaptive Traffic Signal Control in Urban Networks*
2021 – 2022	*GAO Xinwei, M.Sc, Individual Voting for Combined Learning/Conventional based MAPF*
2021 – 2022	*FAN Haolin, M.Sc, Attention-based Network for 3D Adaptive Informative Path Planning*
2021 – 2022	*LU Yujie, M.Sc, Active-SLAM For Hexapod Robot Based On LiDAR*
2021 – 2022	*XIA Langmeng, M.Sc, Decentralized Attention-based Neural Network for the CVRP*
2020 - 2021	*WANG Yutong, M.Sc, Communication Learning for Multi-Agent Cooperation.*
2020 - 2021	*ZHANG Yifeng, M.Sc, dRL for Decentralized Traffic Management in Urban Environments.*
2020 - 2021	*WANG Yizhuo, M.Sc, Reinforcement Learning for Multi-Agent Search and Rescue.*

2020 - 2021	*ZHANG Xiaoyang, M.Sc, Visual/LiDAR-based SLAM on legged articulated robot.*
2020 - 2021	*HUANG Jiangeng, M.Sc, Multi-agent Search based on Distributed RL.*
2020 - 2021	*LI Aijia, M.Sc, Urban Traffic Management and Optimization for Pedestrians.*
2019 - 2020	*LUO Zhiyao, M.Sc, Deep Reinforcement Learning Based Multi-Agent Pathfinding.*
2019 - 2020	*DAI Weiheng, M.Sc, Multi-Agent Search based on distributed Deep RL.*
2019 - 2020	*XIA Yixuan, M.Sc, Obstacle Avoidance for A Legged Robot Based on FFT Control.*
2019 - 2020	*GE Sun, M.Sc, Bio-inspired Visual Servoing for a Legged Robot.*
2019 - 2020	*XING Yan, M.Sc, Model-based Dynamic Obstacle Avoidance on Inclined Surface.*

Grants and Awards

2022 - 2025	**Maritime Transformation Programme White Space Funding** Title: *Robotic Systems for Securing/Un-securing of Containers in Vessels.* Co-PIs: Profs. G. Chirikjian (PI), M. ANG, C M CHEW, H.ZHANG. Amount: S$ 4.8M.
2021 - 2026	**Project 3, Work Package 4 of "Cisco-NUS Corporate Laboratory" (Co-PI).** Title: *Scalable, Decentralized Urban Traffic Management for Autonomous Vehicles.* Co-PIs: Profs. Biplab Sidkar (PI), Marcelo ANG. Amount: S$ 650k.
2021 - 2022	**Seed Research Project, T-Lab@NUS (main PI).** Title: *Learning Based Approaches for Advanced Multi-Agent Search Problems.* Co-PIs: Dr. Jiawei CAO. Amount: S$ 60k.
2021 - 2024	**MOE Academic Research Fund (AcRF) Tier 1 FRC Research Grant (main PI).** Title: *Communication-Based AI Methods for Multi-Robot Decentralized Cooperation.* Amount: S$ 226,5k.
2020 - 2022	**Work Package 3 of "Urban Traffic Flow Smoothening Models" (Co-PI).** Title: *Traffic Light Control for Optimal Traffic Flow.* Co-PIs: Profs. Kien Ming Ng (PI), Marcelo ANG, and Gerard LENG. Amount: S$ 780k.
2020 - 2021	**Seed Research Project, T-Lab@NUS (main PI).** Title: *Scalable Decentralized Multi-Robot Search via Distributed RL.* Co-PIs: Drs. Swee Huat Rodney TEO and Jiawei CAO. Amount: S$ 60k.
2018 - 2019	**Manufacturing Futures Initiative (MFI) Postdoctoral Fellowship.** Title: *Distributed Learning for large-scale multi-robot path planning in complex environments.* Advisor: Prof. Howie Choset.
2018 - 2019	**Extreme Science and Engineering Discovery Environment (XSEDE)** Startup grant in the form of 2'500 additional hours of GPU computation at the PSC.

Invited Lectures, Seminars and Colloquia

20/05/2022	**Amazon Robotics, Boston, USA, Invited Seminar.**
27/09/2021	**ETHZ Autonomy Talk, 1h Invited Seminar (virtual), https://youtu.be/2Jts4uFbbBM**
02/12/2019	**National University of Singapore, Invited Seminar, Temasek Laboratory.**
06/11/2019	**Case Western Reserve University, Invited Seminar, Mechanical & Aerospace Eng. Dpt.**
09/19/2018	**Invited Seminar at the National Robotics Engineering Center (NREC).**

08/09/2018	**Tufts University, Invited Seminar, Computer Science Department.**
01/28/2016	**EPFL, Informal private presentation, DISAL laboratory.**
09/29/2015	**Drexel University, Private presentation, SAS and GRASP laboratories.**

Other Academic Activities

2022 - Current	**Section Editor for the "Multiple Mobile Robot Systems" section of Springer Nature's Encyclopedia of Robotics.**
2021 - Current	**Associate Editor for the IEEE International Conference on Robotic and Automation (ICRA), in the "Mechanism, Design, and Control" area.**
2021 - Current	**Senior Program Committee Member (SPC) for the International Joint Conference on Artificial Intelligence (IJCAI), the AAAI Conference on Artificial Intelligence, and the Conference on Robot Learning (CoRL).**
2021 - Current	**Associate Editor for the Intl. Symp. on Multi-Robot and Multi-Agent Systems (MRS).**
2020 - Current	**Associate Editor for IEEE RA-L (in the *Multiple and Distributed Systems* area).**
2019 - Current	**Guest Editor for Springer Nature Applied Sciences' topical collection on "Distributed Mobile Robotic Systems."**
2019 - Current	**Reviewer for *Science Robotics* (ScienceMag), JAAMAS (Springer), *SICOMP* (Sage), *Robotics and Automation Letters* (RA-L, IEEE), as well as various international conferences on robotics and AI (ICRA, IROS, WAFR, AAMAS, ECC, ACC, IJCAI, CASE).**
2018	**Session chair at the Int. Symp. on Distributed Autonomous Robotic Systems (DARS).**
2015	**Session chair at the *Inter. Symposium on Swarm Behavior and Bio-Inspired Robotics.***
2013	**Session chair at the *International Conference on Agents and Artificial Intelligence.***

Publications: Thesis and Refereed Book Chapters

2016	**PhD Thesis: G. Sartoretti** and M.-O. Hongler. *Control of Agent Swarms in Random Environments*. EPFL, Lausanne (CH).
2013	**G. Sartoretti** and M.-O. Hongler. Soft control of self-organized locally interacting Brownian planar agents. *Lecture Notes in Computer Science*, pp.45-52. Springer.
2012	**G. Sartoretti**, J.-L. Falcone, B. Chopard, and M. J. Gander. Decentralized method for traffic monitoring. *Lecture Notes in Computer Science*, pp.464-473. Springer.

Publications: Refereed Journal Papers

2022	Y. Wang, M. Damani, P. Wang, Y. Cao, and **G. Sartoretti**. Distributed Reinforcement Learning for Robot Teams: A Review. ***Conditionally Accepted*** *to Springer's Current Robotics Reports.*

2022	G. Sun and **G. Sartoretti**. Joint-Space CPG for Safe Foothold Planning and Body Pose Control during Locomotion and Climbing. *IEEE Robotics and Automation Letters.*
2022	B. Chong, Y. Ozkan-Aydin, J. Rieser, **G. Sartoretti**, et al. A general locomotion control framework for multi-legged locomotors. *Bioinspiration & Biomimetics.*
2022	S. Shaw, E. Wenzel, A. Walker, and **G. Sartoretti**. ForMIC: Foraging via Multiagent RL with Implicit Communication. *Robotics and Automation Letters (RA-L*), 7(2):4877-4884.
2021	*M*. Damani, Z. Luo, E. Wenzel, and **G. Sartoretti**. PRIMAL$_2$: Pathfinding via Reinforcement and Multiagent Imitation Learning - Lifelong. *IEEE RA-L*, 6(2):2666-2673.
2021	B. Chong, Y.O. Aydin, C. Gong, **G. Sartoretti**, Y. Wu, J.M. Rieser, H. Xing, P.E. Schiebel, J.W. Rankin, K.B. Michel, A. Nicieza, J.R. Hutchinson, D.I. Goldman and H. Choset. Coordination of lateral body bending and leg movements for sprawled posture quadrupedal locomotion. *The International Journal of Robotics Research*.
2020	B. Freed, **G. Sartoretti**, and H. Choset. Simultaneous policy and discrete communication learning for multi-agent cooperation. *IEEE RA-L*, 5(2):2498-2505.
2019	**G. Sartoretti**, W. Paivine, Y. Shi, Y. Wu, H. Choset. Distributed learning of decentralized control policies for articulated mobile robots. *Transactions in Robotics*, 35(5):1109-1122.
2019	**G. Sartoretti**, J. Kerr, Y. Shi, G. Wagner, T. K. S. Kumar, S. Koenig, H. Choset. PRIMAL: Pathfinding via Reinforcement and Imitation Multi-Agent Learning. *IEEE RA-L*, 4(3):2378-2385.
2016	**G. Sartoretti.** Leader-based versus soft control of multi-agent swarms. *Artificial Life and Robotics*, 21(3):302–307.
2016	**G. Sartoretti** and M.-O. Hongler. Interacting Brownian swarms: Analytical results. *Entropy*, 18, 27.
2014	**G. Sartoretti**, M.-O. Hongler, M. Elias de Oliveira, and F. Mondada. Decentralized self-selection of swarm trajectories: From dynamical system theory to robotic implementation. *Swarm Intelligence*, vol. 8(no. 4):329-351.
2013	**G. Sartoretti** and M.-O. Hongler. Self-organized mixed canonical-dissipative dynamics for Brownian planar agents. *Cybernetics and Physics*, 2(1):41-46.
2013	B. Barbieri, **G. Sartoretti**, J.-L. Falcone, B. Chopard, and M. J. Gander. Traffic prediction based on a local exchange of information. *Journal of Cellular Automata*, 8(5-6):429-441.

Publications: Refereed Conference Papers

2022	Q. Ge, **G. Sartoretti**, J. Duan, S. E. Li, Y. Yin, and S. Zheng. Distributed Model Predictive Control of Connected Multi-Vehicle Systems at Unsignalized Intersections. ***Submitted to*** *the IEEE International Conference on Unmanned Systems (ICUS 2022).*
2022	A. Rao, I. Abraham, **G. Sartoretti**, and H. Choset. Sparse Sensing in Ergodic Optimization. ***Submitted to*** *the International Symposium on Distributed Autonomous Robotic Systems (DARS 2022).*
2022	Y. Cao, Z. Sun, and **G. Sartoretti**. DAN: Decentralized Attention-based Neural Network for the MinMax Multiple Traveling Salesman Problem. ***Submitted to*** *the International Symposium on Distributed Autonomous Robotic Systems (DARS 2022).*

2022	S. Shaw and G. Sartoretti. Keyframe-based CPG for Stable Gait Design and Online Transitions in Legged Robots. ***Accepted for Presentation*** *at the IEEE Conference on Decision and Control (CDC 2022).*
2022	Y. Zhang, M. Damani, and **G. Sartoretti**. Multi-Agent Traffic Signal Control via Distributed RL with Spatial and Temporal Feature Extraction. *International Workshop on Agent-Based Modelling of Urban Systems (ABMUS) @ AAMAS.*
2022	H. Coffin, I. Abraham, **G. Sartoretti**, T. Dillstrom, and H. Choset. Multi-Agent Dynamic Ergodic Search with Low-Information Sensors. *International Conference on Robotics and Automation (ICRA), pages 11480-11486.*
2022	Y. Wang and **G. Sartoretti**. FCMNet: Full Communication Memory Net for Team-Level Cooperation in Multi-Agent Systems. *International Conference on Autonomous Agents and Multiagent Systems (AAMAS), pages 1355-1363.*
2021	F. Laurent, [18 authors omitted], **G. Sartoretti**, Z. Luo, M. Damani, N. Bhattacharya, S. Agarwal, A. Egli, E. Nygren, and S. Mohanty. Flatland competition 2020: MAPF and MARL for efficient train coordination on a grid world. *In NeurIPS 2020 Competition and Demonstration Track*, pp. 275-301.
2021	**G. Sartoretti**, A. Rao, and H. Choset. Spectral-based distributed Ergodic coverage for heterogeneous multi-agent search. *15th International Symposium on Distributed Autonomous Robotics Systems (DARS 2021)*. **Best Paper Award**.
2021	**G. Sartoretti**, T. Wang, G. Chuang, Q. Li, and H. Choset. Autonomous decentralized shape-based navigation for snake robots in dense environments. *International Conference on Robotics and Automation (ICRA 2021)*.
2020	B. Freed, R. James, **G. Sartoretti**, and H. Choset. Sparse discrete communication learning for multi-agent cooperation through backpropagation. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2020).*
2020	B. Freed, **G. Sartoretti**, J. Hu, and H. Choset. Communication learning via backpropagation in discrete channels with unknown noise. *Proceedings of AAAI 2020 - 34th Conference on Artificial Intelligence*, pp.7160-7168.
2019	B. Chong, Y. Ozkan Aydin, **G. Sartoretti**, J. Rieser, C. Gong, H. Xing, H. Choset, and D. Goldman. A hierarchical geometric framework to design locomotive gaits for highly articulated robots. *Proceedings of Robotics: Science and Systems (RSS).*
2019	S. Shaw, **G. Sartoretti**, J. Olkin, W. Paivine, and H. Choset. Workspace CPG with body pose control for stable, directed vision during omni-directional locomotion. *International Conference on Robotics and Automation (ICRA) 2019*, pp.6316-6322.
2018	**G. Sartoretti**, Y. Wu, W. Paivine, T. K. Satish Kumar, S. Koenig, and H. Choset. Distributed reinforcement learning for multi-robot decentralized collective construction. *International Symposium on Distributed Autonomous Robotic Systems (DARS)*, pp.35-49.
2018	B. Chong, Y. Ozkan Aydin, C. Gong, **G. Sartoretti**, Y. Wu, J. Rieser, H. Xing, J. Rankin, K. Michel, A. Nicieza, J. Hutchinson, D. Goldman, and H. Choset. Coordination of back bending and leg movements for quadrupedal locomotion. *RSS 2018.*
2018	**G. Sartoretti**, Y. Shi, W. Paivine, M. Travers, and H. Choset. Distributed learning for the decentralized control of articulated mobile robots. *ICRA 2018*, pp.3789-3794.

2018	**G. Sartoretti**, S. Shaw, K. Lam, N. Fan, M. Travers, and H. Choset. Central pattern generator with inertial feedback for stable locomotion and climbing in unstructured terrain. *ICRA 2018*, pp.5769-5775.
2018	F. Ruscelli, **G. Sartoretti**, J. Nan, Z. Feng, M. Travers, and H. Choset. Proprioceptive-inertial autonomous locomotion for articulated robots. *ICRA 2018*, pp.3436-3441.
2016	**G. Sartoretti**, S. Shaw, and M. Ani Hsieh. Distributed planar manipulation in fluidic environments. *ICRA 2016*, pp.5322-5327.
2015	**G. Sartoretti**. Leader-based versus soft control of multi-agent swarms. *SWARM 2015 - International Symposium on Swarm Behavior and Bio-Inspired Robotics.*
2014	**G. Sartoretti**, M.-O. Hongler, and R. Filliger. The estimation problem and heterogenous swarms of autonomous agents. *SMTDA 2014 - Stochastic Modeling Techniques and Data Analysis International Conference*, volume 1.
2013	**G. Sartoretti** and M.-O. Hongler. Self-organized mixed canonic-dissipative dynamics for Brownian planar agents. *EUROCAST 2013 - International Conference on Computer Aided Systems Theory*, volume 1, pp.45-52.
2013	**G. Sartoretti** and M.-O. Hongler. Soft control of swarms: Analytical approach. *ICAART 2013 - Proceedings of the 5th International Conference on Agents and Artificial Intelligence*, volume 1, pp.147-153.
2012	**G. Sartoretti**, J.-L. Falcone, B. Chopard, M. J. Gander. Decentralized method for traffic monitoring. *ACRI 2012: Cellular Automata for Research and Industry*, Vol. 1, pp.464-73.

Languages

French	mother tongue	*Spanish*	oral comprehension
English	fluent	*Hungarian*	weak oral comprehension
German	good knowledge		

References for Guillaume Sartoretti

Available upon request.