# Makram Chahine | AI & Robotics doctoral student - MIT EECS

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## Education

**Massachusetts Institute of Technology** — **Cambridge MA, USA**
*PhD in Electrical Engineering and Computer Science,* — *2021–Present*
Artificial Intelligence, Robotics, Dynamical Systems.

**Georgia Institute of Technology** — **Atlanta GA, USA**
*Master's of Science in Aerospace Engineering,* — *2018–2019*
Control Theory, Mathematics, Decision and Planning for Autonomy.

**École Centrale Paris** — **Paris, France**
*Diplôme d'Ingénieur des Arts et Manufactures (Master's level),* — *2015–2019*
Applied Mathematics, Algorithms and Programming, Optimization.

## Professional experience

**Harvard University** — **Boston MA, USA**
*Research Associate* — *Sep 2024–Present*
Developing aerial robotics solutions in the context of Project CETI in Prof. Robert J. Wood's Lab. Marine missions involve sperm whale monitoring and sensor deployment around the island of Dominica.

**Massachusetts Institute of Technology** — **Cambridge MA, USA**
*Graduate Research Assistant* — *Sep 2021–Present*
Exploring topics at the intersection of machine learning, control theory, and robotics with Prof. Daniela Rus at the Distributed Robotics Laboratory.

**Stanford University** — **Stanford, CA, USA**
*Visiting Student Researcher* — *Jan 2024*
Desiging guidance based diffusion planners for multi-agent cooperation at the Multi-agent Systems Lab under the supervision of Prof. Mac Schwager.

**MIT-IBM Watson AI Lab** — **Cambridge, MA, USA**
*Graduate Research Intern* — *Jun 2023–Aug 2023*
Deploying Large Language Models as game-theoretic objective designers and planners for multi-agent systems.

**Parrot Drones** — **Paris, France**
*Control and Estimation Engineer* — *Mar 2020–Aug 2021*
Enhancing control and sensor/vision fusion estimation algorithms for utility quadrotor drones. Expanding on the modeling of vision, sensor and mechanical faults in simulated and real flight environments.

**Georgia Institute of Technology** — **Atlanta GA, USA**
*Graduate Research Assistant* — *Aug 2018–Dec 2019*
Developing novel hybrid control architectures for multi-agent systems consensus within Prof. Wassim M. Haddad's CASCADES laboratory. (Center for Advanced Studies in Controls and Dynamics in Engineering and Science).

**European Space Agency** — **Noordwijk, Netherlands**
*GNC & Systems Engineer Intern* — *Feb–Aug 2018*
Validating the performance of the Guidance, Navigation and Control software for the two autonomous satellites flying in tandem on the Proba-3 mission through Monte Carlo simulations at the European Space Research and Technology Centre.

## Publications

**The Curious Case of In-Training Compression of State Space Models**
*M. Chahine, P. Nazari, D. Rus, T.K. Rusch,* *2025*
Preprint, (link)

**Neural Low-Discrepancy Sequences**
*M.E. Van Huffel, N. Kirk, M. Chahine, D. Rus, T.K. Rusch,* *2025*
Preprint, (link)

**Improving Efficiency of Sampling-based Motion Planning via Message-Passing Monte Carlo**
*M. Chahine, T.K. Rusch, Z.J. Patterson, D. Rus,* *2025*
Conference on Robot Learning, (link)

**Decentralized Vision-Based Autonomous Aerial Wildlife Monitoring**
*M. Chahine, W. Yang, A. Maalouf, J. Siriska, N. Jadhav, D.M. Vogt, S. Gil, R.J. Wood, D. Rus* *2025*
International Symposium on Experimental Research, (link)

**Flex: End-to-End Text-Instructed Visual Navigation with Foundation Models**
*M. Chahine, A. Quach, A. Maalouf, T-H. Wang, D. Rus,* *2024*
Preprint, (link)

**Gaussian splatting to real world flight navigation transfer with liquid networks**
*A. Quach*, M. Chahine*, A. Amini, R. Hasani, D. Rus,* *2024*
Conference on Robot Learning, (link)

**Follow Anything: Open-Set Detection, Tracking, and Following in Real-Time**
*A. Maalouf, N. Jadhav, K.M. Jatavallabhula, M. Chahine, D. Vogt, R. Wood, A. Torralba, D. Rus,* *2024*
*IEEE Robotics and Automation Letters*, (link)

**Towards Cooperative Flight Control Using Visual-Attention**
*L. Yin, M. Chahine, T-H. Wang, T. Seyde, C. Liu, M. Lechner, R. Hasani, and D. Rus,* *2023*
*IEEE International Conference on Intelligent Robots and Systems*, (link)

**Local Non-Cooperative Games with Principled Player Selection for Scalable Motion Planning**
*M. Chahine, R. Firoozi, W. Xiao, M. Schwager, and D. Rus,* *2023*
*IEEE International Conference on Intelligent Robots and Systems*, (link)

**Learning stability attention in vision-based end-to-end driving policies**
*T-H. Wang, W. Xiao, M. Chahine, A. Amini, R. Hasani, and D. Rus,* *2023*
*Learning for Dynamics & Control Conference*, (link)

**Robust Flight Navigation Out-of-Distribution with Liquid Neural Networks**
*M. Chahine, R. Hasani, P. D. Kao, A. Ray, R. Shubert, M. Lechner, A. Amini, and D. Rus,* *2023*
*Science Robotics (Vol 8, 2023)*, (link)

**BarrierNet: Differentiable Control Barrier Functions for Learning of Safe Robot Control**
*W. Xiao, T-H. Wang, R. Hasani, M. Chahine, A. Amini, X. Li, and D. Rus,* *2023*
*IEEE Transactions on Robotics*, (link)

**Intention Communication and Hypothesis Likelihood in Game-Theoretic Motion Planning**
*M. Chahine, R. Firoozi, W. Xiao, M. Schwager, and D. Rus,* *2023*
*IEEE Robotics and Automation Letters*, (link)

**Liquid Structural State-Space Models**
*R. Hasani, M. Lechner, T-H. Wang, M. Chahine, A. Amini, and D. Rus,* *2023*
*International Conference on Learning Representations*, (link)

**Differentiable control barrier functions for vision-based end-to-end autonomous driving**
*W. Xiao, T-H. Wang, M. Chahine, A. Amini, R. Hasani, and D. Rus,* *2022*
Preprint, (link)

**A Hybrid Thermodynamic Control Protocol for Semistability and Consensus**
*W. M. Haddad and M. Chahine*, *2021*
*IEEE Transactions on Automatic Control*, (link)

**Condensed Matter Physics, and Hybrid Consensus Protocols for Network Systems**
*W. M. Haddad and M. Chahine*, *2020*
*American Control Conference*, (link)

## Invited talks

**Monte-Carlo Methods Conference**
*Illinois Institute of Technology* *Jul 2025*
Improving Efficiency of Sampling-based Motion Planning via Message-Passing Monte Carlo

**Multi-agent Systems Lab**
*Stanford University* *Jan 2024*
Robust Flight Navigation Out-of-Distribution with Liquid Neural Networks

**Robotics and Perception Group**
*University of Zurich* *Sep 2023*
Robust Flight Navigation Out-of-Distribution with Liquid Neural Networks

**SIAM Conference on Control and Its Applications**
*Society for Industrial and Applied Mathematics* *Jul 2023*
BarrierNet: Differentiable Control Barrier Functions for Learning of Safe Robot Control

## Student mentoring

***Ishaan Vohra***
*Undergraduate Research Opportunities Program in EECS at MIT* *Sep 2025 – May 2026*
Generative Simulation for Visuo-Motor Policy Generalization

***Arthur De Los Santos***
*Undergraduate Research Opportunities Program in EECS at MIT* *Sep 2025 – May 2026*
Temporal Logic Planning for Multistep Vision-Language Navigation

***William Yang***
*Undergraduate Research Opportunities Program & M. Eng. in EECS at MIT* *Sep 2024 – May 2026*
Decentralized Multi-Agent Wildlife Monitoring
Graph Neural Networks for Scalable Robot Interaction Prediction

***Kartikesh Mishra***
*M. Eng. in EECS at MIT* *Jan 2025 – May 2025*
Foundation Model Features for Vision-Language Navigation

***Alex Quach***
*M. Eng. in EECS at MIT* *Jun 2023 – May 2024*
Sim-to-real Flight Policy Transfer via Gaussian Splatting

***Patrick D. Kao***
*M. Eng. in EECS at MIT* *Sep 2021 – May 2022*
Visuo-motor Navigation with Liquid Neural Networks

***Nikhil M. Singhal***
*M. Eng. in EECS at MIT* *Sep 2021 – May 2022*
Efficient Connectivity Maintenance For Distributed Robotic Systems