



# Exponent<sup>®</sup>

Engineering & Scientific Consulting

## Sleiman Safaoui, Ph.D.

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## Professional Profile

Dr. Sleiman Safaoui's area of expertise is in robotics and autonomy with an emphasis on motion planning and decision making under uncertainty. He has extensive knowledge in designing algorithms that make robots and autonomous systems robust to uncertainties in the dynamics and the surrounding environment, along with experience designing robotic platforms and implementing autonomy solutions on physical systems.

Prior to joining Exponent, Dr. Safaoui was a research associate in the Controls, Optimization, and Networks Lab (CONLab) at The University of Texas at Dallas where he worked on designing a software package to make encoding and solving complex risk-based optimization problems easier and implementing motion planning algorithms on single and multi-robot systems. Before that, he was a research assistant in CONLab focusing on designing motion planning and control algorithms for robotic systems in the presence of uncertainty. More specifically, his work focused on utilizing statistics, optimization, and data-driven methods for safe trajectory planning for ground and aerial robots including quadrotors and autonomous vehicles.

Dr. Safaoui also worked at Mitsubishi Electric Research Laboratories (MERL) where he leveraged machine learning and optimization-based methods to design motion planning algorithms for robot teams. Furthermore, he implemented autonomy algorithms on physical platforms using quadrotors and miniature autonomous vehicles.

## Academic Credentials & Professional Honors

Ph.D., Electrical Engineering, University of Texas, Dallas, 2023

M.S., Electrical Engineering, University of Texas, Dallas, 2023

B.S., Electrical Engineering, University of Texas, Dallas, 2019

Excellence in Education Doctoral Fellowship, University of Texas at Dallas, 2020-2023.

Best Paper Award, Joint Workshop on CPS and IoT Security and Privacy (CPSIoTSec), in conjunction with the ACM Conference on Computer and Communications Security, 2021, Seoul, South Korea.

## Prior Experience

Research Associate, The University of Texas at Dallas, Mar 2024-May 2024

Research Assistant, The University of Texas at Dallas, 2019-2023

Research Intern, Mitsubishi Electric Research Laboratories (MERL), Aug 2021-Mar 2022

Research Experience for Undergraduates, The University of Texas at Dallas, 2017-2019

## Professional Affiliations

Institute of Electrical and Electronics Engineers

## Patents

U.S. Patent Application 18/049,293: System and Method for Controlling Motion of One or More Devices, filed November 16, 2023 (Vinod AV, Safaoui S, Chakrabarty A, Quirynen R, Yoshikawa N, Di Cairano S)

## Publications

Safaoui S, Vinod AP, Chakrabarty A, Quirynen R, Yoshikawa N, Di Cairano S. "Safe multi-agent motion planning under uncertainty for drones using filtered reinforcement learning." IEEE Transactions on Robotics. 2024 Apr 10.

Renganathan V, Safaoui S, Kothari A, Gravell B, Shames I, Summers T. "Risk bounded nonlinear robot motion planning with integrated perception & control. Artificial Intelligence." 2023 Jan 1;314:103812.

Safaoui S, Lindemann L, Shames I, Summers TH. "Risk-Bounded Temporal Logic Control of Continuous-Time Stochastic Systems." In 2022 American Control Conference (ACC) 2022 Jun 8 (pp. 1555-1562). IEEE.

Vinod AP, Safaoui S, Chakrabarty A, Quirynen R, Yoshikawa N, Di Cairano S. "Safe multi-agent motion planning via filtered reinforcement learning." In 2022 International Conference on Robotics and Automation (ICRA) 2022 May 23 (pp. 7270-7276). IEEE.

Quinonez R, Safaoui S, Summers T, Thuraishingham B, Cardenas AA. "Shared reality: detecting stealthy attacks against autonomous vehicles." In Proceedings of the 2th Workshop on CPS&IoT Security and Privacy 2021 Nov 15 (pp. 15-26).

Safaoui S, Gravell BJ, Renganathan V, Summers TH. "Risk-averse RRT\* planning with nonlinear steering and tracking controllers for nonlinear robotic systems under uncertainty." In 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2021 Sep 27 (pp. 3681-3688). IEEE

Renganathan V, Fathian K, Safaoui S, Summers T. "Spoof resilient coordination in distributed and robust robotic networks." IEEE Transactions on Control Systems Technology. 2021 Mar 29;30(2):803-10.

Fathian K, Safaoui S, Summers TH, Gans NR. "Robust distributed planar formation control for higher order holonomic and nonholonomic agents." IEEE Transactions on Robotics. 2020 Aug 24;37(1):185-205

Safaoui S, Lindemann L, Dimarogonas DV, Shames I, Summers TH. "Control design for risk-based signal temporal logic specifications." IEEE Control Systems Letters. 2020 May 29;4(4):1000-5.

Fathian K, Safaoui S, Summers TH, Gans NR. "Robust 3D distributed formation control with collision avoidance and application to multirotor aerial vehicles." In 2019 International Conference on Robotics and Automation (ICRA) 2019 May 20 (pp. 9209-9215). IEEE.

## Presentations

Safaoui S, Summers TH. "Distributionally Robust CVaR-Based Safety Filtering for Motion Planning in

Uncertain Environments.” Oral and Poster presentation, IEEE International Conference on Robotics and Automation (ICRA), 2024.

Safaoui S, Lindemann L, Shames I, Summers TH. “Risk-Bounded Temporal Logic Control of Continuous-Time Stochastic Systems.” Oral presentation, American Control Conference (ACC), 2022

Safaoui S, Gravell BJ, Renganathan V, Summers TH. “Risk-averse RRT\* planning with nonlinear steering and tracking controllers for nonlinear robotic systems under uncertainty.” Oral presentation, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2021.

Safaoui S, Lindemann L, Dimarogonas DV, Shames I, Summers TH. “Control design for risk-based signal temporal logic specifications.” Oral presentation, IEEE Conference on Decision and Control (CDC), 2020.

Fathian K, Safaoui S, Summers TH, Gans NR. “Robust 3D distributed formation control with collision avoidance and application to multirotor aerial vehicles.” Poster presentation, IEEE International Conference on Robotics and Automation (ICRA), 2019.

## Peer Reviews

IEEE Transactions on Robotics (T-RO)

IEEE Transactions on Automatic Control (TAC)

IEEE Transactions on Control Systems Technology (TCST)

IEEE Control Systems Letters (L-CSS)

IEEE Open Journal of Control Systems (OJ-CSYS)

Wiley Optimal Control Applications and Methods (OCAM)

IEEE International Conference on Robotics and Automation (ICRA)

IEEE/RSJ International Conference on Intelligent Robots Systems (IROS)

IEEE Conference on Decision and Control (CDC)

IEEE International Symposium on Multi-Robot and Multi-Agent Systems (MRS)

ACM/IEEE International Conference on Cyber Physical Systems (ICCPS)

IFAC Conference on Analysis and Design of Hybrid Systems (AHDS)

American Control Conference (ACC)

Annual Learning for Dynamics & Control Conference (L4DC)

International Conference on Vehicle Technology and Intelligent Transport Systems (VEHITS)

Modeling, Estimation and Control Conference (MECC)