

Research Interests

Algorithms for safe planning in high-dimensional, long-horizon, uncertain environments (POMDPs); applied to aviation, autonomous vehicles, and sustainable energy.

Experience

Stanford Intelligent Systems Laboratory (SISL)

Graduate Student Researcher [2019 – Present]

Using surrogate models for high-dimensional planning and safety validation [1–8].

Stanford Doerr School of Sustainability

Graduate Student Researcher [2022 – Present]

Developing planning algorithms for sustainable energy applications: carbon capture and storage, geothermal energy production, and critical battery mineral exploration.

Xwing

AI Safety and DAA Consultant, PhD Student Research Intern [2022 – 2023]

Developed method for failure probability estimation of safety-critical systems [2, 3].

NASA Ames Research Center

Research Engineer [2020 – 2021]

Created lunar rover traverse GUI for NASA's VIPER, looking for water on the Moon.

Stanford School of Engineering

Teaching Assistant [2019 – 2021]

Head TA for CS238/AA228: Decision Making Under Uncertainty and course development assistant for AA120Q: Building Trust in Autonomous Systems.

MIT Lincoln Laboratory

Associate Staff [2013 – 2019]

Part of the core team that developed, optimized, and validated the next-generation aircraft collision avoidance system, certified by the FAA (ACAS Xa, Xu, and sXu) [9]. Developed decision support tool for wildfire incident commanders to optimize resources for wildfire suppression [10].

Publications (Selected)

[full list of publications]

- [1] **R. J. Moss**, A. Corso, J. Caers, and M. J. Kochenderfer, BetaZero: Belief-State Planning for Long-Horizon POMDPs using Learned Approximations. *arXiv 2306.00249*, 2023.
- [2] **R. J. Moss**, M. J. Kochenderfer, M. Gariel, and A. Dubois, Bayesian Safety Validation for Black-Box Systems. *AIAA AVIATION Forum*, 2023.
- [3] J.-G. Durand, A. Dubois, and **R. J. Moss**, Formal and Practical Elements for the Certification of Machine Learning Systems. *AIAA/IEEE Digital Avionics Systems Conference*, 2023.
- [4] **R. J. Moss**, Algorithms for Efficient Validation of Black-Box Systems. *M.S. Thesis*, 2021.
- [5] A. Corso, **R. J. Moss**, et al., A Survey of Algorithms for Black-Box Safety Validation of Cyber-Physical Systems. *Journal of Artificial Intelligence Research (JAIR)*, 2021.
- [6] **R. J. Moss**, et al., Autonomous Vehicle Risk Assessment. *Stanford Center for AI Safety*, 2021.
- [7] **R. J. Moss**, POMDPStressTesting.jl: Adaptive Stress Testing for Black-Box Systems. *Journal of Open Source Software (JOSS)*, 2021. <https://github.com/sisl/POMDPStressTesting.jl>
- [8] **R. J. Moss**, R. Lee, et al., Adaptive Stress Testing of Trajectory Predictions in Flight Management Systems. *AIAA/IEEE Digital Avionics Systems Conference (DASC)*, 2020.
- [9] M. P. Owen, A. Panken, **R. J. Moss**, et al., ACAS Xu: Integrated Collision Avoidance and Detect and Avoid Capability for UAS. *AIAA/IEEE Digital Avionics Systems Conference*, 2019.
- [10] J. D. Griffith, M. J. Kochenderfer, **R. J. Moss**, et al., Automated Dynamic Resource Allocation for Wildfire Suppression. *Lincoln Laboratory Journal*, 2017.

Education

Ph.D. in Computer Science (AI) [2021 – 2025]
Stanford University Stanford, CA

M.S. in Computer Science (AI) [2019 – 2021]
Awarded best CS master's thesis [4].
Awarded for teaching excellence (Centennial TA).

Stanford University Stanford, CA

B.S. in Computer Science [2010 – 2014]
Minor in Physics

Wentworth Institute of Technology Boston, MA

Awards

- Best-of-Conference, *AIAA/IEEE DASC*, 2023. [3]
- Best-of-Track (UAS/AAM), *AIAA/IEEE DASC*, 2023. [3]
- Best-of-Session (AI/ML), *AIAA/IEEE DASC*, 2023. [3]
- R&D 100 Award for ACAS sXu, 2022.
- Best CS Master's Thesis, *Stanford University*, 2021. [4]
- Centennial TA Award, *Stanford University*, 2021.
- Best-of-Session (Safe & Secure Tech.), *AIAA/IEEE DASC*, 2021.
- First Place Student Research Award, *AIAA/IEEE DASC*, 2020. [8]
- Best-of-Session (V&V), *AIAA/IEEE DASC*, 2020. [8]
- Best-of-Track (UAS), *AIAA/IEEE DASC*, 2019. [9]
- Best-of-Track (Safety and Resilience), *ATM R&D Seminar*, 2017.
- R&D 100 Award for ACAS Xu, 2016.
- MIT Lincoln Laboratory Team Award for ACAS X, 2015–2016.
- Magna Cum Laude, *Wentworth Institute of Technology*, 2014.

Volunteering

Julia Academy

Course Creator and Lecturer [2021]

POMDPs.jl course on decision making under uncertainty.

Massachusetts Science and Engineering Fair

Judge for CS and Engineering [2015 – 2019]

Evaluated middle and high school science projects.

Other Experience

Harvard University

Technical Support (IT) Co-op [2012]

Built a diagnostic system for all of Harvard's computer labs.

Awesome Products, LLC

Co-owner, Software Developer [2012 – 2014]

Handled programming design and development of music making apps. Secured funding through Accelerate at WIT.

Technical Skills

Julia, MATLAB, Python, JavaScript, C++, \LaTeX , TikZ

Sequential decision making under uncertainty, machine learning, deep learning, optimization, safety validation.

External Links

- CV: <https://bit.ly/moss-cv>
- Résumé: <https://bit.ly/moss-resume>
- Website: <https://robert-moss.com>
- GitHub: <https://github.com/mossr>
- Google Scholar: <https://bit.ly/moss-scholar>
- LinkedIn: <https://www.linkedin.com/in/robert-j-moss>