

# Alexander Robey

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## Education

- 2018–present **PhD, Electrical and Systems Engineering**, *University of Pennsylvania*, Philadelphia, PA, USA.
- 2014–2018 **Bachelor of Science, Engineering**, *Swarthmore College*, Swarthmore, PA, USA.
- 2014–2018 **Bachelor of Arts, Mathematics**, *Swarthmore College*, Swarthmore, PA, USA.

## Refereed Conference Papers

- 2022 Allan Zhou, Fahim Tajwar, **Alexander Robey**, Tom Knowles, George J. Pappas, Hamed Hassani, and Chelsea Finn. Do deep networks transfer invariances across classes? In *International Conference on Learning Representations*, 2022.
- 2021 **Alexander Robey**, George J Pappas, and Hamed Hassani. Model-based domain generalization. In *Advances in Neural Information Processing Systems*, 2021.
- 2021 **Alexander Robey**, Lars Lindemann, Stephen Tu, and Nikolai Matni. Learning robust hybrid control barrier functions for uncertain systems. *IFAC Conference on Analysis and Design of Hybrid Systems*, 2021.
- 2021 **Alexander Robey**, Luiz F. O. Chamon, George J. Pappas, Hamed Hassani, and Alejandro Ribeiro. Adversarial robustness with semi-infinite constrained learning. In *Advances in Neural Information Processing Systems*, 2021.
- 2021 **Alexander Robey**, Arman Adibi, Brent Schlotfeldt, George J Pappas, and Hamed Hassani. Optimal algorithms for submodular maximization with distributed constraints. In *Learning for Dynamics and Control*. PMLR, 2021.
- 2021 Lars Lindemann, Haimin Hu, **Alexander Robey**, Hanwen Zhang, Dimos V Dimarogonas, Stephen Tu, and Nikolai Matni. Learning hybrid control barrier functions from data. *Conference on Robot Learning*. PMLR, 2021.
- 2020 **Alexander Robey**, Haimin Hu, Lars Lindemann, Hanwen Zhang, Dimos V Dimarogonas, Stephen Tu, and Nikolai Matni. Learning control barrier functions from expert demonstrations. In *2020 59th IEEE Conference on Decision and Control (CDC)*, pages 3717–3724. IEEE, 2020.
- 2019 Mahyar Fazlyab, **Alexander Robey**, Hamed Hassani, Manfred Morari, and George Pappas. Efficient and accurate estimation of lipschitz constants for deep neural networks. In *Advances in Neural Information Processing Systems*, pages 11427–11438, 2019.

## Journal Papers

- 2018 **Alexander Robey** and Vidya Ganapati. Optimal physical preprocessing for example-based super-resolution. *Optics Express*, volume 26, pages 31333–31350. Optical Society of America, 2018.

## Preprints

- 2022 **Alexander Robey**, Luiz F. O. Chamon, George J Pappas, and Hamed Hassani. Probabilistically robust learning: Balancing average-and worst-case performance. *arXiv preprint arXiv:2202.01136*, 2022.

- 2021 Stephen Tu, **Alexander Robey**, Tingnan Zhang, and Nikolai Matni. On the sample complexity of stability constrained imitation learning. *arXiv preprint arXiv:2102.09161*, 2021.
- 2021 Lars Lindemann, **Alexander Robey**, Lejun Jiang, Stephen Tu, and Nikolai Matni. Learning robust output control barrier functions from safe expert demonstrations. *arXiv preprint arXiv:2111.09971*, 2021.
- 2020 **Alexander Robey**, Hamed Hassani, and George J Pappas. Model-based robust deep learning. *arXiv preprint arXiv:2005.10247*, 2020.
- 2020 Edgar Dobriban, Hamed Hassani, David Hong, and **Alexander Robey**. Provable tradeoffs in adversarially robust classification. *arXiv preprint arXiv:2006.05161*, 2020.

## Patents

- 2020 **Alexander Robey**, Hamed Hassani, and George J Pappas. Model-based robust deep learning, 2020. United States Provisional Patent 63/034,355.

## Work Experience

- 2017 Summer research intern, Center for Applied Scientific Computing (CASC), Lawrence Livermore National Laboratory (LLNL), Livermore, CA, USA.
- 2016, 2018 Summer research assistant, Department of Engineering, Swarthmore College, Swarthmore, PA, USA.

## Fellowships & Awards

- 2021 *Outstanding Reviewer Award*, Neural Information Processing Systems (NeurIPS) 2021.
- 2021 *Outstanding Reviewer Award*, International Conference on Learning Representations (ICLR) 2021.
- 2020 *Outstanding Reviewer Award*, International Conference on Machine Learning (ICML) 2020.
- 2020 *Teaching Assistant of the Year*, Department of Electrical and Systems Engineering, University of Pennsylvania.
- 2018 *Dean's Fellowship*, Department of Electrical and Systems Engineering, University of Pennsylvania.
- 2016 *Summer Undergraduate Research Fellowship*, Department of Engineering, Swarthmore College.

## Professional Activities

### Organizing

- 2022 European Conference on Computer Vision (ECCV) workshop on *Adversarial Robustness in the Real World*.
- 2021 International Conference on Computer Vision (ICCV) workshop on *Adversarial Robustness in the Real World*.

### Reviewing

*Conferences:* Neural Information Processing Systems (NeurIPS), International Conference on Machine Learning (ICML), International Conference on Learning Representations (ICLR), International Conference on Cyber-Physical Systems (ICCPs), Learning for Dynamics and Control (L4DC), Conference on Decision Making and Control (CDC), American Control Conference (ACC), International Conference on Computer Vision (ICCV), European Conference on Computer Vision (ECCV), International Symposium on Information Theory (ISIT)

*Journals:* Journal of Machine Learning Research (JMLR), Transactions on Pattern Analysis and Machine Intelligence (PAMI), IEEE Robotics and Automation Letters (RA-L), Transactions on Automatic Control (TAC), SIAM Journal on Mathematics of Data Science (SIMODS), Transactions on Machine Learning Research (TMLR)

## Technical Skills

*Programming languages:* Python, MATLAB, JavaScript, HTML, CSS, R, C/C++, SQL (Postgres), Verilog HDL, LaTeX

*Frameworks:* Pytorch, TensorFlow, Jax, Django, Slurm

## Teaching Experience

- Spring 2021 ESE 605: *Modern Convex Optimization*, University of Pennsylvania (Teaching Assistant).
- Spring 2020 ESE 290: *Introduction to Research Methodologies*, University of Pennsylvania (Mentor).
- Fall 2020 ESE 530: *Elements of Probability Theory*, University of Pennsylvania (Teaching Assistant).
- Fall 2019 ESE 530: *Elements of Probability Theory*, University of Pennsylvania (Teaching Assistant).
- Spring 2018 ENGR 019: *Numerical Methods for Engineering Applications*, Swarthmore College (Teaching Assistant).
- Fall 2017 ENGR 011: *Electrical Circuit Analysis*, Swarthmore College (Teaching Assistant).
- Spring 2017 ENGR 012: *Linear Physical Systems Analysis*, Swarthmore College (Teaching Assistant).
- Fall 2016 ENGR 011: *Electrical Circuit Analysis*, Swarthmore College (Teaching Assistant).
- Spring 2016 ENGR 006: *Engineering Mechanics*, Swarthmore College (Teaching Assistant).

## Selected Talks

- Mar. 2022 *Probabilistically Robust Learning: Balancing Worst- and Average-case Performance*, The Institute for Learning-enabled Optimization at Scale (TILOS), University of California, San Diego, San Diego, CA, USA (virtual).
- Mar. 2022 *TBD*, Swarthmore College, Swarthmore, PA, USA.
- Dec. 2021 *Model-Based Domain Generalization*, CDC 2021 Workshop on Robust Deep Learning-Based Control, Austin, TX, USA (virtual).
- Oct. 2021 *Robustness against Natural Variation: Theory and Practice*, GRASP SFI Seminar, University of Pennsylvania, Philadelphia, PA, USA.
- Sept. 2021 *A Critique of "Generalization in Adversarially Robust Deep Learning"*, NSF-Simons Math of Deep Learning (MoDL) annual meeting, Simons Foundation, New York, NY, USA.
- Sept. 2021 *Robustness against Natural Variation: Theory and Practice*, NSF-Simons THEORINET seminar, Baltimore, MD, USA (virtual).
- July 2021 *Learning Robust Hybrid Control Barrier Functions for Uncertain Systems*, 7th IFAC Conference on Analysis and Design of Hybrid Systems (ADHS), Brussels, Belgium (virtual).
- Apr. 2021 *Model-Based Robust Deep Learning: Generalizing to Natural Out-of-Distribution Data*, Italian Conference on CyberSecurity (ITASEC), AI for Security and Security for AI Workshop (virtual).
- Mar. 2021 *Model-Based Domain Generalization*, NSF-Simons Math of Deep Learning (MoDL) seminar (virtual).
- Dec. 2020 *Learning Control Barrier Functions from Expert Demonstrations*, 59<sup>th</sup> IEEE Conference on Decision and Control (CDC 2020), Jeju Island, Korea (virtual).
- Nov. 2020 *Model-Based Robust Deep Learning: Generalizing to Natural Out-of-Distribution Data*, Intel, Santa Clara, CA, USA (virtual).
- Oct. 2020 *Generalizing to Natural Out-of-Distribution Data*, C3.ai Workshop on the Analytical Foundations of Deep Learning (virtual).
- Sept. 2020 *Model-Based Robust Deep Learning: Generalizing to Natural Out-of-Distribution Data*, Intel, Santa Clara, CA, USA (virtual).

- Sept. 2020 *Model-Based Robust Deep Learning: Generalizing to Natural Out-of-Distribution Data*, Data Augmentation and Equivariance Workshop, University of Pennsylvania, Philadelphia, PA, USA (virtual).
- Aug. 2020 *Model-Based Robust Deep Learning: Generalizing to Natural Out-of-Distribution Data*, European Conference on Computer Vision (ECCV) workshop on Adversarial Robustness in the Real World, Glasgow, Scotland (virtual).
- July 2020 *Model-Based Robust Deep Learning*, Stanford University, Stanford, CA, USA (virtual).
- Dec. 2019 *Efficient and Accurate Estimation of Lipschitz Constants of Deep Neural Networks*, Spotlight talk at Neural Information Processing Systems (NeurIPS), Vancouver, Canada.
- May 2018 *Computationally Expediting Fourier Ptychographic Microscopy*, Swarthmore Research Showcase, Swarthmore College, Swarthmore, PA, USA.

## Selected Poster Presentations

- Dec. 2021 *Adversarial Robustness via Semi-Infinite Constrained Learning*, Neural Information Processing Systems (NeurIPS) 2021.
- Dec. 2021 *Model-Based Domain Generalization*, Neural Information Processing Systems (NeurIPS) 2021.
- Sept. 2021 *Model-Based Domain Generalization*, NSF-Simons Mathematics of Deep Learning (MoDL) annual meeting, Simons Foundation, New York, NY, USA.
- July 2021 *Model-Based Robust Deep Learning: Generalizing to Natural Out-of-Distribution Data*, International Conference on Machine Learning (ICML) Workshop on Uncertainty and Robustness in Deep Learning (virtual).
- June 2021 *Optimal Algorithms for Submodular Maximization with Distributed Constraints*, Learning for Dynamics and Control (L4DC), Zurich, Switzerland (virtual).
- Nov. 2020 *Learning Hybrid Control Barrier Functions from Data*, Conference on Robot Learning (CoRL), Boston, MA, USA (virtual).
- Dec. 2019 *Efficient and Accurate Estimation of Lipschitz Constants of Deep Neural Networks*, Neural Information Processing Systems (NeurIPS) 2019, Vancouver, Canada.
- Aug. 2017 *Quantifying the Impact of Factors Affecting Communication Performance*, Lawrence Livermore National Laboratory (LLNL), Livermore, CA, USA.
- Sept. 2016 *Bird-Window Collision Prevention*, Sigma Xi Poster Session, Swarthmore College, Swarthmore, PA, USA.