# **Eric Wong**

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## **Briefly**

How can we make sure that deep learning models are actually doing what we want them to do? My research interests are centered around foundations of reliable machine learning systems: understanding, debugging, and guaranteeing the behavior of data-driven models. I created the first provable defenses that guarantee robustness to adversarial examples and real-world specifications, and currently work on securing modern foundation models. I am also interested in explaining models with provable certificates and scientific applications ranging from surgery to cosmology.

#### **Education**

University of Pennsylvania, Assistant Professor	Philadelphia, PA 2022-current
Massachusetts Institute of Technology, Post-Doctoral Associate Advisor: Aleksander Mądry	Cambridge, MA 2020-2022
Carnegie Mellon University, Ph. D. in Machine Learning Thesis: Provable, structured, and efficient methods for robustness of deep networks to adversarial examples; SCS Dissertation Award — Honorable Mention Advisor: Zico Kolter	Pittsburgh, PA 2015-2020
Carnegie Mellon University, B. S. in Computer Science Double major in Mathematics, minor in Machine Learning	Pittsburgh, PA 2011-2015

## Work experience

2019-2020	Bosch Center for Artifical Intelligence (Renningen, Germany and Pittsburgh, PA) Created a virtual sensor based on neural networks for a fuel injection system in truck engines; formally verified the worst-case error of the system under conversative estimates of physical sensor noise.
2012-2015	<b>CERT Program (Pittsburgh, PA)</b> Migrated secure coding rules from POSIX to C11; analyzed security reports for Java android applications; developed an analysis toolfor security vulnerabilities in source code.

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2025	AI2050 Early Career Award Towards Robust Generative AI with Adaptive Risk Evaluations, Schmidt Sciences
2025	<b>NSF Early Career Award</b> <i>CAREER: Certified Explanations for Trustworthy Artificial Intelligence,</i> NSF
2024	Amazon Research Award (AWS AI) Adversarial Manipulation of Prompting Interfaces, Amazon
2023	Area Chair Award (Interpretability and Analysis of Models for NLP) Faithful Chain-of-Thought Reasoning, IJCNLP-AACL Conference
2020	SCS Dissertation Award – Honorable Mention  Provable, structured, and efficient methods for robustness of deep networks to adversarial examples, Carnegie Mellon University
2020	Siebel Scholar Fellowship Carnegie Mellon University
2017	<b>Best Defense Paper</b> Provable defenses against adversarial examples via the convex outer adversarial polytope, NeurIPS 2017 ML & Security Workshop
2013	Summer Undergraduate Research Fellowship Carnegie Mellon University
Publications	
NeurIPS 2024	<b>AR-Pro: Counterfactual Explanations for Anomaly Repair with Formal Properties</b> Xiayan Ji, Anton Xue, Eric Wong, Oleg Sokolsky, Insup Lee
eBioMedicine	Crowd-sourced machine learning prediction of long COVID using data from the National COVID Cohort Collaborative  Timothy Bergquist, Johanna Loomba, Emily Pfaff, Fangfang Xia, Zixuan Zhao, Yitan Zhu, Elliot Mitchell, Biplab Bhattacharya, Gaurav Shetty, Tamanna Munia, Grant Delong, Adbul Tariq, Zachary Butzin-Dozier, Yunwen Ji, Haodong Li, Jeremy Coyle, Seraphina Shi, Rachael V. Philips, Andrew Mertens, Romain Pirracchio, Mark van der Laan, John M. Colford Jr., Alan Hubbard, Jifan Gao, Guanhua Chen, Neelay Velingker, Ziyang Li, Yinjun Wu, Adam Stein, Jiani Huang, Zongyu Dai, Qi Long, Mayur Naik, John Holmes, Danielle Mowery, Eric Wong, Ravi Parekh, Emily Getzen, Jake Hightower, Jennifer Blase
NeurIPS 2024	<b>Data-Efficient Learning with Neural Programs</b> Alaia Solko-Breslin, Seewon Choi, Ziyang Li, Neelay Velingker, Rajeev Alur, Mayur Naik, Eric Wong
ICML 2024	Towards Compositionality in Concept Learning Adam Stein, Aaditya Naik, Yinjun Wu, Mayur Naik, Eric Wong
ICML 2024	DISCRET: Synthesizing Faithful Explanations For Treatment Effect Estimation

NeurIPS 2024 JailbreakBench: An Open Robustness Benchmark for Jailbreaking Large Language Models Patrick Chao, Edoardo Debenedetti, Alexander Robey, Maksym Andriushchenko, Francesco Croce, Vikash Sehwag, Edgar Dobriban, Nicolas Flammarion, George J. Pappas, Florian Tramer, Hamed Hassani, Eric Wong ICLR 2024, Tiny Evaluating Groups of Features via Consistency, Contiguity, and Stability Papers (Oral) Chaehyeon Kim, Weiqiu You, Shreya Havaldar, Eric Wong ICLR 2024 SalUn: Empowering Machine Unlearning via Gradient-based Weight Saliency in **Both Image Classification and Generation** Chongyu Fan, Jiancheng Liu, Yihua Zhang, Dennis Wei, Eric Wong, Sijia Liu **CVPR 2024** Initialization Matters for Adversarial Transfer Learning Andong Hua, Jindong Gu, Zhiyu Xue, Nicholas Carlini, Eric Wong, Yao Qin **EMNLP 2023 Comparing Styles across Languages** Shreya Havaldar, Matthew Pressimone, Eric Wong, Lyle Ungar SaTML 2025 Jailbreaking Black Box Large Language Models in Twenty Queries Patrick Chao, Alexander Robey, Edgar Dobriban, Hamed Hassani, George J. Pappas, Eric Wong OOPSLA 2024 TorchQL: A Programming Framework for Integrity Constraints in Machine Learn-Aaditya Naik, Adam Stein, Yinjun Wu, Eric Wong, Mayur Naik NeurIPS 2023 Stability Guarantees for Feature Attributions with Multiplicative Smoothing Anton Xue, Rajeev Alur, Eric Wong ICLR 2023, Tiny TopEx: Topic-based Explanations for Model Comparison **Papers** Shreya Havaldar, Adam Stein, Eric Wong, Lyle Ungar **ICML 2023** Do Machine Learning Models Learn Statistical Rules Inferred from Data? Aaditya Naik, Yinjun Wu, Mayur Naik, Eric Wong **DLSP 2023** Adversarial Prompting for Black Box Foundation Models Natalie Maus\*, Patrick Chao\*, Eric Wong, Jacob Gardner Keynote IJCNLP-AACL, Faithful Chain-of-Thought Reasoning Qing Lyu\*, Shreya Havaldar\*, Adam Stein\*, Li Zhang, Delip Rao, Eric Wong, Mari-2023 anna Apidianaki, Chris Callison-Burch **CVPR 2023** A data-based perspective on transfer learning Saachi Jain\*, Hadi Salman\*, Alaa Khaddaj\*, Eric Wong, Sung Min Park, Aleksander Madry ICLR 2022 Missingness bias in model debugging Saachi Jain\*, Hadi Salman\*, Pengchuan Zhang, Vibhav Vineet, Sal Vemprala, Aleksander Madry CVPR 2022 Certified patch robustness via smoothed vision transformers Hadi Salman\*, Saachi Jain\*, Eric Wong\*, Aleksander Madry

OJCS 2022	<b>DeepSplit: Scalable verification of deep neural networks via operator splitting</b> Shaoru Chen*, Eric Wong*, J. Zico Kolter, Mahyar Fazlyab
ICML 2021 (Oral)	<b>Leveraging Sparse Linear Layers for Debuggable Deep Networks</b> Eric Wong*, Shibani Santurkar*, Aleksander Madry
ICLR 2021	<b>Learning perturbation sets for robust machine learning</b> Eric Wong, J. Zico Kolter
ICML 2020	Overfitting in adversarially robust deep learning Leslie Rice*, Eric Wong*, J. Zico Kolter
IEEE IV 2020	Neural network virtual sensors for fuel injection quantities with provable performance specifications Eric Wong, Tim Schneider, Joerg Schmitt, Frank R. Schmidt, J. Zico Kolter
ICLR 2020	Fast is better than free: revisiting adversarial training Eric Wong*, Leslie Rice*, J. Zico Kolter
ICML 2020	Adversarial robustness against the union of multiple perturbation models Pratyush Maini, Eric Wong, J. Zico Kolter
ICML 2019	Wasserstein adversarial examples Eric Wong, Frank R. Schmidt, J. Zico Kolter
NeurIPS 2018	Scaling provable adversarial defenses Eric Wong, Frank R. Schmidt, Jan Hendrik Metzen, J. Zico Kolter
ICML 2018	Provable defenses against adversarial examples via the convex outer adversarial polytope Eric Wong, J. Zico Kolter
ICML 2017	A Semismooth Newton Method for Fast, Generic Convex Programming Alnur Ali*, Eric Wong*, J. Zico Kolter
ICML 2015	An SVD and Derivative Kernel Approach to Learning from Geometric Data Eric Wong, J. Zico Kolter
Preprints	
2024	The FIX Benchmark: Extracting Features Interpretable to eXperts Helen Jin, Shreya Havaldar, Chaehyeon Kim, Anton Xue, Weiqiu You, Helen Qu, Marco Gatti, Daniel A. Hashimoto, Bhuvnesh Jain, Amin Madani, Masao Sako, Lyle Ungar, Eric Wong
2024	Logicbreaks: A Framework for Understanding Subversion of Rule-based Inference Anton Xue, Avishree Khare, Rajeev Alur, Surbhi Goel, Eric Wong
2024	Avoiding Copyright Infringement via Machine Unlearning Guangyao Dou, Zheyuan Liu, Qing Lyu, Kaize Ding, Eric Wong

2024	Defending Large Language Models against Jailbreak Attacks via Semantic Smoothing Jiabao Ji, Bairu Hou, Alexander Robey, George J. Pappas, Hamed Hassani, Yang Zhang, Eric Wong, Shiyu Chang
2023	Sum-of-Parts Models: Faithful Attributions for Groups of Features Weiqiu You, Helen Qu, Marco Gatti, Bhuvnesh Jain, Eric Wong
2023	SmoothLLM: Defending Large Language Models Against Jailbreaking Attacks Alexander Robey, Eric Wong, Hamed Hassani, George J. Pappas
2023	Rectifying Group Irregularities in Explanations for Distribution Shift Adam Stein, Yinjun Wu, Eric Wong, Mayur Naik
2023	In-context Example Selection with Influences Tai Nguyen, Eric Wong
2022	When does bias transfer in transfer learning Hadi Salman*, Saachi Jain*, Andrew Ilyas*, Logan Engstrom*, Eric Wong, Aleksander Madry
Grants	
2025-06-01 – 2027-05-31	Towards Robust Generative AI with Adaptive Risk Evaluations \$450k, AI2050 Early Career Fellowship, Schmidt Sciences, PI
2025-06-01 – 2030-05-31	CAREER: Certified Explanations for Trustworthy Artificial Intelligence \$675k, NSF, PI
2024-12-01 – NaT	Harnessing Artificial Intelligence and Language Modeling for Enhancing Innovation and Evaluating Research Claims (HAILMEIER-C)
2024-05-01 – 2025-04-30	Preventing Complications with Transparent Surgical AI Assistants \$100K, ASSET-IBI, PI with Daniel Hashimoto
2024-07-01 – 2028-06-30	Safe and Explainable AI-enabled Decision Making for Personalized Treatment \$6.85M, ARPA-H, Co-PI with Rajeev Alur, Rajat Deo, Sameed Ahmed M. Khatana, Qi Long, Mayur Naik, Ravi Parikh, Gary Weissman
2023-10-01 – 2027-09-30	SLES: SPECSRL: Specification-guided Perception-enabled Conformal Safe Reinforcement Learning \$1.5M, NSF, Co-PI with Rajeev Alur, Osbert Bastani & Dinesh Jayaraman
2024-05-01 – 2025-04-30	Adversarial Manipulation of Prompting Interfaces \$70K (+\$50K compute), Amazon Research Award, PI
2023-10-01 – 2027-09-30	SHF: Medium: Scallop: A Neurosymbolic Programming Framework for Combining Logic with Deep Learning \$1.2M, NSF, Co-PI with Mayur Naik & Rajeev Alur
Invitations	

2024	Elements of Trust in Machine Learning Seminar speaker, Cornell AI Seminar
2024	Elements of Trust in Machine Learning Seminar speaker, University of Maryland
2023	Robustness of Adversarial Attacks for LLM Distinguished speaker, Responsible Machine Learning Summit, UCSB
2023	Adversarial Prompting: Return of the Adversarial Example Keynote speaker, IEEE S&P 2023, 6th Deep Learning Security & Privacy Workshop
2023	From Prompt Engineering to Prompt Science Seminar speaker, Wayne State University
2022	Robustness for the Real World Invited talk, 6th Annual Conference on Information Sciences and Systems (CISS)
2022	Debuggable Deep Networks Invited talk, TrustML Young Scientist Seminar
2021	Panel Discussion Panelist, ATVA 2021 Workshop on Security and Reliability of Machine Learning

## **Teaching Experience**

2024	<b>Mathematics of Machine Learning -</b> CIS 3333 (UPenn, Instructor) Second iteration of the new Mathematics of Machine Learning course under an official course number as a SEAS mathematics elective.
2024	Machine Learning - CIS 5200 (UPenn, Instructor) 2nd round teaching CIS 5200, further consolidation and unification of the course material with the other AI faculty. 150 students.
2023	Mathematics of Machine Learning - CIS 3990 (UPenn, Instructor) Created a new course that prepares undergraduates for technical research and a graduate level coursework in machine learning. Two students that took the course last semester are now doing ML theory research.
2023	Machine Learning - CIS 5200 (UPenn, Instructor) Substantially overhauled and updated the Machine Learning course at UPenn to (a) fully autograded assignments using PennGrader, (b) brand new PyTorch-based programming assignments to replace dated Numpy notebooks, (c) expanded to a more balanced set of topics across all of Machine Learning (i.e. Duality/Lagrangian, MCMC, an entire theory module including PAC Learning & VC Theory, other learning paradigms like Online and Active Learning). 128 students.
2022	Debugging Data & Models - CIS 7000-005 (UPenn, Instructor)

tor/course scores of 3.47/4 and 3.54/4.

Designed new special topics course in the seminar/lecture format on debugging machine learning (7000-005). Taught 25 enrolled students with average instruc2016 Practical Data Science - 15-388/688 (CMU, TA)

> Designed new assignments, taught recitations, and prepared write-ups for the first iteration of CMU's Practical Data Science course (15-388/688). I was the head TA (out of two TAs) and managed over 300 enrolled students. Received 55 student reviews with an average rating of 4.85/5.

2016-2019 Eberly Center for Teaching Excellence and Educational Innovation - Teaching Sem-

inars (CMU, Participant)

Enrolled in teaching seminars at the Eberly Center in CMU to develop personal teaching skills; seminars include "Teaching Inclusively: Leveraging Diversity and Promoting Equity in Your Classroom" and "Helping Students Develop Mastery and Critical

Thinking"

2015 Advanced Introduction to Machine Learning - 10-715 (CMU, TA)

> Taught recitations, held office hours, and created/graded assignments for the second iteration of the Advanced Introduction to Machine Learning course intended for

doctoral students in CMU's Machine Learning Department.

2014 Algorithm Design and Analysis - 15-451 (CMU, TA)

> Taught recitations, conducted oral examinations/office hours, and graded assignments/exams for the computer science department's Algorithm Design and Analysis

course (15-451) at CMU.

2014 Pervasive and Mobile Computing Services - 08-766/781 (CMU, TA)

> Held office hours and graded assignments/exams for the software engineering department's Pervasive and Mobile Computing Services course (08-766/781) at CMU.

2013 Pervasive and Mobile Computing Services - 08-766/781 (CMU, TA)

> Held office hours and graded assignments/exams for the software engineering department's Pervasive and Mobile Computing Services course (08-766/781) at CMU.

2013 Mobile Development for iOS and Android - 08-723 (CMU, TA)

Held office hours and graded assignments/exams for the software engineering de-

partment's Mobile Deveopment course (08-723) at CMU.

#### **Graduate Theses Supervised**

Fall 2024 – Spring 2029	Cassandra Goldberg (PhD) Thesis: Anticipated Spring 2029
Fall 2024 – Spring 2029	<b>Davis Brown</b> (PhD) Thesis: Anticipated Spring 2029, co-advised with Hamed Hassani
Fall 2024 – Spring 2029	Vitoria Guardieiro (PhD) Thesis: Anticipated Spring 2029
Spring 2024 – Spring 2026	Adam Stein (PhD) Thesis: Anticipated Spring 2026, co-advised with Mayur Naik
Fall 2023 – Spring 2028	Chaehyeon Kim (PhD) Thesis: Anticipated Spring 2028

Fall 2023 – Helen Jin (PhD) Thesis: Anticipated Spring 2026 Spring 2026 Summer 2023 -Anton Xue (PhD) Thesis: Anticipated Spring 2025, co-advised with Rajeev Alur Spring 2025 Spring 2023 – Weiqiu You (PhD) Fall 2025 Thesis: Anticipated Fall 2025 Spring 2023 -Shreya Havaldar (PhD) Spring 2026 Thesis: Anticipated Spring 2026, co-advised with Lyle Ungar Fall 2022 – **Shailesh Sridhar** (Masters) Thesis: Controlling for Missingness Bias in Feature Attribution Evaluation Spring 2024 Fall 2022 -Tai Nguyen (Masters)

## **Undergraduate Projects Supervised**

Spring 2024 – Spring 2024	<b>Dora Wu</b> (Undergraduate) Thesis: Image Generative Artificial Intelligence: Theory, Applications, and Outlook
Fall 2022 – Spring 2023	Gideon Tesfaye (Undergraduate) Practicum: Using deep learning to compose music

Thesis: Attribute in-context learning examples with influences

### **Penn Service**

Spring 2024

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2024 – 2024	PhD Admit Weekend Organizer, Co-Lead with Andrew Head
2023 – 2024	BSE in AI Curriculum Committee
2023 – ongoing	ML+FM Seminar Organizer of a seminar series for researchers in the areas of formal methods and machine learning. Averages 18 attendees weekly.
2023 – 2023	Adhoc Computing Cluster Committee Committee Member
2023 – 2023	PhD Admit Weekend Organizer, Co-Lead with Andrew Head
2022 – ongoing	Locust Cluster Test driver for the SEAS cluster and working with CETS to iron out scalability of the system.

## **DEI Service**

2024 WiML@PennCIS (CIS)

Organizer of a new DEI event to help women in CIS form a community. Averages 20 attendees per monthly meeting for women in machine learning at CIS.

2023 WiML Workshop Mentoring (NeurIPS)

Volunteered as a mentor for the round table event at the Women in Machine Learning workshop at NeurIPS.

2023 **USABE fireside chat** (Penn Engineering)

Participated in the Faculty Fireside Chat Series, where students may talk to professors and faculty in a small-group setting run by the Underrepresented Student Advisory Board in Engineering (USABE). USABE is an organization that works with SEAS leadership to promote diversity, equity, and inclusion through student advocacy. One of their initiatives includes student-faculty engagement and allowing students to interact in more casual settings with faculty.

2022-2024 Mentorship for Underrepresented Masters/Undergraduates at Penn (CIS)

Direct mentorship in research experiences of masters and undergraduate students that are underrepresented in CS (1 woman and 1 Ethiopean)

2021 Graduate Application Assistance Program (MIT)

Assisted applicants from under-represented groups with their graduate student applications to MIT's EECS PhD program.

2021-2022 MIT Undergraduate Research Opportunities Program (MIT)

Directly supervised an undergraduate for the UROP program at MIT; provided an opportunity for a member of an under-represented group to learn about machine learning and tackle a challenging research project

2020-2022 MEnTorEd Opportunities in Research (METEOR) (MIT)

Participated in the METEOR postdoc fellowship selection committee, an effort at CSAIL MIT to increase diversity, equity, and inclusion. Provided confidential technical feedback on candidates based on their application materials.

2019-2020 CMU AI Mentoring Program (CMU)

Mentored undergraduate women and minorities in one-on-one meetings to provide career advice and discuss research/graduate school; the mentee is now a PhD student at UC Berkeley.

2019-2020 **Tecknowledge Mentor** (Obama Academy)

Taught middle schoolers how to code as part of the Teknowledge outreach program at the Obama Academy; courses were intended to provide early exposure to computer science for under-represented students in low-income neighborhoods of Pittsburgh

2019 Mental Health First Aid Certification (CMU)

Underwent training to recognize mental health issues and provide first aid assistance to those in need

## Workshop Organizing

2023 **2nd New Frontiers in Adversarial Machine Learning**Organizer for the 2nd ICML 2023 workshop on new directions in adversarial machine learning

Website: https://advml-frontier.github.io/

2022 Workshop on Adversarial Machine Learning and Beyond

Organizer for an AAAI 2022 workshop broadly themed around adversarial machine

learning

Website: https://advml-workshop.github.io/aaai2022/

2022 New Frontiers in Adversarial Machine Learning

Organizer for an ICML 2022 workshop on new directions in adversarial machine

learning

Website: https://advml-frontier.github.io/

2021 A Blessing in Disguise: The Prospects and Perils of Adversarial Machine Learning

Organizer for an ICML 2021 workshop themed around the dangers and benefits of

adversarial machine learning adversarial machine learning. Website: https://advml-workshop.github.io/icml2021/

2021 Robust and reliable ML in the real world

Main organizer for an ICLR 2021 workshop on real world robustness.

Website: https://sites.google.com/connect.hku.hk/robustml-2021/home

## **Research Community Service**

2024	NSF SaTC Panelist
2024	ICML Area Chair
2023	WiML Workshop Mentor
2023	SatML Program Committee
2022	Principles of Distribution Shift Workshop at ICML Program Committee Website: https://sites.google.com/view/icml-2022-pods
2022	AAAI 2023 Doctoral Consortium Program Committee
2022	15th ACM Workshop on Artificial Intelligence and Security Program Committee Website: https://aisec.cc/
2021	14th ACM workshop on Artificial Intelligence and Security Program Committee Website: https://aisec.cc/

2020 Towards Trustworthy ML: Rethinking Security and Privacy for ML

Program Committee

Website: https://trustworthyiclr20.github.io/

2020 **AAAI** 

**Program Committee** 

2020-2024 ICML, NeurIPS, ICLR

Reviewer

2019 Human-Centric Machine Learning Workshop

Program Committee

Website: https://sites.google.com/view/hcml-2019

2019 Security and Privacy of Machine Learning Workshop at ICML

**Program Committee** 

Website: https://icml2019workshop.github.io/

2019 Adversarial Machine Learning in Real-World Computer Vision Systems at CVPR

Technical Program Commitee

2019 1st Workshop on Adversarial Learning Methods for Machine Learning and Data

Mining at KDD

**Technical Program Commitee** 

Website: https://sites.google.com/view/advml

2019 Safe Machine Learning Workshop at ICLR

Program Committee

Website: https://sites.google.com/view/safeml-iclr2019/