

RESEARCH INTERESTS

My vision is to safely and responsibly develop the next generation of generative artificial intelligence (AI) systems. I aim to enhance their capabilities while identifying and addressing emerging safety and security challenges in these systems.

Research topics: Generative AI, Multimodal learning, Unified vision foundation model, AI safety and alignment, Diffusion models, Video generative models, Data curation and benchmarking, Security & privacy, Data provenance

Sub-topics: Multimodal robust learning, Red teaming, Text-to-image/video models, Large-scale deep learning, Adversarial robustness, Data watermarking and tracing, Data memorization and privacy leakage, Membership inference, Differential privacy, Deepfake detection, Bias and fairness, Trustworthy AI

Phd thesis: Promises and Pitfalls of Generative AI: An AI-Safety Centric Approach (Princeton University)

WORK EXPERIENCE

- Research Scientist – *Sony AI*, USA 2023 - present
I lead research efforts on enhancing safety and utility of generative models at Sony AI.
- Research Internship – *Meta AI*, USA Summer 2021
Advisors – Caner Hazirbas, Cristian Canton Ferrer (*AI Red Team*)
Project: Generating novel hard instances from low-density regions using generative models.
- Research Internship – *Microsoft Research*, Redmond (USA) Summer 2019
Advisors – Jay Stokes, Cha Zhang
Project: Adversarial attacks and defenses beyond ℓ_p norms
- Research Internship – *Technische Universität Darmstadt*, Germany Summer 2016
Advisor – Heinz Koeppl
Project: A study of stochastic SIS disease spreading on random graphs

EDUCATION

Program	Institution	Years
Ph.D., Electrical and Computer Engineering <i>Advisors</i> – Prateek Mittal, Mung Chiang	Princeton University NJ, USA	2017 - 2023
M.A., Electrical Engineering	Princeton University NJ, USA	2017 - 2019
B.Tech., Electronics and Electrical Communication Engg.	Indian Institute of Technology (IIT) Kharagpur, INDIA	2013 - 2017

HONORS AND AWARDS

- Received the 2023 Adversarial Machine Learning (AdvML) rising star award 2023
- Graduate student award for excellence in service (ECE department, Princeton University) 2022
- Charlotte Elizabeth Proctor Honorific Fellowship, one of the highest honors at Princeton University 2022
- Best paper honorable mention award at ICLR workshop on Security and Safety in ML Systems 2021
- Winner of Qualcomm Innovation Fellowship, North America Region 2019
- Received best undergraduate thesis award (1 from 72 students) at IIT Kharagpur 2017
- IEEE student award from IEEE student branch of IIT Kharagpur 2016
- Awarded the WISE scholarship from German Academic Exchange Service (DAAD), Germany 2016
- Received Merit-cum-Means Scholarship from MHRD, Government of India 2013-17

PUBLICATIONS

Latest preprints and papers under review

- [Stretching Each Dollar: Diffusion Training from Scratch on a Micro-Budget](#)
Vikash Sehwal, Xianghao Kong, Jingtao Li, Michael Spranger, Lingjuan Lyu
Arxiv 2024 (We trained a stable diffusion quality model from scratch in only \$2,000)
- [Evaluating and Mitigating IP Infringement in Visual Generative AI](#)
Zhenting Wang, Chen Chen, Vikash Sehwal, Minzhou Pan, Lingjuan Lyu
Arxiv 2024, Under review
- [Activity Recognition on Avatar-Anonymized Datasets with Masked Differential Privacy](#)
David Schneider, Sina Sajadmanesh, Vikash Sehwal, Saquib Sarfraz, Rainer Stiefelhofen, Lingjuan Lyu, Vivek Sharma
Arxiv 2024, Under review
- [EnTruth: Enhancing the Traceability of Unauthorized Dataset Usage in Text-to-image Diffusion Models with Minimal and Robust Alterations](#)
Jie Ren, Yingqian Cui, Chen Chen, Vikash Sehwal, Yue Xing, Jiliang Tang, Lingjuan Lyu
Arxiv 2024, Under review
- [Position Paper: AI Risk Management Should Unambiguously Take into Account Both Safety and Security](#)
Qi et al., 2024
Under review
- [Scaling Compute Is Not All You Need for Adversarial Robustness](#)
Edoardo Debenedetti, Zishen Wan, Maksym Andriushchenko, Vikash Sehwal, Kshitij Bhardwaj, Bhavya Kailkhura
Arxiv 2023, Under review

Conference and Journal Publications

- [JailbreakBench: An Open Robustness Benchmark for Jailbreaking Large Language Models](#)
Patrick Chao, Edoardo Debenedetti, Alexander Robey, Maksym Andriushchenko, Francesco Croce, Vikash Sehwal, Edgar Dobriban, Nicolas Flammarion, George J. Pappas, Florian Tramèr, Hamed Hassani, Eric Wong
Neural Information Processing Systems (NeurIPS), 2024 - Datasets and Benchmarks Track
- [Finding a needle in a haystack: A Black-Box Approach to Invisible Watermark Detection](#)
Minzhou Pan, Zhenting Wang, Xin Dong, Vikash Sehwal, Lingjuan Lyu, Xue Lin
European Conference on Computer Vision (ECCV), 2024
- [How to Trace Latent Generative Model Generated Images without Artificial Watermark?](#)
Zhenting Wang, Vikash Sehwal, Chen Chen, Lingjuan Lyu, Dimitris N. Metaxas, Shiqing Ma
International Conference on Machine Learning (ICML), 2024
- [A New Linear Scaling Rule for Private Adaptive Hyperparameter Optimization](#)
Ashwinee Panda, Xinyu Tang, Vikash Sehwal, Saeed Mahloujifar, Prateek Mittal
International Conference on Machine Learning (ICML), 2024
- [Differentially Private Image Classification by Learning Priors from Random Processes](#)
Xinyu Tang, Ashwinee Panda, Vikash Sehwal, Prateek Mittal
Neural Information Processing Systems (NeurIPS), 2023 - Spotlight presentation
- [Extracting Training Data from Diffusion Models](#)
Nicholas Carlini, Jamie Hayes, Milad Nasr, Matthew Jagielski, Vikash Sehwal, Florian Tramèr, Borja Balle, Daphne Ippolito, Eric Wallace
USENIX Security Symposium, 2023
- [Uncovering Adversarial Risks of Test-Time Adaptation](#)
Tong Wu, Feiran Jia, Xiangyu Qi, Jiachen T. Wang, Vikash Sehwal, Saeed Mahloujifar, Prateek Mittal
International Conference on Machine Learning (ICML), 2023

* refers to equal contribution.

- [MultiRobustBench: Benchmarking Robustness Against Multiple Attacks](#)
Sihui Dai, Saeed Mahloujifar, Chong Xiang, **Vikash Sehwal**, Pin-Yu Chen, Prateek Mittal
International Conference on Machine Learning (ICML), 2023
- [A Light Recipe to Train Robust Vision Transformers](#)
Edoardo Debenedetti, **Vikash Sehwal**, Prateek Mittal
IEEE Conference on Secure and Trustworthy Machine Learning (SaTML), 2023
- [Generating High Fidelity Data from Low-density Regions using Diffusion Models](#)
Vikash Sehwal, Caner Hazirbas, Albert Gordo, Firat Ozgenel, Cristian Canton Ferrer
Conference on Computer Vision and Pattern Recognition (CVPR), 2022
- [Understanding Robust Learning through the Lens of Representation Similarities](#)
Christian Cianfarani*, Arjun Nitin Bhagoji*, **Vikash Sehwal***, Ben Zhao, Prateek Mittal, Haitao Zheng
Neural Information Processing Systems (NeurIPS), 2022
- [Robust Learning Meets Generative Models: Can Proxy Distributions Improve Adversarial Robustness?](#)
Vikash Sehwal, Saeed Mahloujifar, Tinashe Handina, Sihui Dai, Chong Xiang, Mung Chiang, Prateek Mittal
International Conference on Learning Representations (ICLR), 2022
- [RobustBench: a standardized adversarial robustness benchmark](#)
Francesco Croce*, Maksym Andriushchenko*, **Vikash Sehwal***, Edoardo Debenedetti*, Nicolas Flammarion, Mung Chiang, Prateek Mittal, Matthias Hein
Neural Information Processing Systems (NeurIPS), 2021 - *Datasets and Benchmarks Track*
Won best paper honorable mention prize at ICLR 2021 workshop on Security and Safety in Machine Learning Systems.
- [Lower Bounds on Cross-Entropy Loss in the Presence of Test-time Adversaries](#)
Arjun Nitin Bhagoji, Daniel Cullina, **Vikash Sehwal**, Prateek Mittal
International Conference on Machine Learning (ICML), 2021
- [SSD: A Unified Framework for Self-Supervised Outlier Detection](#)
Vikash Sehwal, Mung Chiang, Prateek Mittal
International Conference on Learning Representations (ICLR), 2021
Short version accepted at NeurIPS 2020 Workshop on Self-Supervised Learning - Theory and Practice
- [Beyond \$\ell_p\$ Norms: Delving Deeper into Robustness to Physical Image Transformations](#)
Vikash Sehwal, Jay Stokes, Cha Zhang
IEEE Military Communications Conference (MILCOM), 2021
- [PatchGuard: Provable Defense against Adversarial Patches Using Masks on Small Receptive Fields](#)
Chong Xiang, Arjun Nitin Bhagoji, **Vikash Sehwal**, Prateek Mittal
USENIX Security Symposium, 2021
- [HYDRA: Pruning Adversarially Robust Neural Networks](#)
Vikash Sehwal, Shiqi Wang, Prateek Mittal, Suman Jana
Neural Information Processing Systems (NeurIPS), 2020
- [Fast-Convergent Federated Learning](#)
Hung T. Nguyen, **Vikash Sehwal**, Seyyedali Hosseinalipour, Christopher G. Brinton, Mung Chiang, H. Vincent Poor
IEEE Journal on Selected Areas in Communications (J-SAC) - Series on Machine Learning for Communications and Networks, 2020

Peer-reviewed Workshop Publications

- [Differentially Private Generation of High Fidelity Samples From Diffusion Models](#)
Vikash Sehwal*, Ashwinee Panda*, Ashwini Pople, Xinyu Tang, Saeed Mahloujifar, Mung Chiang, Zico Kolter, Prateek Mittal
ICML workshop on Deployable Generative AI, 2023
- [Just Rotate it: Deploying Backdoor Attacks via Rotation Transformation](#)
Tong Wu, Tianhao Wang, **Vikash Sehwal**, Saeed Mahloujifar, Prateek Mittal
In Proceedings of the 12th ACM Workshop on Artificial Intelligence and Security (AISec), 2022

- [Robustness from Perception](#)
Saeed Mahloujifar, Chong Xiang, **Vikash Sehwal**, Sihui Dai, Prateek Mittal
ICLR workshop on Security and Safety in Machine Learning Systems, 2021
- [Time for a Background Check! Uncovering the impact of Background Features on Deep Neural Networks](#)
Vikash Sehwal, Rajvardhan Oak, Mung Chiang, Prateek Mittal
ICML workshop on Object-Oriented Learning, 2020
- [On separability of self-supervised representations](#)
Vikash Sehwal, Mung Chiang, Prateek Mittal
ICML workshop on Uncertainty & Robustness in Deep Learning, 2020
- [On Pruning Adversarially Robust Neural Networks](#)
Vikash Sehwal, Shiqi Wang, Prateek Mittal, Suman Jana
ICLR workshop on Towards Trustworthy ML, 2020
- [Analyzing the robustness of open-world machine learning](#)
Vikash Sehwal*, Arjun Nitin Bhagoji*, Liwei Song*, Chawin Sitawarin, Daniel Cullina, Mung Chiang, Prateek Mittal
In Proceedings of the 12th ACM Workshop on Artificial Intelligence and Security (AISec), 2019
- [Not All Pixels are Born Equal: An Analysis of Evasion Attacks under Locality Constraints](#)
Vikash Sehwal, Chawin Sitawarin, Arjun Nitin Bhagoji, Arsalan Mosenia, Mung Chiang, Prateek Mittal
Poster at ACM SIGSAC Conference on Computer and Communications Security (CCS), 2018.

ACADEMIC SERVICES

Teaching

- Lecture on basics of adversarial machine learning at Princeton-Intel REU Seminar 2021
- Teaching assistant for ECE 574: Security & Privacy Fall 2021
- Taught a mini-course on adversarial attacks & defenses in Wintersession at Princeton University 2020
- Teaching assistant for ECE 535: Machine Learning and Pattern Recognition Fall 2019

Mentoring

I strongly believe in mentoring the next generation of researchers.

- *Christian Cianfarani* - Graduate student at University of Chicago. 2021-2023
- *Edoardo Debenedetti* - Master's student at École polytechnique fédérale de Lausanne (EPFL) 2021-2022
- *Rajvardhan Oak* - Master's student at University of California, Berkeley Summer 2020
- *Tinashe Handina* (B.S.E., Electrical Engineering 2021) - now a graduate student at Caltech.
- *Matteo Russo* (B.S.E., Computer Science 2020) - now a masters student at ETH Zurich.

Peer reviewing Conference on Neural Information Processing Systems (NeurIPS) - 2021, 2022, 2023; IEEE Conference on Secure and Trustworthy Machine Learning (SaTML) - 2023, 2024; International Conference on Learning Representations (ICLR) - 2022, 2024; ACM Computing Surveys - 2023; Transactions on Machine Learning Research (TMLR) - 2022; International Conference on Machine Learning (ICML) - 2022; Conference on Computer Vision and Pattern Recognition (CVPR) - 2022; International Conference on Computer Vision (ICCV) - 2021, 2023; Privacy Enhancing Technologies Symposium (PETS) - 2021, 2022; Conference on Information Sciences and Systems (CISS) - 2020, 2022; PLOS Computational Biology - 2020; ACM Transactions on Privacy and Security (TOPS) - 2019; USENIX Security Symposium - 2018, 2019

Other Services

- Workshop organizer - ICCV 2023 ARROW workshop, CVPR 2023 Workshop of Adversarial Machine Learning on Computer Vision: Art of Robustness 2023
- Program committee member for IEEE Conference on Secure and Trustworthy Machine Learning 2023
- Organized more than 20 talks on security & privacy in machine learning ([SPML seminar series](#)) 2022
- Part of core maintaining team of Adversarial Robustness Benchmark ([robustbench.github.io](#)) 2020-now
- Volunteered as junior mentor at Princeton-OLCF-NVIDIA GPU Hackathon 2020

INVITED TALKS

- On Safety Risks of Generative AI - From ChatGPT to DallE.3
Invited speaker at Responsible AI Webinar, Columbia University Nov 2023
- Prospects and Pitfalls of modern generative models - An AI safety perspective
Workshop on Practical Deep Learning in the Wild (AAAI 2023) Feb 2023
- Enhancing machine learning using synthetic data distilled from generative models
Microsoft Research, Cambridge Jan 2023
- Role of synthetic data in trustworthy machine learning
University of Chicago; University of California, Berkeley May 2022
- A generative approach to robust machine learning
Annual Conference on Information Sciences and Systems (CISS) Mar 2022
- A generative approach to robust machine learning ([link](#))
RIKEN-AIP TrustML Young Scientist Seminar, Japan Jan 2022
- Generating novel hard-instances from low-density regions using generative models
Facebook AI, USA Aug 2021
- A primer on adversarial machine learning
Princeton-Intel REU Seminar July 2021
- Embedding data distribution to make machine learning more reliable
Adversarial robustness seminar, École polytechnique fédérale de Lausanne (EPFL) March 2021
- Private Deep Learning Made Practical
Qualcomm, San Diego Oct 2019