NICHOLAS ROBERTS

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EDUCATION

University of Wisconsin - Madison August 2021 - Present
Ph.D. Computer Science, Mathematics minor
- Advisor: Frederic Sala

Carnegie Mellon University August 2019 - May 2021
M.S. Machine Learning
- Advisors: Ameet Talwalkar, Zachary C. Lipton

University of California San Diego September 2015 - March 2019
B.S. Computer Science, Mathematics minor
- Advisors: Sanjoy Dasgupta, Garrison W. Cottrell
- Magna Cum Laude with CSE department Highest Distinction honors

Fresno City College August 2013 - May 2015

PUBLICATIONS

*equal contribution, +alphabetical

CONFERENCE PUBLICATIONS

Tianyi Zhang*, Linrong Cai*, Jeffrey Li, **Nicholas Roberts**, Neel Guha, Frederic Sala. (2024). *Stronger Than You Think: Benchmarking Weak Supervision on Realistic Tasks.* Neural Information Processing Systems (NeurIPS) Datasets and Benchmarks Track, 2024.

Nicholas Roberts, Xintong Li, Dyah Adila, Sonia Cromp, Tzu-Heng Huang, Jitian Zhao, Frederic Sala. (2023). *Geometry-Aware Adaptation for Pretrained Models.* Neural Information Processing Systems (NeurIPS), 2023.

Mayee Chen, **Nicholas Roberts**, Kush Bhatia, Jue Wang, Ce Zhang, Frederic Sala, Christopher Ré. (2023). *Skill-it! A data-driven skills framework for understanding and training language models.* Neural Information Processing Systems (NeurIPS), 2023 (spotlight).

Benedikt Boecking, **Nicholas Roberts**, Willie Neiswanger, Stefano Ermon, Frederic Sala, Artur Dubrawski. (2023). *Generative Modeling Helps Weak Supervision (and Vice Versa).* International Conference on Learning Representations (ICLR), 2023.

Nicholas Roberts*, Xintong Li*, Tzu-Heng Huang, Dyah Adila, Spencer Schoenberg, Cheng-Yu Liu, Lauren Pick, Haotian Ma, Aws Albarghouthi, Frederic Sala. (2022). *AutoWS-Bench-101: Benchmarking Automated Weak Supervision with 100 Labels.* Neural Information Processing Systems (NeurIPS) Datasets and Benchmarks Track, 2022.

Renbo Tu*, **Nicholas Roberts***, Mikhail Khodak, Junhong Shen, Frederic Sala, Ameet Talwalkar. (2022). *NAS-Bench-360: Benchmarking Neural Architecture Search on Diverse Tasks.* Neural Information Processing Systems (NeurIPS) Datasets and Benchmarks Track, 2022.

Harit Vishwakarma, **Nicholas Roberts**, Frederic Sala. (2022). Lifting Weak Supervision To Structured Prediction. Neural Information Processing Systems (NeurIPS), 2022.

Changho Shin, Winfred Li, Harit Vishwakarma, **Nicholas Roberts**, Frederic Sala. (2022). *Universalizing Weak Supervision.* International Conference on Learning Representations (ICLR), 2022.

Nicholas Roberts*, Mikhail Khodak*, Tri Dao, Liam Li, Christopher Ré, Ameet Talwalkar. (2021). *Rethinking Neural Operations for Diverse Tasks.* Neural Information Processing Systems (NeurIPS), 2021.

Sanjoy Dasgupta, Akansha Dey, **Nicholas Roberts**, Sivan Sabato. (2018). *Learning from discriminative feature feedback.* Neural Information Processing Systems (NeurIPS), 2018.

JOURNAL PUBLICATIONS

Nicholas Roberts*, Samuel Guo*, Cong Xu*, Ameet Talwalkar, David Lander, Lvfang Tao, Linhang Cai, Shuaicheng Niu, Jianyu Heng, Hongyang Qin, Minwen Deng, Johannes Hog, Alexander Pfefferle, Sushil Ammanaghatta Shivakumar, Arjun Krishnakumar, Yubo Wang, Rhea Sukthanker, Frank Hutter, Euxhen Hasanaj, Tien-Dung Le, Mikhail Khodak, Yuriy Nevmyvaka, Kashif Rasul, Frederic Sala, Anderson Schneider, Junhong Shen, Evan Sparks. (2023). *AutoML Decathlon: Diverse Tasks, Modern Methods, and Efficiency at Scale.* NeurIPS 2022 Competition Track, Proceedings of Machine Learning Research (PMLR).

Aarohi Srivastava+, ..., **Nicholas Roberts**+ (276), ..., (442 authors). (2023). *Beyond the Imitation Game: Quantifying and Extrapolating the Capabilities of Language Models.* Transactions on Machine Learning Research (TMLR), 2023 (Finalist for Outstanding Certification).

Kaustubh D. Dhole, ..., **Nicholas Roberts** (85), ..., (128 authors). (2023). *NL-Augmenter: A Framework for Task-Sensitive Natural Language Augmentation.* Northern European Joural of Language Technology (NEJLT), 2023.

Chen Zhang*, Yerlan Idelbayev*, **Nicholas Roberts**, Yiwen Tao, Yashwanth Nannapaneni, Brendan M. Duggan, Jie Min, Eugene C. Lin, Erik C. Gerwick, Garrison W. Cottrell, William H. Gerwick. (2017). *Small Molecule Accurate Recognition Technology (SMART) to Enhance Natural Products Research.* Scientific Reports.

WORKSHOP PUBLICATIONS & PREPRINTS

Nicholas Roberts, Niladri Chatterji, Sharan Narang, Mike Lewis, Dieuwke Hupkes. (2025). *Compute Optimal Scaling of Skills: Knowledge vs Reasoning.* Preprint.

Deepak Nathani, Lovish Madaan, **Nicholas Roberts**, Nikolay Bashlykov, Ajay Menon, Vincent Moens, Amar Budhiraja, Despoina Magka, Vladislav Vorotilov, Gaurav Chaurasia, Dieuwke Hupkes, Ricardo Silveira Cabral, Tatiana Shavrina, Jakob Foerster, Yoram Bachrach, William Yang Wang, Roberta Raileanu. (2025). *MLGym: A New Framework and Benchmark for Advancing AI Research Agents.* Preprint.

Sonia Cromp, Satya Sai Srinath Namburi GNVV, Catherine Cao, Mohammed Alkhudhayri, Samuel Guo, **Nicholas Roberts**, Frederic Sala. (2024). *Tabby: Tabular Adaptation for Language Models.* NeurIPS 2024 Table Representation Learning Workshop.

Nicholas Roberts, Samuel Guo, Zhiqi Gao, Satya Sai Srinath Namburi GNVV, Sonia Cromp, Chengjun Wu, Chengyu Duan, Frederic Sala. (2024). *Pretrained Hybrids with MAD Skills.* ICML 2024 Long-Context Foundation Models (LCFM) Workshop. ICML 2024 Next Generation of Sequence Modeling Architectures (NGSM) Workshop. ICML 2024 Efficient Systems for Foundation Models (ES-FoMo) Workshop. ICML 2024 Workshop on Foundation Models in the Wild.

Wenxuan Tan, **Nicholas Roberts**, Tzu-Heng Huang, Jitian Zhao, John Cooper, Samuel Guo, Chengyu Duan, Frederic Sala. (2024). *MoRe Fine-Tuning with 10x Fewer Parameters.* ICML 2024 Efficient Systems for Foundation Models (ES-FoMo) Workshop. ICML 2024 Workshop on Foundation Models in the Wild.

Nicholas Roberts, Yingyu Liang, Frederic Sala. (2023). *Understanding Neural Architecture Search by its Architecture Parameters.* Midwest Machine Learning Symposium 2023.

Tzu-Heng Huang, Harit Vishwakarma, Catherine Cao, Spencer Schoenberg, **Nicholas Roberts**, Frederic Sala. (2023). *ScriptoriumWS: A Code Generation Assistant for Weak Supervision.* ICLR 2023 Deep Learning for Code Workshop.

Renbo Tu, **Nicholas Roberts**, Vishak Prasad, Sibasis Nayak, Paarth Jain, Frederic Sala, Ganesh Ramakrishnan, Ameet Talwalkar, Willie Neiswanger, Colin White. (2022). *AutoML for Climate Change: A Call to Action.* NeurIPS 2022 Tackling Climate Change with Machine Learning Workshop.

Nicholas Roberts, Davis Liang, Graham Neubig, Zachary C. Lipton. (2020). *Decoding and Diversity in Machine Translation.* NeurIPS 2020 Resistance AI Workshop.

Mikhail Khodak, Liam Li, **Nicholas Roberts**, Maria-Florina Balcan, Ameet Talwalkar. (2020). *A Simple Setting for Understanding Neural Architecture Search with Weight-Sharing.* ICML 2020 AutoML Workshop.

Mikhail Khodak*, Liam Li*, **Nicholas Roberts**, Maria-Florina Balcan, Ameet Talwalkar. (2020). *Weight-Sharing Beyond Neural Architecture Search: Efficient Feature Map Selection and Federated Hyperparameter Tuning.* MLSys 2020 On-Device Intelligence Workshop.

Nicholas Roberts, Dian A. Yap, Vinay U. Prabhu. (2019). *Deep Connectomics Networks: Neural Network Architectures Inspired by Neuronal Networks.* NeurIPS 2019 Real Neurons and Hidden Units Workshop.

Nicholas Roberts, Poornav S. Purushothama, Vishal T. Vasudevan, Siddarth Ravichandran, Chen Zhang, William H. Gerwick, Garrison W. Cottrell. (2019). *Using Deep Siamese Neural Networks to Speed up Natural Products Research.* NeurIPS 2019 workshop on Machine Learning and the Physical Sciences.

Dian A. Yap, **Nicholas Roberts**, Vinay U. Prabhu. (2019). *Grassmannian Packings in Neural Networks: Learning with Maximal Subspace Packings for Diversity and Anti-Sparsity.* NeurIPS 2019 Workshop on Bayesian Deep Learning.

Nicholas Roberts, Vinay U. Prabhu, Matthew McAteer. (2019). *Model Weight Theft With Just Noise Inputs: The Curious Case of the Petulant Attacker.* ICML 2019 Workshop on Security and Privacy of Machine Learning.

PRESENTATIONS

The Science of Scaling Laws

Invited Talk William Yang Wang group.
Host: Deepak Nathani
UCSB – Santa Barbara, California. March 2025.

Compute Optimal Scaling of Skills: Knowledge vs Reasoning

Invited Talk Meta Generative AI Tech Talks.
London, England. February 2025.

Hybrid Foundation Models

Guest Lecture UW-Madison CS 839: Foundation Models.
Madison, WI. October 2024.

Geometry-Aware Adaptation for Pretrained Models

Invited Talk CMU AI Seminar.
Hosts: Zico Kolter, Asher Trockman
Carnegie Mellon University – Pittsburgh, PA. October 2023.

Geometry-Aware Adaptation for Pretrained Models

Invited Talk UW Madison IFDS Ideas Forum.
Host: Sebastien Roch
Madison, WI. October 2023.

AutoML Cup 2023

Invited Talk AutoML Conference 2023.
Host: Frank Hutter
Hasso-Plattner Institut – Potsdam/Berlin, Germany. September 2023.

Toward Data-Structured Prediction

Lightning Talk MLCommons Rising Stars 2023 Workshop.
Hosts: Udit Gupta, Abdulrahman Mahmoud, Lillian Pentecost
Google – Sunnyvale, CA. August 2023.

Geometry-Aware Adaptation for Pretrained Models

Invited Talk Microsoft Research, ML Foundations Seminar.
Host: Sébastien Bubeck.
Microsoft – Redmond, WA. August 2023.

The AutoML Decathlon: Diverse Tasks, Modern Methods, and Efficiency at Scale

Invited Talk AutoML Seminar.
Host: Aaron Klein.
Online. April 2023.

AutoML Decathlon Hackathon

Invited Hackathon AutoML Fall School.
Host: Frank Hutter.
Freiburg, Germany. October 2022.

Rethinking AutoML for Diverse Tasks

Invited Talk Physics ∩ ML Seminar, University of Wisconsin - Madison.
Host: Gary Shiu
Madison, WI. March 2022.

Searching for Convolutions and a More Ambitious NAS

Plenary Talk AAAI 2021 Workshop on Learning Network Architecture During Training.
Online. February 2021.

Model Weight Theft With Just Noise Inputs: The Curious Case of the Petulant Attacker

Spotlight Presentation ICML 2019 Workshop on Security and Privacy of Machine Learning.
Long Beach, CA, USA. June 2019.

Small Molecule Accurate Recognition Technology: A Digital Frontier to Reshape Natural Product Research

Spotlight Presentation Applied Machine Learning Days 2018.
EPFL – Lausanne, Switzerland. January 2018.

AWARDS

Jane Street Ph.D. Fellowship (honorable mention) 2025
Jane Street Capital

NeurIPS Scholar Award 2023
Neural Information Processing Systems (NeurIPS)

ML and Systems Rising Stars Award 2023
MLCommons

NeurIPS Scholar Award 2022
Neural Information Processing Systems (NeurIPS)

Prove AI Fellowship 2021
Prove AI Labs

First-Year CS Departmental Scholarship 2021
University of Wisconsin - Madison

NeurIPS "Travel" Award 2020
Neural Information Processing Systems (NeurIPS)

UnifyID AI Fellowship 2019
UnifyID AI Labs

Outstanding Undergraduate Researcher Award (honorable mention) 2019
Computing Research Association (CRA)

NeurIPS Travel Award 2018
Neural Information Processing Systems (NeurIPS)

Best Spotlight Presentation Award 2018
Applied Machine Learning Days (AMLD)

EXPERIENCE

University of Wisconsin - Madison August 2021 -
Research Assistant (Sprocket Lab led by Frederic Sala)

· Ph.D. research on Foundation Models, Data-Centric AI, and Automated ML advised by Frederic Sala

Meta August 2024 - February 2025
Research Scientist Intern (Llama Generative AI pretraining with Dieuwke Hupkes)

· Research on skills and scaling laws for LLM training.

Together AI May 2024 - August 2024
Research Intern (mentored by Tri Dao)

· Research on mechanistic interpretability of hybrid LLM architectures.

Microsoft Research June 2023 - September 2023
Research Intern (Physics of AGI group led by Sébastian Bubeck)

· Developed activation function search techniques for large-scale LLM pretraining
· Developed learning curve extrapolation techniques to ablate architectural choices in transformers

Carnegie Mellon University May 2020 - August 2020, May 2021 - August 2021
Research Assistant (SAGE Lab led by Ameet Talwalkar)

· Explored two directions for expanding NAS search spaces: large scale edge learning and operation learning
· Gave monthly research presentations to J.P. Morgan researchers

Amazon AWS AI June 2019 - August 2019
Applied Scientist Intern (AWS Transcribe research led by Katrin Kirchhoff)

· Identified areas for improvement in existing ASR systems when recognizing rare or zero shot entities
· Researched and developed methods for hypothesis rescoring in ASR systems using neural language modeling

UnifyID February 2019 - June 2019
Machine Learner Intern (mentored by Vinay Uday Prabhu)

· Developed a novel model extraction attack against deep learning models for computer vision using just noise inputs
· Researched ways to apply network neuroscience findings to deep learning

Intuit June 2018 - September 2018
Software Engineering Intern

· Researched and implemented a novel controllable text generation model as a service within Intuit
· Identified dynamic topic models as a promising direction for analyzing customer support tickets over time

Altum January 2018 - May 2018
Applied Scientist Intern

· Developed language model to extract NLP features from text data for cryptocurrency trading
· Implemented SoTA unsupervised sentiment analysis models for classifying streaming online forum data

UCSD CSE Department September 2017 - March 2018
Data Science Tutor

· Tutored DSC 10 Introduction to Data Science, under Professor Janine Tiefenbruck
· Tutored DSC 20 Principles of Data Science, under Professor Marina Langlois

Teradata June 2017 - September 2017
Software Engineering Intern

· Improved training methodology and architecture of deep learning time series model used internally
· Developed open source Spark-Teradata connector forked from Databricks connector for AWS Redshift

Skqrl June 2016 - December 2016
Software Engineering Intern

· Developed web scraping tool to compile product data
· Designed and implemented search pipeline and database using Python, Django, and MySQL

ModSpot January 2016 - March 2016
Software Engineering Intern

· Implemented new user account, edit profile, and login designs in Objective-C for iOS application
· Refactored analytics code for gathering statistics on app usage

The Comeback Community June 2015 - September 2015
Volunteer Full Stack Developer

· Developed website for educational nonprofit using Google Cloud Platform

Fresno City College January 2015 - May 2015
Tutor

· Tutored calculus, linear algebra, data structures, discrete mathematics, and Android app development

Fresno County Sheriff's Office May 2013 - August 2013
IT Intern

· Replaced malfunctioning hardware in employee PCs

MENTORING

Linrong Cai 2023 - Present

· Current position: undergraduate in Computer Science at Wisconsin

Tianyi Zhang 2023 - Present

· Current position: undergraduate in Computer Science at University of Washington

Chengyu Duan 2023 - Present

· Current position: undergraduate in Computer Science at Wisconsin

Chengjun Wu 2023 - Present

· Current position: undergraduate in Computer Science at Wisconsin

Zhiqi Gao 2023 - 2024

· Current position: Ph.D. student in Computer Science at Wisconsin

Spencer Schoenberg 2021 - 2022

· Current position: Ph.D. student in Computer Science at Wisconsin

Xintong Li 2021 - 2023

· Current position: Ph.D. student in Computer Science at UCSD

LEADERSHIP, ACTIVITIES, SERVICE, AND EXTRACURRICULAR

Wisconsin:	AutoML Conference 2023	Competition Chair
	NeurIPS 2022 High School Outreach	Group Leader
	Lead competition organizer:	
	AutoML Cup 2023	
	AutoML Decathlon competition @ NeurIPS 2022	
	AutoML Decathlon Hackathon @ Wisconsin	
	AutoML Decathlon Hackathon @ the AutoML Fall School 2022	
	Reviewer:	
	NeurIPS 2022, 2023, 2024	
	NeurIPS Datasets and Benchmarks Track 2021, 2022, 2023, 2024	
	ICLR 2024, 2025	
	ICML 2022, 2023, 2024	
	ICML Efficient Systems for Foundation Models Workshop 2023, 2024	
	ICML Mechanistic Interpretability Workshop 2024	
	AAAI Spring Symposium on Clinical Foundation Models 2024	
	AISTATS 2023	
	AutoML 2023	
	AutoML 2023 Workshop Track	
	AutoML 2024 ABCD Track	
	TMLR	
	Scratch Club	Instructor
	Wisconsin Hoofer Sailing Club	Member
	Wisconsin Triathlon Team	Member
CMU:	MSML Student Committee 2019-2021	Event Organizer
	MSML Admissions Committee 2020-2021	Committee Member
UCSD:	Tau Beta Pi Engineering Honor Society	House Leader
	Triton Engineering Student Council	Data Analyst
	Data Science Student Society	Workshop Coordinator
FCC:	Google Developer Group Fresno City College	President/Founder
	Science and Engineering Club	Treasurer

TECHNOLOGIES AND SKILLS

Competent:	Python, PyTorch, AWS, TensorFlow, Java, Scala, C/C++, Unix, Docker
Familiar:	SQL, Kaldi ASR, Google Cloud Platform, Matlab/Octave, JavaScript