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Brando Miranda

Gates Bldg., 353 Jane Stanford Way

Google Scholar; Website; Stanford Profile; MIT Website

Education

Ph.D. in Computer Science *2022-2026 (expected)*
Stanford University GPA: 4.045/4.0
Advisor: Prof. Sanmi Koyejo, Stanford Trustworthy AI Research (STAIR) group
Fellowships: Stanford School of Engineering Fellowship, EDGE Scholar

Master of Engineering in Electrical Engineering and Computer Science *2014-2016*
Massachusetts Institute of Technology GPA: 4.8/5.0
Advisor: Prof. Tomaso Poggio, Center for Brains, Minds and Machines (CBMM)

Bachelor of Science, Computer Science and Engineering *2010-2014*
Massachusetts Institute of Technology minor in Mathematics & Music

Coursework

- Statistical Learning Theory
- Artificial Intelligence
- Linear Algebra
- Distributed Systems
- Computer System Security
- Learning to Learn
- Multi-variable Calculus
- Intro to Machine Learning
- Probability & Random Variables
- Computability & Complexity
- Differential Equations
- Computer System Engineering
- Reinforcement Learning & MDPs
- Mathematical Logic
- Algorithmic Aspects of Machine Learning
- Algorithms for Inference (PGMs)
- Design & Analysis of Algorithms
- Online Methods in Machine Learning
- Programming Language Semantics
- Formal Software Development Methods
- Advances in Foundation Models

Research Experience

Stanford University - Stanford, CA *September 2022 - 2026 (expected)*
Ph.D. Student in Computer Science

- Machine Learning PhD student with professor Sanmi Koyejo conducting research on data-centric machine learning for Frontier Models, formal reasoning and verification, and scaling laws for LLMs.
- Published award-winning work challenging prevailing notions of "emergent abilities" in large language models (NeurIPS Outstanding Paper Award 2023).
- Leading development of VeriBench and Putnam-AXIOM benchmarks for evaluating AI mathematical reasoning (both accepted at ICML 2025).
- Research mentor for undergraduate and master's students focused on data quality for Foundation Models.

Morph Labs - Remote *2023*
Machine Learning Research Scientist Consultant

- Made key contributions to Morph Prover v0-7B, the first frontier model for the Lean 4 formal verification programming language.
- Led the creation of the embedding system for Moogle.ai, the first search engine for verified code in Lean.

Wise Agents - Stanford Spin-out *2023*
AI Research Consultant

- Consulted on AI agent-based systems to transform sales performance.
- Company featured in Forbes Mexico.

IBM - ML Research Internship - Yorktown Heights, NY *May 2022 - August 2022*
Graduate Research Intern

- PhD research intern studying the ability of Transformer models to predict mathematical formal proofs using the program representation in the theorem proving language of Coq.

University of Illinois Urbana-Champaign - Urbana-Champaign, IL *September 2018 - 2021*
Graduate Student

- PhD student with professor Sanmi Koyejo working on the foundations of meta-learning and cognitively inspired deep learning methods for program synthesis, theorem proving and reasoning.

IBM - ML Research Internship - Yorktown Heights, NY *May 2021 - August 2021*
Graduate Research Intern

- PhD Research Intern studying the optimization and architectural inductive biases of Transformer models for the task of type inference of programs.

MIT CBMM (Center for Brain Minds & Machines) - Cambridge, MA *June 2015 - September 2018*
Research Assistant

- Research assistant with professor Tomaso Poggio working on Deep Learning Theory
- Graduate research assistant, thesis topic; Training methods for Deep Gaussian Networks and function approximation for compositional hierarchical functions
- My website at CBMM: https://cbmm.mit.edu/about/people/miranda

MIT CBMM (Center for Brain Minds & Machines), UIUC & Stanford *June 2016 - present*
Research Mentor

- Stanford: Research mentor with an Undergraduate and two master students on studying data quality for Foundation Models.
- UIUC: Research mentor for the REU programs
- MIT CBMM: Research leader mentoring undergraduates with the Engineering of Intelligence Team (EIT)

Publications

Google Scholar metrics: 2,948+ citations — h-index: 17 — i10-index: 22

2025

R. Schaeffer, H. Schoelkopf, B. Miranda, G. Mukobi, V. Madan, A. Ibrahim, H. Bradley, S. Biderman, S. Koyejo, Why Has Predicting Downstream Capabilities of Frontier AI Models with Scale Remained Elusive?
(**ICML 2025** & **ICML TiFA Workshop Outstanding Paper Award 2024**)

A. Gulati, B. Miranda, E. Chen, E. Xia, K. Fronsdal, B. de Moraes Dumont, S. Koyejo, Putnam-AXIOM: A Functional & Static Benchmark for Measuring Higher Level Mathematical Reasoning in LLMs.
(**ICML 2025** & NeurIPS MATH-AI Workshop 2024)

B. Miranda, Z. Zhou, A. Nie, E. Obbad, L. Aniva, K. Fronsdal, W. Kirk, D. Soylu, et al., VeriBench: End-to-End Formal Verification Benchmark for AI Code Generation in Lean 4.
(**2nd AI for Math Workshop @ ICML 2025**)

Z. Zhou, X. Lu, C. Cao, B. Miranda, T. Liu, B. Han, S. Koyejo, CoDaPO: Confidence and Difficulty-Adaptive Policy Optimization for Post-Training Language Models.
(**2nd AI for Math Workshop @ ICML 2025**)

L. Aniva, C. Sun, B. Miranda, C. Barrett, S. Koyejo, Pantograph: A machine-to-machine interaction interface for advanced theorem proving, high level reasoning, and data extraction in Lean 4.
(**TACAS 2025** - International Conference on Tools and Algorithms for the Construction and Analysis of Systems)

R. Schaeffer, B. Miranda, J. Kazdan, K. Liu, A. M. Ahmed, N. Mireshghallah, et al., Causally Quantifying the Effect of Test Set Contamination on Generative Benchmarks.
(NeurIPS 2025 Workshop on Evaluating the Evolving LLM Lifecycle)

R. Schaeffer, J. Kazdan, Y. Denisov-Blanch, B. Miranda, M. Gerstgrasser, et al., Position: Machine Learning Conferences Should Establish a 'Refutations and Critiques' Track.
(Preprint 2025)

2024

R. Schaeffer, D. Valentine, L. Bailey, J. Chua, et al., B. Miranda, et al., S. Koyejo, E. Perez, Failures to Find Transferable Image Jailbreaks Between Vision-Language Models.
(**ICLR 2024** & NeurIPS Red Teaming GenAI Workshop 2024)

R. Schaeffer, M. Khona, S. Chandra, M. Ostrow, B. Miranda, S. Koyejo, Does Maximizing Neural Regression Scores Teach Us About The Brain?
(UniReps Workshop 2nd Edition, NeurIPS 2024)

K. Chawla, A. Sahai, M. DePavia, S. Sundar, B. Miranda, Quantifying the Importance of Data Alignment in Downstream Model Performance.
(ICLR 2024 Workshop on Data-centric Machine Learning Research)

A. Gulati, D. Ladsaria, S. Mishra, J. Sidhu, B. Miranda, An Evaluation Benchmark for Autoformalization in Lean4.
(The Second Tiny Papers Track at ICLR 2024)

2023

R. Schaeffer, B. Miranda, S. Koyejo, Are Emergent Abilities of Language Models a Mirage?
(**NeurIPS Outstanding Paper Award & Oral 2023**, Stanford IEEE Invited Talk 2023)
Featured in: New York Times, Quanta Magazine, Forbes, Stanford HAI. Cited in the 2024 Economic Report of the President (White House).

B. Miranda (ML Research Scientist Consultant) & Morph Labs Team, Morph Prover v0 7b: The 1st Frontier Model for the Lean 4 Formal Verification Programming Language.
[Blog] [Hugging Face Model Card]

A. Lee*, B. Miranda*, P. Yu, S. Koyejo, Beyond Scale: the Diversity Coefficient as a Data Quality Metric Demonstrates LLMs are Pre-trained on Formally Diverse Data.
(ICML Data-Centric ML Workshop & ICML Deployable Generative AI Workshop 2023) (*equal contribution)

B. Miranda, P. Yu, S. Goyal, Y. Wang, S. Koyejo, Is Pre-training Truly Better Than Meta-Learning?
(Preprint 2023)

B. Miranda, A. Shinnar, V. Pestun, B. Trager, Transformer Models for Type Inference in the Simply Typed Lambda Calculus: A Case Study in Deep Learning for Code.
(Preprint 2023)

2022

B. Miranda, P. Yu, Y. Wang, S. Koyejo, The Curse of Zero Task Diversity: the Failure of Transfer Learning to Outperform MAML and their Empirical Equivalence.
(NeurIPS Contributed Talk - Meta-learning Workshop 2022)

2021

B. Miranda, Y. Wang, S. Koyejo, Does MAML Only Work via Feature Re-use? A Data Set Centric Perspective.
(Preprint 2021)

2020

B. Miranda, An Empirical Study of Meta-Learning: a step towards rigorously understanding meta-learning algorithms.
(Preprint 2020)

2019

T. Poggio, A. Banburski, Q. Liao, B. Miranda, L. Rosasco, J. Hidary, Weight and Batch Normalization implement Classical Generalization Bounds.
(ICML Workshop 2019)

A. Banburski, Q. Liao, B. Miranda, L. Rosasco, B. Liang, J. Hidary, T. Poggio, Theory III: Dynamics and Generalization in Deep Networks.
(Preprint 2019)

2018

Q. Liao, B. Miranda, A. Banburski, J. Hidary, T. Poggio, A Surprising Linear Relationship Predicts Test Performance in Deep Networks.
(Preprint 2018)

C. Zhang, Q. Liao, A. Rakhlin, B. Miranda, N. Golowich, T. Poggio, Theory of Deep Learning IIb: Optimization Properties of SGD.
(Preprint 2018)

T. Poggio, Q. Liao, B. Miranda, A. Banburski, X. Boix, J. Hidary, Theory IIIb: Generalization in Deep Networks.
(Preprint 2018)

D. Kita, B. Miranda, H. Lin, J. Michon, D. Favela, J. Hu, High-resolution on-chip digital Fourier transform spectroscopy.
(CLEO: Science and Innovations 2018)

D. Kita, B. Miranda, D. Favela, D. Bono, J. Michon, H. Lin, T. Gu, J. Hu, High-performance and scalable on-chip digital Fourier transform spectroscopy.
(**Nature Communications** 9 (1), 4405. 2018)

2017

T. Poggio, K. Kawaguchi, Q. Liao, B. Miranda, L. Rosasco, X. Boix, J. Hidary, M. Mhaskar, Theory of Deep Learning III: explaining the non-overfitting puzzle.

(Preprint 2017)

T. Poggio, H. Mhaskar, L. Rosasco, B. Miranda, Q. Liao, Why and when can deep-but not shallow-networks avoid the curse of dimensionality: A review.
(**International Journal of Automation and Computing**, pp. 1-17, 2017. **Most Cited Paper Certificate.**)

Awards & Honors

- ICML Outstanding Paper TiFA Workshop Award (July 2024)
- NeurIPS Outstanding Main Track Paper Award, (December 11, 2023) (top 0.4% and only 2 papers selected)
- EDGE Scholar, Stanford University (September 2022)
- Stanford School of Engineering fellowship, Stanford University (September 2022)
- Honorable Mention, Ford Foundation Fellowship (2021)
- Best research project award for the UIUC graduate course CS 598 "Learning to Learn" by professor Y. Wang (December 2020).
- HSF (Hispanic Scholarship Fund) Scholar (2020)
- Honorable Mention, Ford Foundation Fellowship (2020)
- Most Cited Paper Certificate, International Journal of Automation & Computing (IJAC) (December 2019)
- Computer Science Excellence Saburo Muroga Endowed Fellow, (2019-2020)
- Sloan Scholar, Alfred P. Sloan Foundation's Minority Ph.D. (MPHD) Program, awarded in (2018-2019)
- Grainger Engineering SURGE Fellowship, awarded in (2018-2019)
- Chopper Trading, LLC, Best Strategy Report award, MIT Battle Code AI competition (2013)
- MIT Mitchell B. Kaufman Memorial Scholarship (2012-2013, 2013-2014)
- MIT Eugene and Margaret (HM) McDermott Scholarship (2012-2013, 2013-2014)
- Greengates Scholarship (30% 2007, 50% 2008, 100% 2009, 100% 2010)
- High Achievement Prize Award, Greengates School (2007, 2008, 2009, 2010) – similar to Valedictorian
- Achievement Prize award, Greengates School (2006)
- Best all round student award, Greengates School (2010)
- Certificate for Progress award, Greengates School (2005)

Media Coverage

- **White House Economic Report of the President (2024)**: Our work on emergent abilities was cited in the official economic report to the President
- **The New York Times (2023)**: "Silicon Valley Confronts the Idea That the 'Singularity' Is Here"
- **Quanta Magazine (2024)**: "How Quickly Do Large Language Models Learn Unexpected Skills?"
- **Forbes (2023)**: "AI 'Emergent Abilities' Are A Mirage, Says AI Researcher"
- **Andrew Ng (2024)**: Endorsed our paper as evidence that AGI development will be smooth and predictable
- **Additional coverage**: Stanford HAI, Y Combinator News, Vice, Medium, HackerNews, NeurIPS blog

Presentations and Posters

Emergent Abilities of Large Language Models? (Talk)	Stanford IEEE	*Stanford, CA 2023*
Curse of low Task Diversity (Talk & Poster)	NeurIPS 2022	*New Orleans, LA, December 2022*
Compact, Fourier transform spectroscopy (Poster)	Materials Day MIT	*Cambridge, MA, November 2018*
Theories of Deep Learning (Poster)	MIT CBMM External Advisory Committee meeting	*Cambridge, MA, April 2018*
Theories of Deep Learning (Poster)	MIT Quest for Intelligence launch	*Cambridge, MA, March 2018*
Theories of Deep Learning (Poster)	MIT CBMM annual NSF meeting	*Cambridge, MA, March 2018*
Thesis presentation	Final M.Eng presentation MIT CBCL	*Cambridge, MA, August 2016*
Proxy for the Redis database	Rackspace Final Internship Presentations	*San Antonio, TX, August 2014*
Sentiment Analysis presentation	Adobe's Engineering Department	*San Jose, CA, August 2013*

Academic Service

- ICLR 2020 (International Conference on Learning Representations) reviewer
- JMLR 2018 (Journal of Machine Learning Research) joint review with Qianli Liao

Service & Outreach

- Graduate advisor for Latinos in Computer Science (LCS) UIUC 2019-Present
- Outreach research mentorship Distributed Research Experiences for Undergraduates (DREU) UIUC 2019
- Outreach research mentorship Undergraduate Research Opportunity Program (UROP) MIT 2017-2018
- Outreach research mentorship Engineering of Intelligence Team (EIT) CBMM MIT 2017-2018

Teaching experience

UIUC - Urbana-Champaign, IL *August 2020 - December 2020*
Graduate Teaching Assistant

- CS 446 Machine Learning
- Responsible for problem sets and exam design. Held weekly office hours.

MIT CBMM - Cambridge, MA *September 2016 - December 2016*
Graduate Teaching Assistant

- Statistical Learning Theory & Applications (9.520/6.860) with professor Lorenzo Rosasco & Tomaso Poggio
- Made the first draft of course slides for MIT's OpenCourseWare (OCW)
- Graded final projects
- Provided extra support for office hours

MIT EECS - Cambridge, MA *February 2016 - June 2016*
Graduate Teaching Assistant

- Introduction to Algorithms (6.006) with professor Nancy Lynch, Bruce Tidor and Aleksander Madry
- Held weekly office hours
- Helped prepare problem sets and exams
- Graded exams

MIT EECS - Cambridge, MA *September 2015 - December 2015*
Graduate Teaching Assistant

- Design & Analysis of Algorithms (6.046) with Shafi Goldwasser, Dana Moshkovitz, Nir N. Shavit
- Held weekly office hours
- Instructed students across weekly recitations
- Helped prepare problem sets and exams

MIT EECS - Cambridge, MA *February 2015 - May 2015*
Graduate Teaching Assistant

- Introduction to Machine Learning (6.036) with professor Tommi S Jaakkola, Suvrit Sra & Regina Barzilay
- Instructed students across bi-weekly recitations
- Held weekly office hours
- Helped prepare problem sets, projects and exams
- Graded problem sets, projects and exams

MIT EECS - Cambridge, MA *September 2014 - December 2014*
Graduate Teaching Assistant

- Mathematics for Computer Science (6.042) with professor F.Thomson Leighton & Ankur Moitra
- Instructed students across four recitations and problem solving sessions weekly
- Held weekly office hours
- Graded exams

MIT - Cambridge, MA *September 2012 - June 2013*
National Honor Society for Computer Science and Electrical Engineering (Eta Kappa Nu)

- Algorithms tutor for undergraduates at MIT

Industry experience

Rackspace - San Antonio, TX *June 2014 - August 2014*
Software Engineering Intern

- Built a concurrent proxy to extend the functionality of the Redis Database
- Added security functionality to the proxy
- Presented and delivered a demo to engineering team and higher level management

Adobe - San Jose, CA *June 2013 - August 2013*
Software Engineering Intern

- Developed and optimized Machine Learning software for Sentiment Analysis in Spanish
- Researched different machine learning and natural language processing (NLP) techniques to optimize the Naive Bayes algorithm
- Developed different methods for automatic extraction of training data
- Presented and delivered a demo to Adobe's engineering department

Projects

Function approximation with deep Neural and Gaussian Networks
Masters of Engineering Thesis, advised by professor Tomaso Poggio

- Researched the optimization landscape of Gaussian Networks with Gradient Descent
- Discovered a novel source of vanishing gradient impeding the training using backpropagation

Collaborative filtering for movie rating prediction
Matrix completion using mixture of Gaussians

- Designed questions and solutions with fellow TA He Sun and professor Tommi S Jaakola
- Helped implement code that solved project with EM algorithm for matrix completion

Survey in Statistical Learning Theory
Graduate project for class 9.520/6.860 2014

- Prepared a survey on Uniform Stability and Generalization in Learning theory
- Survey contained conceptual explanation to mathematical concepts in learning theory
- Survey also contained my own presentation of the proof for the theorems
- Survey can be read at: project report

Survey in Theoretical Computer Science
Project for graduate class in mathematics 18.409 2015

- Research paper survey on provable algorithms that require less computation time given more training examples
- In the case of SVM optimization PEGASOS requires less runtime assuming a target generalization
- When learning halfspaces over sparse vectors, more training examples reduce the training runtime from exponential to polynomial time
- Provided my unique outline of the main proof for halfspaces time reduction

Evaluating sublinear estimators for big data
undergraduate thesis project, advised by professor Samuel Madden

- Designed sub-linear sampling algorithms for estimating groups from big data in databases
- Designed and proved that the algorithmic estimators were statistically consistency and unbiased
- Experimentally evaluated the algorithms with synthetic data sets using the Mean Absolute Percentage Error

Road Runner
Persistent, fault-tolerant, high-performance KV store

- Built Multipaxos library for efficient consensus
- Optimized disk I/O with batching scheme
- Tested with mocks simulating RPC delays on unreliable, long-distance network

Dark Cloud
Secure, shared, cloud filesystem on untrusted server

- Designed layered cryptography scheme
- Implemented the cryptography API
- Report: project report

BattleCode
Artificial Intelligence competition

- Wrote path finding algorithms & distributed combat strategy
- Finalists in competition pool of 300 teams
- Awarded *Best Strategy Report*

Certification

- Coursera: Learning how to Learn: Powerful mental tools to help you master tough subjects (with Honors), awarded by UC San Diego, Dr. Barbara Oakley, Dr. Terrence Sejnowski & Linda Walker
- Coursera: Mindshift: Break Through Obstacles to Learning and Discover Your Hidden Potential (with Honors), by McMaster University Dr. Barbara Oakley, Dr. Terrence Sejnowski & Linda Walker
- Certified Dance instructor with the World-Mastery program: completed the online training by world renowned artists Korke & Judith

Skills

Programming: Python, PyTorch, TensorFlow, JAX, Lean 4, OCaml, Coq, Java, Go, Javascript

ML/AI Tools: Hugging Face, Weights & Biases, DSPy, git, UNIX, vim

Languages: English, Spanish (both native fluency)

Leadership

Stanford Research Mentor - Stanford, CA *September 2022 - Present*
Research Mentor

- Research mentor with an undergraduate and two master's students on the role of data quality on the ability of Foundation Models to do in context learning.

Stanford AI for Lean (Lean AI Club) - Stanford, CA *2025 - Present*
Founding Member

- Founding member of Stanford AI for Lean, a community of researchers and students dedicated to advancing AI for Lean theorem proving and formalizing mathematics

Stanford Bachata Sensual & Brazilian Zouk (Latin Dance Group) - Stanford, CA *September 2021 - Present*
President and Founder

- Founded the first Bachata Sensual & Zouk (SBSBZ) dance group at the Stanford University – and with our officers made it an officially recognized student organization
- Lead weekly practice and dance classes for students and local community members. Communication channels have over 200 members.
- In line with our commitment to providing accessible, zero-cost information to the wider community, we proudly offer comprehensive summaries of all our lessons on YouTube.

UIUC Latinos in Computer Science (LCS) - Urbana-Champaign, IL *December 2019 - Present*
Graduate Advisor

- Graduate advisor for Latinos in Computer Science (LCS)
- Founded the "LCS professional & wellness development colloquium" speaker series for LCS.
- Organizing "LCS professional & wellness development colloquium" speaker series for LCS. Talks will be made available in the world wide web.

UIUC Bachata Sensual & Zouk (Latin Dance Group) - Urbana-Champaign, IL *January 2019 - December 2021*
President and Founder

- Founded the first Bachata Sensual & Zouk dance group at the UIUC campus
- Lead weekly practice and dance classes for students and local community members
- Organized first Bachata Sensual and Brazilian Zouk social with guest artist from Chicago

UIUC Undergraduate Research Mentor - Urbana-Champaign, IL *May 2019 - Present*
Research Mentor

- Research mentor for Research Experience for Undergraduates (REU).
- Mentoring an undergraduate student on the foundations of meta-learning project.

MIT CBMM (Center for Brain Minds & Machines) - Cambridge, MA *June 2016 - May 2019*
Research Mentor

- Research leader mentoring undergraduates with the Engineering of Intelligence Team (EIT) at MIT CBMM
- Engaged in mentoring and research with MIT undergraduates

MIT Student Latin Dance Group - Cambridge, MA *September 2015 - July 2017*

- Lead an unofficial but committed student dance group under the guidance of MIT Casino Rueda
- Prepared and lead weekly dance practices
- Compiled a foundations Bachata dance curriculum

Undergraduate Practice Opportunity Program (UPOP) - Cambridge, MA *January 2011 - June 2011*

- Advanced professional skills with a one-week MIT intensive course and semester activities
- Advance "firm skills" through guided discovery learning, team decision-making, leadership skills, project engineering, cross cultural communication and recognizing the presence of an ethical dilemma with guidance of seasoned industry professionals and UPOP MIT faculty

Activities

MIT Chamber Music Society - Cambridge, MA *September 2011 - June 2014*
Jazz Musician

- Alto Saxophone player with MIT's Jazz combo as part of the Chamber Music Society lead by Boston jazz artist Keala Kaumeheiwa
- Performed, Composed and arranged several Jazz pieces

MIT Wind Ensemble (MITWE) - Cambridge, MA *February 2011 - June 2011*
Clarinetist

- Clarinet player with director Dr. Harris
- Performed with the Wind Ensemble at the MIT 150th Convocation

Family Background

Latino/Hispanic, Mexican heritage.