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Brando Miranda

Gates Bldg., 353 Jane Stanford Way

Google Scholar; Website; Stanford Website MIT website Stack Exchange;

EDUCATION

Ph.D. in Computer Science

Stanford University

2022-present

GPA: 4.138/4.0

Master of Engineering in Electrical Engineering and Computer Science

Massachusetts Institute of Technology

2014-2016

GPA: 4.8/5.0

Bachelor of Science, Computer Science and Engineering

Massachusetts Institute of Technology

2010-2014

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

Graduate Student

September 2022 - present

- Machine Learning PhD student with professor Sanmi Koyejo studying the foundations of meta-learning, formal data quality metrics and cognitively inspired deep learning methods for formal reasoning using Foundation Models.

IBM - ML Research Internship - Yorktown Heights, NJ

Graduate Research Intern

May 2022 - August 2022

- 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

Graduate Student

September 2018 - 2021

- 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, NJ

Graduate Research Intern

May 2021 - August 2021

- 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

Research Assistant

June 2015 - September 2018

- 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

Research Mentor

June 2016 - present

- 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)

R. Schaeffer, B. Miranda, O. Koyejo, Are Emergent Abilities of Language Models a Mirage?
(Planned Release Date 2023). (In Prep.)

B. Miranda, J. Rute, A. Shinnar, V. Pestun, B. Trager, Theorem Proving as Program Prediction with Transformers
(Planned Release Date 2023) (In Prep.)

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.
(Planned Release Date April 2023) (In Prep.)

A. Lee, B. Miranda, S. Sundar, P. Yu, O. Koyejo, The Diversity Coefficient: a Data Quality Metric for Machine Learning
shows that LLM are Pretrained on formally Diverse Data
(Planned Release Date 2023). (In Prep.)

B. Miranda, P. Yu, Y.Wang, O. 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)

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

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

Tomaso Poggio Andrzej Banburski, Qianli Liao, Brando Miranda, Lorenzo Rosasco, Jack Hidary. ICML. 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)

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

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

T. Poggio, Liao, Q., Miranda, B., Banburski, A., Boix, X., and Hidary, J., 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)

Poggio T., Kawaguchi K., Liao Q., Miranda B., Rosasco L., Boix X., Hidary J., Mhaskar M. Theory of Deep Learning III:
explaining the non-overfitting puzzle.
(Preprint 2017)

T. Poggio, Mhaskar H., Rosasco L., Miranda B., and Liao Q., 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)

T. Poggio, Mhaskar H., Rosasco L., Miranda B., and Liao Q., Why and When Can Deep - but Not Shallow - Networks
Avoid the Curse of Dimensionality: a Review.
(Preprint 2016)

AWARDS & HONORS

- 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 Foundations 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)

PRESENTATIONS AND POSTERS

Curse of low Task Diversity (Talk & Poster)	NeurIPS 2022	<i>New Orleans, LA, December 2022</i>
Compact, Fourier transform spectroscopy (Poster)	Materials Day MIT	<i>Cambridge, MA, November 2018</i>
Theories of Deep Learning (Poster)	MIT CBMM External Advisory Committee meeting	<i>Cambridge, MA, April 2018</i>
Theories of Deep Learning (Poster)	MIT Quest for Intelligence launch	<i>Cambridge, MA, March 2018</i>
Theories of Deep Learning (Poster)	MIT CBMM annual NSF meeting	<i>Cambridge, MA, March 2018</i>
Thesis presentation	Final M.Eng presentation MIT CBCL	<i>Cambridge, MA, August 2016</i>
Proxy for the Redis database	Rackspace Final Internship Presentations	<i>San Antonio, TX, August 2014</i>
Sentiment Analysis presentation	Adobes Engineering Department	<i>San Jose, CA, August 2013</i>

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 - Cambridge, MA

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 can be read here:: report 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

Coding: Python, Matlab, OCaml, Java, Go, Javascript, Maude, Coq, Isabelle

Tools: Pytorch, Jax, Tensorflow, Unix, vim, git

Languages: English, Spanish (both native fluency)

Stanford Research Mentor - Stanford, CA *September 2021 - Present*
Research Mentor

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

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 one undergraduate students on the foundation 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.