Matheus Sobreira Farias

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EDUCATION

Harvard University — **Cambridge, MA**
Ph.D. in Electrical Engineering — 2021–2026 (EXPECTED)
Working on efficient hardware architectures for machine learning. Advised by Prof. H. T. Kung (link). GPA: 3.90/4.00

Harvard University — **Cambridge, MA**
M.Sc. in Electrical Engineering — 2021–2024
Relevant Coursework: Hardware Architectures for Deep Learning (A), Tiny Machine Learning (A), High Performance Computing for Science and Engineering (A), Advanced Computer Architecture (A). GPA: 3.92/4.00

Federal University of Pernambuco — **Recife, Brazil**
B.Sc. in Electronics Engineering — 2016–2021
1st out of 40 students, GPA 8.90/10. Senior Thesis: *iOwlT: Sound Geolocalization System* (link).

RESEARCH

Detailed information can be found here.

EfficientAI/TinyML (Meta AI/AFRL collab) — 2021–PRESENT
Harvard University
Working on the algorithmic-level to improve efficiency of deep neural networks (i.e. quantization, pruning, knowledge distillation, etc). Past work adresses reducing bottlenecks such as data conversions, nonidealities, programming time and weight mapping of compute-in-memory crossbars.

iOwlT: Sound Geolocalization System (link) — 2019–2020
Federal University of Pernambuco
Developed a system using neural networks, adaptive filtering and real-time processing in FPGAs to recognize sound events and determine gun shooters location on a mobile application. Earned 3 international awards at InnovateFPGA 2019 in China (Top 0.7%).

Lock-in: Nano-Volt Signal Amplifier (link) — 2019–2020
Federal University of Pernambuco
Design and optimization of a phase-sensitive lock-in amplifier advised by the former Minister of Science and Technology of Brazil Prof. Sergio Rezende to investigate magnetic properties of IrMn/Py thin films using MOKE technique.

iTraffic: Smart Semaphore Network (link) — 2017
Federal University of Pernambuco
Design and proposal of an internet of things intelligent system to dynamically choose traffic lights timing to optimize vehicle flow on urban roads using genetic algorithm. Achieved 130% improvement in the average speed of cars in tested tracks.

Maracatronics: Robotics Team (link) — 2017
Federal University of Pernambuco
Member of the collective autonomous soccer sub-team, acting on robots control on Tiva-C microcontroller, computer vision mapping and tracking, and intelligent robots decision-making strategies. Achieved 5th Place at XVI Latin American Robotics Competition.

PUBLICATIONS

*denotes equal contribution

[4] **M. Farias**, H. T. Kung, "Semi-Nonnegative Matrix Factorization Improves Compute-in-Memory Crossbars Energy Efficiency", *in submission*.

[3] **M. Farias**, H. T. Kung, "Efficient Reprogramming of Memristive Crossbars for DNNs: Weight Sorting and Bit Stucking", https://arxiv.org/pdf/2410.21730.

[2] O. E. Akgun*, N. Cuevas*, **M. Farias***, D. Garces*, "Tiny Reinforcement Learning for Quadrupled Locomotion Using Decision Transformers", https://arxiv.org/pdf/2402.13201.

[1] **M. Farias**, H. T. Kung, "Sorted Weight Sectioning for Energy-Efficient Unstructured Sparse DNNs on Compute-in-Memory Crossbars", https://arxiv.org/pdf/2410.11298.

Conferences

2. **2019 International Conference on Field-Programmable Technology** Tianjin, China

1. **VII Brazilian Symposium on Computing Systems Engineering** Curitiba, Brazil

Teaching

Harvard University

CS2420 – *Computing at Scale* Fall 2024

CS205 – *High Performance Computing for Science and Engineering* Spring 2023

Federal University of Pernambuco

ES456 – *Machine Learning* Fall 2020

MA326 – *Complex Variables and Applications* 2018–2019

FI007 – *Physics II: Gravitation, Waves and Thermodynamics* 2017–2018

MA026 – *Calculus I: Limits, Derivatives and Integrals* Fall 2016

Work Experience

Neurotech **Recife, Brazil**
Machine Learning Intern 2020–2021
Served as workshop instructor and collaborated adding +5 machine learning algorithms to production.

Espaço Diferencial **Recife, Brazil**
Co-Founder and Teacher 2016–2018
Idealized a non-profit school for underpriviledge students in basic engineering classes. Managed the action strategy planning that impacted over 200 students with a team of 10 teachers. Taught Physics at the undergraduate level.

Awards and Recognitions

First Place Ecossis Award of Innovation and Sustainability at Mostratec 2024 2024
Brazil
Mostratec is the biggest Science and Technology fair in Latin America. The SIMBA project is an AI-powered sound localization system that monitors the Soldadinho-do-Araripe (*Antilophia bokermanni*), an endangered bird which is a cultural symbol of Brazil's Northeast.

MIT Innovator Under 35 2024
Brazil
Title given to top innovators in Science and Technology under the age of 35, I was elected under the artificial intelligence category.

Líder Estudar Fellow 2024
Brazil
One of the 26 students over 45,000 candidates – the most competitive scholarship in the country ("the Brazilian Rhodes Scholarship").

Bronze Medal at the Online Young Physicists' Tournament 2023
Online
8th place at the Online Young Physicists' Tournament 2023.

Silver Medal at the International Young Physicists' Tournament (Physics World Cup) 2023
Murree, Pakistan
2nd place at the 36th International Young Physicists' Tournament 2023 Pakistan.

Behring Foundation Fellowship 2021–Present
Harvard University
Honored by the Behring Foundation with a fellowship to cover my graduate studies at Harvard.

Silver Award at InnovateFPGA 2019 Contest (*Grand Finals*) 2019
Tianjin, China
2nd out of 270 teams with iOwlT: Sound Geolocalization System.

Silver Award at InnovateFPGA 2019 Contest (*Regional Finals*) 2019
Americas
2nd out of 40 teams with iOwlT: Sound Geolocalization System.

Community Award at InnovateFPGA 2019 Contest 2019
Americas
Elected as best project by the community with iOwlT: Sound Geolocalization System.

PIBIC/CNPq funding to do research 2019
Brazil
Awarded by national government funding to do research for Lock-in: Nano-Volt Signal Amplifier.

5th Place at XVI Latin American Robotics Competition 2017
Latin America
In the Small Size League category of autonomous soccer with Maracatronics: Robotics Project.

1st Place at Embedded Systems Regional Contest 2017
Brazil
1st out of 14 teams with iTraffic: Smart Semaphore Network.

Honorable Mention at Brazilian Physics Olympiad 2015
Brazil
One of the 180 medalists over more than 300,000 contestants.

Diversity, Inclusion & Outreach

- President of Brazil Conference 2025 2024–Present
- Vice President of Brazil Conference 2024 2023–2024
- Brazilian Team Leader at the Online Young Physicists' Tournament 2023
- Brazilian Team Leader at the International Young Physicists' Tournament in Pakistan 2023
- Author of the Experimental Exam for the Brazilian selective to the International Physics Olympiad 2023
- Leader of the Diversity & Inclusion branch at the Harvard Brazilian Association 2022–2023
- Judge for the 4th Brazilian Physicists' Tournament 2021
- Officer of the School of Engineering at the Harvard Brazilian Association 2021–2024
- Judge for the International Young Physicists' Tournament Brazil 2021–Present

Talks

Educar – Terra (link) 2024
From failing Physics to a Ph.D at Harvard: discover the MIT award recipient from Pernambuco

Crusoé – O Antagonista (article) (video) 2024
The story of the first Brazilian EE Ph.D student at Harvard

Mais Você – Globo (biggest Brazilian TV channel) (link) 2024
An interview about my life and projects

Futuras Cientistas – Ministry of Science, Technology & Innovation of Brazil (link) 2023
Technology and its Social Impact

PodCast Ph.D nos EUA (part 1) (part 2) 2021
Journey to become a Ph.D student