

Matheus Sobreira Farias

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EDUCATION

Harvard University <i>Ph.D. in Electrical Engineering</i> Hardware-software co-design of efficient hardware architectures for deep learning. Advised by Prof. H. T. Kung (link). GPA: 3.90/4.00	Cambridge, MA 2021–2026 (EXPECTED)
Harvard University <i>M.Sc. in Electrical Engineering</i> 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	Cambridge, MA 2021–2024
Federal University of Pernambuco <i>B.Sc. in Electronics Engineering</i> 1st out of 40 students, GPA 8.90/10. Senior Thesis: <i>iOwlT: Sound Geolocalization System</i> (link).	Recife, Brazil 2016–2021

RESEARCH

Detailed information can be found [here](#).

EfficientAI/TinyML (Meta AI/AFRL collab) <i>Harvard University</i> Designing algorithms to improve deep neural networks efficiency (i.e. quantization, pruning, knowledge distillation, etc). Past work addresses bottlenecks such as data conversions, nonidealities, programming time and weight mapping of compute-in-memory crossbars.	2021–PRESENT
iOwlT: Sound Geolocalization System (link) <i>Federal University of Pernambuco</i> 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%).	2019–2020
Lock-in: Nano-Volt Signal Amplifier (link) <i>Federal University of Pernambuco</i> 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.	2019–2020
iTraffic: Smart Semaphore Network (link) <i>Federal University of Pernambuco</i> 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.	2017
Maracatronics: Robotics Team (link) <i>Federal University of Pernambuco</i> 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.	2017

PUBLICATIONS

*denotes equal contribution

- [6] **M. Farias**, W. Martins, H. T. Kung, “MDM: Manhattan Distance Mapping of DNN Weights for Parasitic-Resistance-Resilient Memristive Crossbars”, *in submission*.
- [5] **M. Farias**, H. T. Kung, “Breaking Sneak Paths: An Accuracy-Aware Bit Flipping Heuristic for Computing-in-Memory Crossbars”, *in submission*.
- [4] **M. Farias**, “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 Sticking”, *ISCAS 2025*, <https://arxiv.org/pdf/2410.21730>.

- [2] **M. Farias**, H. T. Kung, "Sorted Weight Sectioning for Energy-Efficient Unstructured Sparse DNNs on Compute-in-Memory Crossbars", *ISCAS 2025*, <https://arxiv.org/pdf/2410.11298>.
- [1] O. E. Akgun*, N. Cuevas*, **M. Farias***, D. Garces*, "Tiny Reinforcement Learning for Quadrupled Locomotion Using Decision Transformers", <https://arxiv.org/pdf/2402.13201>.

CONFERENCES

- | | |
|--|------------------------|
| 3. 2025 International Symposium on Circuits and Systems | London, United Kingdom |
| 2. 2019 International Conference on Field-Programmable Technology | Tianjin, China |
| 1. VII Brazilian Symposium on Computing Systems Engineering | Curitiba, Brazil |

TEACHING

Harvard University

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|---|--------------------------------|
| CS242 – <i>Computing at Scale</i> | FALL 2024, FALL 2025 (HEAD TA) |
| CS205 – <i>High Performance Computing for Science and Engineering</i> | SPRING 2023 |

Federal University of Pernambuco

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| ES456 – <i>Machine Learning</i> | FALL 2020 |
| MA326 – <i>Complex Variables and Applications</i> | SPRING 2018, FALL 2019 |
| FI007 – <i>Physics II: Gravitation, Waves and Thermodynamics</i> | FALL 2017, SPRING 2018 |
| MA026 – <i>Calculus I: Limits, Derivatives and Integrals</i> | FALL 2016 |

WORK EXPERIENCE

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| Nissan Advanced Technology Center
<i>AI Hardware Accelerator Intern</i>
Led AI accelerator architecture exploration and C++ behavioral modeling. Designed vectorized processing elements optimized for self-driving vehicles, synthesizing RTL using Vitis HLS. Conducted architecture performance analysis and benchmarking, delivering reports on resource utilization and timing metrics. | Silicon Valley, CA
SUMMER 2025 |
| Neurotech
<i>Machine Learning Operations Intern</i>
Implemented 5 machine learning algorithms for creditworthiness assessment system. Built end-to-end ML pipeline using PyTorch for model development, ONNX for production deployment, and MLflow for experiment tracking and model management. | Recife, Brazil
2020–2021 |
| Espaço Diferencial
<i>Co-Founder and Teacher</i>
Idealized a non-profit school for underprivileged students in introductory engineering classes. Managed the action strategy planning that impacted over 200 students with a team of 10 teachers. Taught Physics at the undergraduate level. | Recife, Brazil
2016–2018 |

AWARDS AND RECOGNITIONS

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| Full Member at Sigma Xi, the Scientific Research Honor Society
<i>International</i>
Nominated to the world's largest general research honor society. Founded in 1886, with 200+ Nobel laureates among its members. | 2025 |
| R\$100k Prize at Who Wants to be a Millionaire
<i>Brazil</i>
Correctly answered 11 out of 15 questions in the world's most competitive trivia game. | 2025 |
| 1st Ecosystem Award of Innovation and Sustainability at Mostratec (The biggest S&T fair in LatAm)
<i>Brazil</i>
SIMBA is an AI-powered sound localization system that monitors <i>Antilophia bokermanni</i> , an endangered bird of cultural value in Brazil. | 2024 |
| MIT Innovator Under 35 in Artificial Intelligence
<i>Brazil</i>
Title given to top innovators in Science and Technology under the age of 35. | 2024 |

Líder Estudiar Fellow (“the Brazilian Rhodes Scholarship”) <i>Brazil</i> One of the 26 students over 45,000 candidates – the most competitive scholarship in the country.	2024
Bronze Medal at the Online Young Physicists’ Tournament <i>Online</i> 8th place at the Online Young Physicists’ Tournament 2023.	2023
Silver Medal at the International Young Physicists’ Tournament (Physics World Cup) <i>Murree, Pakistan</i> 2nd place at the 36th International Young Physicists’ Tournament 2023 Pakistan.	2023
Behring Foundation Fellowship <i>Harvard University</i> Honored by the Behring Foundation with a fellowship to cover my graduate studies at Harvard.	2021–PRESENT
Three International Awards at InnovateFPGA 2019 Contest <i>Tianjin, China</i> 2 Silver Awards (<i>Grand Finals</i> and <i>Regional Finals</i>) and Community Award (<i>Best project in America</i>). 2nd out of 270 teams with iOwlT.	2019
PIBIC/CNPq funding to do research (“the Brazilian National Science Foundation fellowship”) <i>Brazil</i> Awarded by national government funding to do research for Lock-in: Nano-Volt Signal Amplifier.	2019
5th Place at XVI Latin American Robotics Competition <i>Latin America</i> In the Small Size League category of autonomous soccer with Maracatronics: Robotics Project.	2017
1st Place at Embedded Systems Regional Contest <i>Brazil</i> 1st out of 14 teams with iTraffic: Smart Semaphore Network.	2017
Honorable Mention at Brazilian Physics Olympiad <i>Brazil</i> One of the 180 medalists over more than 300,000 contestants.	2015

DIVERSITY, INCLUSION & OUTREACH

• President of Brazil Conference 2025	2024–2025
• 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 InnovateFPGA 2022 Contest	2022
• 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

Who Wants to be a Millionaire (link) <i>Trivia + my journey and projects (only available to watch in Brazil)</i>	2025
Backstage PodCast – How’s the Mind of a Harvard student (link) <i>My favorite PodCast! Talked about journey and projects</i>	2025

Conferência Nacional de Defesa e Difusão da Ciência (link) <i>Applied Knowledge: The Academic, Entrepreneur, and Corporative Perspective of Science</i>	2025
Educar – Terra (link) <i>From failing Physics to a Ph.D at Harvard: discover the MIT award recipient from Pernambuco</i>	2024
Crusoé – O Antagonista (article) (video) <i>The story of the first Brazilian EE Ph.D student at Harvard</i>	2024
Mais Você – Globo (biggest Brazilian TV channel) (link) <i>An interview about my journey and projects</i>	2024
Futuras Cientistas – Ministry of Science, Technology & Innovation of Brazil (link) <i>Technology and its Social Impact</i>	2023
PodCast Ph.D nos EUA (part 1) (part 2) <i>Journey to become a Ph.D student</i>	2021