

# Matheus Sobreira Farias

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## EDUCATION

### Harvard University

Ph.D. in Electrical Engineering

Working on efficient hardware architectures for machine learning. Advised by Prof. H. T. Kung ([link](#)). GPA: 3.90/4.00

Cambridge, MA

2021–2026 (EXPECTED)

### Federal University of Pernambuco

B.Sc. in Electronics Engineering

1st out of 40 students, GPA 8.90/10. Senior Thesis: *iOwlT: Sound Geolocalization System* ([link](#)).

Recife, Brazil

2016–2021

## 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 addresses 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>.

## 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

## AWARDS AND RECOGNITIONS

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**First Place Ecosis 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.