

# 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)

### Harvard University

*M.Sc. in Electrical Engineering*

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

*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](#).

### Computing in Memory (Meta AI/AFRL collab)

2021–PRESENT

*Harvard University*

Working on the algorithmic-level to improve efficiency of deep neural network deployment in the crossbar architecture. Particularly interested in reducing bottlenecks such as data conversions, nonidealities, programming time and weight mapping.

### 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, "A Distribution-Based Efficient Programming of Sorted Compute-in-Memory Crossbars", *in submission*.
- [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 – <i>Computing at Scale</i>                                    | FALL 2024   |
| CS205 – <i>High Performance Computing for Science and Engineering</i> | SPRING 2023 |

### Federal University of Pernambuco

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

## WORK EXPERIENCE

- |  |                                    |
|--|------------------------------------|
| <b>Neurotech</b><br><i>Machine Learning Intern</i><br>Served as workshop instructor and collaborated adding +5 machine learning algorithms to production.  | <b>Recife, Brazil</b><br>2020–2021 |
| <b>Espaço Diferencial</b><br><i>Co-Founder and Teacher</i><br>Idealized a non-profit school for underprivileged 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. | <b>Recife, Brazil</b><br>2016–2018 |

## AWARDS AND RECOGNITIONS

- |   |              |
|---|--------------|
| <b>MIT Innovator Under 35</b><br><i>Brazil</i><br>Title given to top innovators in Science and Technology under the age of 35, I was elected under the artificial intelligence category.                | 2024         |
| <b>Líder Estudiar Fellow</b><br><i>Brazil</i><br>One of the 26 students over 45,000 candidates – the most competitive scholarship in the country (“the Brazilian Rhodes Scholarship”).                  | 2024         |
| <b>Bronze Medal at the Online Young Physicists’ Tournament</b><br><i>Online</i><br>8th place at the Online Young Physicists’ Tournament 2023.   | 2023         |
| <b>Silver Medal at the International Young Physicists’ Tournament (Physics World Cup)</b><br><i>Murree, Pakistan</i><br>2nd place at the 36th International Young Physicists’ Tournament 2023 Pakistan. | 2023         |
| <b>Behring Foundation Fellowship</b><br><i>Harvard University</i><br>Honored by the Behring Foundation with a fellowship to cover my graduate studies at Harvard.                                       | 2021–PRESENT |
| <b>Silver Award at InnovateFPGA 2019 Contest (Grand Finals)</b><br><i>Tianjin, China</i><br>2nd out of 270 teams with iOwlT: Sound Geolocalization System.  | 2019         |
| <b>Silver Award at InnovateFPGA 2019 Contest (Regional Finals)</b><br><i>Americas</i><br>2nd out of 40 teams with iOwlT: Sound Geolocalization System.  | 2019         |
| <b>Community Award at InnovateFPGA 2019 Contest</b><br><i>Americas</i><br>Elected as best project by the community with iOwlT: Sound Geolocalization System.  | 2019         |

<b>PIBIC/CNPq funding to do research</b> <i>Brazil</i> Awarded by national government funding to do research for Lock-in: Nano-Volt Signal Amplifier.	2019
<b>5th Place at XVI Latin American Robotics Competition</b> <i>Latin America</i> In the Small Size League category of autonomous soccer with Maracatronics: Robotics Project.	2017
<b>1st Place at Embedded Systems Regional Contest</b> <i>Brazil</i> 1st out of 14 teams with iTraffic: Smart Semaphore Network.	2017
<b>Honorable Mention at Brazilian Physics Olympiad</b> <i>Brazil</i> One of the 180 medalists over more than 300,000 contestants.	2015

## 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

<b>Educar – Terra (<a href="#">link</a>)</b> <i>From failing Physics to a Ph.D at Harvard: discover the MIT award recipient from Pernambuco</i>	2024
<b>Crusoé – O Antagonista (<a href="#">article</a>) (<a href="#">video</a>)</b> <i>The story of the first Brazilian EE Ph.D student at Harvard</i>	2024
<b>Mais Você – Globo (biggest Brazilian TV channel) (<a href="#">link</a>)</b> <i>An interview about my life and projects</i>	2024
<b>Futuras Cientistas – Ministry of Science, Technology &amp; Innovation of Brazil (<a href="#">link</a>)</b> <i>Technology and its Social Impact</i>	2023
<b>PodCast Ph.D nos EUA (<a href="#">part 1</a>) (<a href="#">part 2</a>)</b> <i>Journey to become a Ph.D student</i>	2021