Paulo Freitas de Araujo Filho

Presentation

Paulo Freitas received the bachelor's degree (*Summa Cumme Laude* honors) in electrical and electronic engineering and the M.S. degree in computer science from the Universidade Federal de Pernambuco (UFPE), Recife, Brazil, in 2016 and 2018, respectively. He is currently pursuing the Ph.D. degree in computer science with UFPE and the Ph.D. degree in electrical engineering with the École de Technologie Supérieure, Université du Québec, Montreal, QC, Canada. His main research interests include cyber-security, intrusion detection systems, artificial intelligence, deep learning, adversarial attacks, and connected things. His knowledge includes, but is not limited to, cyber-security, machine learning, deep learning, generative adversarial networks (GANs), adversarial attacks, microcontrollers, FPGAs, SoCs, hardware description languages, and programming languages.

Education

2019–present   **Ph.D. in Computer Science**, *Universidade Federal de Pernambuco*, Recife, Brazil.
Main area: Cyber-security, machine learning-based intrusion detection systems, adversarial attacks. Supervisor: Prof. Divanilson Campelo

2020–present   **Ph.D. in Electrical Engineering**, *École de Technologie Supérieure (ÉTS)*, Montreal, Canada.
Main area: Cyber-security, machine learning-based intrusion detection systems, adversarial attacks. Supervisor: Prof. Georges Kaddoum

2016–2018   **M.Sc. in Computer Science**, *Universidade Federal de Pernambuco*, Recife, Brazil.
Dissertation title: **Contributions to In-vehicle Networks: Error Injection and Intrusion Detection System for CAN, and Audio Video Bridging Synchronization.**
A configurable error injection tool and an intrusion detection system (IDS) based-on machine learning algorithms were designed and implemented for CAN/CAN FD networks. The gPTP (generalized Precision Time Protocol) protocol, specified in the IEEE 802.1AS Standard, was implemented in hardware for automotive Ethernet networks.
Supervisor: Prof. Divanilson Campelo
GPA: 4.00/4.00

2012–2013   **Non-degree exchange program in Electrical and Computer Engineering**, *University of Massachusetts*, North Dartmouth, EUA.
Brazil Science Without Borders Exchange Program Scholarship
GPA: 3.89/4.00

2010–2016   **Electrical Electronics Engineering**, *Universidade Federal de Pernambuco*, Recife, Brazil.
Dissertation title: **Modeling and Digital Control of Quadcopters.**
A Digital PID controller was modeled, simulated and implemented for quadcopters.
Supervisor: Prof. Gilson Jerônimo da Silva Junior.
GPA: 9.25/10.00 – **Graduated with Summa Cum Laude Honors**

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Professional Experience

Feb/2022– Present   **Researcher**, TEMPEST SECURITY INTELLIGENCE, Recife, Brazil.
Research and implementation of security solutions for cyber-attacks and adversarial attacks.

May/2020– Jan/2022   **Researcher**, ERICSSON GLOBAL ARTIFICIAL INTELLIGENCE ACCELERATOR (GAIA), Montreal, Canada.
Research and implementation of security solutions for cyber-attacks and adversarial attacks.

Feb/2019– Apr/2020   **Embedded System Engineer**, REDEPOS, Recife, Brazil.
Design and implementation of wireless Point of Sales (POS) systems.

Feb/2017– Jan/2019   **Embedded Systems Engineering**, INTREPID CONTROL SYSTEMS, Detroit, USA.
Design and implementation of hardware modules and communication protocols for automotive embedded systems. Feature topics: CAN/CAN FD, automotive Ethernet, AVB/TSN.

Sep/2014– Feb/2015   **Commissioning Intern**, QUEIROZ GALVAO ENERGIA, Fortaleza, Brazil.
Field monitoring of commissioning, energization and operation of Alstom ECO 122 wind turbines at wind farms in Ceara and Rio Grande do Norte, Brazil.

Mai/2013– Aug/2013   **Platform Intern**, SMART LUNCHES INC., Boston, USA.
Summer internship at a Startup located in Boston. Development, test and deployment of delivery system and financial control platform programming in Ruby on Rails.

Awards and Scholarships

2021   Fonds de recherche du Quebec B2X Scholarship, Canada.

2020   Mitacs Accelerate Fellowship, Canada.

2020   Brazilian Ph.D. scholarship from Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), Brazil.

2016   Brazilian M.S. scholarship from Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Brazil.

2012   Brazilian Science Without Borders scholarship from Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), Brazil.

Peer-Reviewed Publications

2022   P. Freitas de Araujo-Filho, G. Kaddoum, M. Naili, E. T. Fapi and Z. Zhu, "Multi-Objective GAN-Based Adversarial Attack Technique for Modulation Classifiers", in IEEE Communications Letters, April, 2022, doi: 10.1109/LCOMM.2022.3167368.

2021   P. Freitas de Araujo-Filho, G. Kaddoum, D. R. Campelo, A. Gondim Santos, D. Macêdo and C. Zanchettin, "Intrusion Detection for Cyber–Physical Systems Using Generative Adversarial Networks in Fog Environment", in IEEE Internet of Things Journal, vol. 8, no. 8, pp. 6247-6256, April 15, 2021, doi: 10.1109/JIOT.2020.3024800.

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2021   P. Freitas De Araujo-Filho, A. J. Pinheiro, G. Kaddoum, D. R. Campelo and F. L. Soares, "An Efficient Intrusion Prevention System for CAN: Hindering Cyber-Attacks With a Low-Cost Platform", in IEEE Access, vol. 9, pp. 166855-166869, 2021, doi: 10.1109/ACCESS.2021.3136147.

2021   A. J. Pinheiro, P. Freitas de Araujo-Filho, J. de M. Bezerra and D. R. Campelo, "Adaptive Packet Padding Approach for Smart Home Networks: A Tradeoff Between Privacy and Performance", in IEEE Internet of Things Journal, vol. 8, no. 5, pp. 3930-3938, March 1, 2021, doi: 10.1109/JIOT.2020.3025988.

2022   P. do Carmo, P. Freitas de Araujo-Filho, D. R. Campelo, E. Freitas, D. Sadok, "Machine Learning-Based Intrusion Detection System for Automotive Ethernet: Detecting Cyber-Attacks with a Low-Cost Platform", in Anais do XL Simpósio Brasileiro de Redes de Computadores e Sistemas Distribuídos, Fortaleza, 2022.

2020   L. Prado D'Andrada, P. Freitas de Araujo-Filho, and D. R. Campelo, "A Real-time Anomaly-based Intrusion Detection System for Automotive Controller Area Networks", in Anais do XXXVIII Simpósio Brasileiro de Redes de Computadores e Sistemas Distribuídos, Rio de Janeiro, 2020, pp. 658-671, doi: https://doi.org/10.5753/sbrc.2020.12316.

2018   E. A. Silva Junior, P. F. d. Araujo-Filho and D. R. Campelo, "Experimental Evaluation of Cryptography Overhead in Automotive Safety-Critical Communication", 2018 IEEE 87th Vehicular Technology Conference (VTC Spring), 2018, pp. 1-5, doi: 10.1109/VTCSpring.2018.8417610.

Co-Supervision Activities

2021–Present   **Mohamed Chiheb Ben Nasr**, *Master's Student,* École de Technologie Supérieure, Montreal, Canada.

2021–Present   **Luigi Luz**, *Master's Student,* Universidade Federal de Pernambuco, Recife, Brazil.

2020–2022   **Robinson Raymond**, *Master's Student,* École de Technologie Supérieure, Montreal, Canada.

Teaching Activities

2016–2019   **Automotive Networks**, Universidade Federal de Pernambuco, Recife, Brazil.

2015   **Probabilistic Systems**, Universidade Federal de Pernambuco, Recife, Brazil.

2014   **Signals and Systems**, Universidade Federal de Pernambuco, Recife, Brazil.

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2010–2011 **General Physics 1 (Classical Mechanics)**, Universidade Federal de Pernambuco, Recife, Brazil.

Technical Skills

Machine and Deep Learning
Pytorch, Tensorflow, and Keras

Hardware
SoCs, FPGAs and Microcontrollers

Hardware Description and Programming Languages
VHDL, C, C++, Python, Assembly, and Matlab

Development and Simulation Software
Xilinx Vivado, Xilinx SDK, Texas Code Composer Studio, Keil uVision, Mbed Platform, Visual Studio, CodeBlocks, Matlab, and Scilab

Languages

Portuguese **Native**

English **Advanced**

Proficiency exam TOEFL iBT 110/120 – 2018
Proficiency exam TOEFL iBT 100/120 – 2013
English Course at Kaplan International Colleges, London, UK,
Jan/2011–Fev/2011
English Course at Cultura Inglesa, Recife, Brazil – 2003/2008

Interests

- Security
- Privacy
- Intrusion Detection Systems
- Adversarial Attacks
- Connected Things
- Artificial Intelligence
- Machine Learning
- Deep Learning

References and Recommendation Letters

Available upon request