About

F. Fernando Jurado-Lasso

ffjla@dtu.dk | LinkedIn: fdojurado | people.compute.dtu.dk/ffjla/

I am a postdoctoral researcher at the Department of Applied Mathematics and Computer Science (DTU Compute) within the Embedded Systems Engineering (ESE) section of the Technical University of Denmark (DTU).

Research Interest

I am passionate about exploring the dynamic realm where Software-Defined Wireless Sensor Networks (SDWSNs) intersect with the power of Machine Learning (ML). This unique fusion of technologies serves as the focal point of my research endeavors. My goal is to address the burgeoning challenges posed by the ever-increasing number of Internet of Things (IoT) devices and applications.

My research is dedicated to overcoming the technological barriers associated with resource management and reconfiguration complexities prevalent in current IoT applications. Delving into the intricacies of networked embedded systems, SDWSNs, ML, and IoT protocols and applications.

Beyond this, my curiosity extends to the application of machine Learning and artificial intelligence for communications and networking. I am enthusiastic about harnessing the potential of these cutting-edge technologies to enhance the efficiency and intelligence of communication systems.

Keywords

- Internet of Things (IoT)
- Networked Embedded Systems
- Machine Learning (ML) and Artificial Intelligence (AI) for Communications and Networking

Education

PhD in Engineering & IT Jan 2017 - Dec 2020 The University of Melbourne Thesis: A software-defined networking framework for IoT. Advisor: Prof. Ampalavanapillai Nirmalathas and Mr. Ken Clarke.

MEng in Telecommunications Jul 2014 - Aug 2015 The University of Melbourne First Class Honours Advisor: Mr. Ken Clarke.

BEng in Electronics Aug 2006 - May 2012 Universidad del Valle Thesis: Design and implementation of an AVR (Automatic Voltage Regulator) using programmable hardware for a synchronous generator of up to 4MW. First Class Honours Advisor: Prof. Jaime Velasco-Medina.

Work Experience

Postdoctoral researcher Oct 2021 - present Technical University of Denmark (DTU) Department of applied mathematics and computer science (DTU compute) Embedded Systems Engineering (ESE) section Copenhague, Denmark

Description: I serve as the co-Principal Investigator (co-PI) for the Distributed Artificial Intelligence Systems (DAIS) project, a collaborative effort involving 48 partners from 11 European countries. In this pivotal role, I contribute significantly to the project's success by overseeing and actively participating in various key responsibilities and duties.

Developing and implementing research initiatives aligned with the scope of the EU DAIS project.

Utilizing machine learning methodologies to address networking challenges in wireless embedding systems.

Validating research findings through simulation tools such as Contiki-NG operating system, C code, Python, and PyTorch.

Presenting research outcomes at conferences, workshops, industrial gatherings, and open days.

Publishing research articles in reputable journals to contribute to the academic discourse.

Co-leading the university's supply chain management efforts.

Representing DTU and actively participating in project meetings to ensure effective collaboration and communication.

Co-supervising undergraduate and postgraduate students and providing mentorship and guidance in their academic pursuits.

Ph.D. Researcher Jan 2017 - Dec 2021 The University of Melbourne Department of Electrical and Electronic Engineering (EEE) Melbourne, Australia

Description: I investigate the challenges and benefits of Software Defined Wireless Sensor Networks (SDWSNs) as a solution to flexible resource management and reconfiguration of WSNs.

Design, model, and implement a software-defined management solution for WSNs.

Propose a mathematical model of energy consumption for SDWSNs to examine the implications for network performance when making the WSN reprogrammable.

Propose an innovative energy-aware routing algorithm and new control overhead reduction technique for prolonging the network lifetime of software-defined multihop WSNs.

Present research outcomes in various highly-regarded peer-reviewed venues.

Hardware Engineer Intern Jan 2017 - Jun 2018 Networked Society Institute (NSI) Department of Electrical and Electronic Engineering (EEE) Melbourne, Australia

Description: The project involved the development and evaluation of an online open-source educational resource to support the teaching and learning of STEM high-school education in Years 9 and 10. This project was supported by Google Australia.

Develop a sensor system to measure environment temperature, humidity, pressure, and other environmental parameters using Raspberry Pi.

Develop a communication interface to send the collected data to a remote server using the MQTT protocol.

To work with other interdisciplinary team members to plan, execute, and test the system.

Support Engineer Jan 2016 - Dec 2016 Emcali (Empresas Municipales de Cali) Cali, Cololmbia

Description: I play a pivotal role in actively contributing to the conceptualization, design, and execution phases of a groundbreaking project. The project was centered around developing and deploying prepaid energy services within smart grid systems.

To work with other team members to plan, execute, and deliver service to the prepaid electricity project.

To ensure the innovative energy solutions' seamless integration and robust performance.

To troubleshoot, provide technical support, and collaborate with cross-functional teams to enhance prepaid energy services' overall efficiency and reliability.

To elaborate on the project's documentation.

Research Intern Jan 2015 - Jun 2015 Networked Society Institute (NSI) Department of Electrical and Electronic Engineering (EEE) Melbourne, Australia

Description: Conceptual study and implementation of architectures and technologies used in IoT.

To investigate different publish-subscribe communications protocols

To work with multiple Unix-based operating systems.

Software development of the system.

Ph.D. Researcher Jan 2017 - Dec 2021 The University of Melbourne Department of Electrical and Electronic Engineering (EEE) Melbourne, Australia

Description: I investigate the challenges and benefits of Software Defined Wireless Sensor Networks (SDWSNs) as a solution to flexible resource management and reconfiguration of WSNs.

Design, model, and implement a software-defined management solution for WSNs.

Propose a mathematical model of energy consumption for SDWSNs to examine the implications for network performance when making the WSN reprogrammable.

Propose an innovative energy-aware routing algorithm and new control overhead reduction technique for prolonging the network lifetime of software-defined multihop WSNs.

Present research outcomes in various highly-regarded peer-reviewed venues.

Hardware Engineer Intern Jan 2017 - Jun 2018 Networked Society Institute (NSI) Department of Electrical and Electronic Engineering (EEE) Melbourne, Australia

Description: The project involved the development and evaluation of an online open-source educational resource to support the teaching and learning of STEM high-school education in Years 9 and 10. This project was supported by Google Australia.

Develop a sensor system to measure environment temperature, humidity, pressure, and other environmental parameters using Raspberry Pi.

Develop a communication interface to send the collected data to a remote server using the MQTT protocol.

To work with other interdisciplinary team members to plan, execute, and test the system.

Support Engineer Jan 2016 - Dec 2016 Emcali (Empresas Municipales de Cali) Cali, Cololmbia

Description: I play a pivotal role in actively contributing to the conceptualization, design, and execution phases of a groundbreaking project. The project was centered around developing and deploying prepaid energy services within smart grid systems.

To work with other team members to plan, execute, and deliver service to the prepaid electricity project.

To ensure the innovative energy solutions' seamless integration and robust performance.

To troubleshoot, provide technical support, and collaborate with cross-functional teams to enhance prepaid energy services' overall efficiency and reliability.

To elaborate on the project's documentation.

Research Intern Jan 2015 - Jun 2015 Networked Society Institute (NSI) Department of Electrical and Electronic Engineering (EEE) Melbourne, Australia

Description: Conceptual study and implementation of architectures and technologies used in IoT.

To investigate different publish-subscribe communications protocols

To work with multiple Unix-based operating systems.

Software development of the system.

Work Experience

Postdoctoral researcher Oct 2021 - present Technical University of Denmark (DTU) Department of applied mathematics and computer science (DTU compute) Embedded Systems Engineering (ESE) section Copenhague, Denmark

Ph.D. Researcher Jan 2017 - Dec 2021 The University of Melbourne Department of Electrical and Electronic Engineering (EEE) Melbourne, Australia

Hardware Engineer Intern Jan 2017 - Jun 2018 Networked Society Institute (NSI) Department of Electrical and Electronic Engineering (EEE) Melbourne, Australia

Support Engineer Jan 2016 - Dec 2016 Emcali (Empresas Municipales de Cali) Cali, Cololmbia

Research Intern Jan 2015 - Jun 2015 Networked Society Institute (NSI) Department of Electrical and Electronic Engineering (EEE) Melbourne, Australia

Teaching Experience

Guest Lecturer, Operating Systems for IoT Nov 2023 Undergraduate coursework Nov 2022 Technical University of Denmark (DTU) Nov 2022 Department of Applied Mathematics and Computer Science (DTU Compute) Nov 2022

Key Responsibilities:

Deliver engaging and informative presentations.

Share insights into operating systems tailored for the IoT.

Facilitate discussions to enhance students' understanding of key concepts in this dynamic field.

Supervisor: A/Prof. Xenofon Fafoutis

Head Tutor, Electrical Network Analysis and Design (ENAD) Jul 2020 - Nov 2020 Undergraduate coursework The University of Melbourne Department of Electrical and Electronic Engineering (EEE)

Key Responsibilities:

Develop and implement a comprehensive workshop delivery plan for the Electrical Network Analysis and Design course.

Facilitate engaging and informative workshops, elucidating complex concepts in electrical networks and hardware design.

Utilize various hardware tools, including Analog Discovery 2, and simulation tools such as LTspice.

Provide guidance to students on theoretical principles and practical applications in electrical networks and hardware design.

Address and resolve students' queries while maintaining meticulous records through the University's learning management system.

Lead a team of demonstrators by assigning responsibilities and establishing marking criteria for workshops.

Manage records of students' assessment results, ensuring accuracy and confidentiality.

Contribute to the grading process for final exams, maintaining high standards of evaluation.

Supervisor: Prof. Ampalavanapillai Nirmalathas.

Head Tutor, Embedded System Design (ESD) Jul 2020 - Nov 2020 Postgraduate coursework Jul 2019 - Nov 2019 The University of Melbourne Jul 2019 - Nov 2019 Department of Electrical and Electronic Engineering (EEE) Jul 2019 - Nov 2019

Key Responsibilities:

Provide comprehensive guidance to students on theoretical concepts in embedded systems, hardware design, and simulation problems.

Proficiently utilize C language, Visual Studio, Eclipse, and LabVIEW.

Address students' queries effectively and maintain meticulous records through the University's learning management system.

Lead a team of demonstrators by assigning responsibilities and establishing marking criteria in workshops, fostering a collaborative and effective learning environment.

Manage accurate records of students' assessment results, ensuring confidentiality and precision.

Contribute to the grading process for final exams, upholding rigorous standards of evaluation.

Supervisor: A/Prof. Gavin Buskes

Head Tutor, Analog and Digital Electronics Concepts (ADEC) Mar 2019 - Jun 2019 Undergraduate coursework Mar 2018 - Jun 2018 The University of Melbourne Mar 2018 - Jun 2018 Department of Electrical and Electronic Engineering (EEE)

Key Responsibilities:

Provide expert guidance to students in the modeling and analysis of linear time-invariant behavior in electrical and electronic systems, spanning both time and frequency domains.

Supervise and mentor students in designing, constructing, and testing passive and active electrical networks, ensuring they achieve specified linear time-invariant behavior.

Instruct students on utilizing software tools for simulating the behavior of linear electrical networks, enhancing their practical skills.

Oversee and guide students in applying fundamental concepts and tools for the analysis and design of combinational and sequential logic systems.

Foster an appreciation for the role and limitations of crucial digital abstractions.

Train students in configuring and testing digital hardware development platforms within laboratory settings.

Maintain meticulous records of students' assessment results and diligently grade final exams.

Supervisor: A/Prof. Gavin Buskes

Teaching Experience

Guest Lecturer, Operating Systems for IoT Nov 2023 Undergraduate coursework Nov 2022 Technical University of Denmark (DTU) Nov 2021 Department of Applied Mathematics and Computer Science (DTU Compute)

Head Tutor, Electrical Network Analysis and Design (ENAD) Jul 2020 - Nov 2020 Undergraduate coursework The University of Melbourne Department of Electrical and Electronic Engineering (EEE)

Head Tutor, Embedded System Design (ESD) Jul 2020 - Nov 2020 Postgraduate coursework Jul 2019 - Nov 2019 The University of Melbourne Jul 2018 - Nov 2018 Department of Electrical and Electronic Engineering (EEE)

Head Tutor, Analog and Digital Electronics Concepts (ADEC) Mar 2019 - Jun 2019 Undergraduate coursework Mar 2018 - Jun 2018 The University of Melbourne Department of Electrical and Electronic Engineering (EEE)

Supervision

Master (1)

Daniel Borislavov, Niels Georg, and Andreas Work (2023). A Software-Defined based Approach for Mobile IoT. Master of Science in Engineering (MScEng). Technical University of Denmark (DTU). Department of Applied Mathematics and Computer Science (DTU Compute).

Bachelor (2)

Qixin Ma (2023). Design and Implementation of a GUI for a SDWSN Architecture. Bachelor of Engineering (BEng). Technical University of Denmark (DTU). Department of Applied Mathematics and Computer Science (DTU Compute).

Christopher Acosta (2022). Comparison of TSCH schedulers for WSNs in Contiki-NG. Bachelor of Engineering (BEng). Technical University of Denmark (DTU). Department of Applied Mathematics and Computer Science (DTU Compute).

Grants and Awards

Melbourne School of Engineering Conference Travel Scholarships (AUD $1,500)2018The University of MelbourneAustralia

Ph.D. Studentship (AUD $25,000 per year)2017Networked Society Institute (NSI)Australia

Melbourne Fee Remission Scholarship (Full tuition fee waiver)2017The University of MelbourneAustralia

Colciencias Doctoral Scholarship (AUD $153,000)2017MincienciasColombia

Research Internship 2015Networked Society Institute (NSI)Australia

Santander Formula Scholarship (GBP $4,200 - not taken)2014University of LeicesterUK

Postgraduate Scholarship (USD $50,000)2014Colfuturo's ScholarshipColombia

Distinguished Student Award (Full tuition fee waiver)2011Universidad del ValleColombia

Publications

Preprints (3)

- **Jurado-Lasso, F. F.**, Orfanidis, C., Jurado, J. F., & Fafoutis, X. (2024). HRL-TSCH: A Hierarchical Reinforcement Learning-based TSCH Scheduler for IIoT. *arXiv.* [*rxiv]
- **Jurado-Lasso, F. F.**, Jurado, J. F., & Fafoutis, X. (2024). A Centralized Reinforcement Learning Framework for Adaptive Clustering with Low Control Overhead in IoT Networks. *arXiv.* [*rxiv] [code]
- **Jurado-Lasso, F. F.**, Barzegaran, M., Jurado, J. F., & Fafoutis, X. (2023). ELISE: A Reinforcement Learning Framework to Optimize the Slotframe Size of the TSCH Protocol in IoT Networks. *TechRxiv.* [*rxiv] [code] [slides] [doc]

Journal Articles (4)

- **Jurado-Lasso, F. F.**, Marchegiani, L., Jurado, J. F., Abu-Mahfouz, A. M., & Fafoutis, X. (2022). A survey on machine learning software-defined wireless sensor networks (ml-SDWSNS): Current status and major challenges. *IEEE Access*, vol. 10, pp. 23560-23592. [pdf] [*rxiv]
- **Jurado-Lasso, F. F.**, Clarke, K., Cadavid, A. N., & Nirmalathas, A. (2021). Energy-aware routing for software-defined multihop wireless sensor networks. *IEEE Sensors Journal*, vol. 21(8), pp. 10174-10182. [pdf]
- **Jurado-Lasso, F. F.**, Clarke, K., & Nirmalathas, A. (2019). Performance analysis of software-defined multihop wireless sensor networks. *IEEE Systems Journal*, vol. 14(4), pp. 4653-4662. [pdf]
- **Jurado-Lasso, F. F.**, Clarke, K., & Nirmalathas, A. (2019). A software-defined management system for IP-enabled WSNs. *IEEE Systems Journal*, vol. 14(2), pp. 2335-2346. [pdf]

Conference Papers (1)

- **Jurado-Lasso, F. F.**, Clarke, K., & Nirmalathas, A. (2018). A software-defined networking framework for IoT based on 6LoWPAN. *Proceeding of Wireless Telecommunications Symposium (WTS).* [pdf]

Software

- Contiki-NG-SDWSN: The OS for Next Generation SDN-IoT network. Contiki-NG-SDWSN is an SDN-based solution for WSNs. It focuses in making the sensor network reprogrammable. [code]

- ELISE: The SDN-based solution for the next generation of IoT networks. ELISE is built upon multidisciplinary research efforts of Software-Defined Networking (SDN), Wireless Sensor Networks (WSNs), and Machine Learning (ML). [code] [web]

- PyNetSim: PyNetSim stands out as a robust wireless sensor network simulator specifically crafted for the evaluation of LEACH-based protocols, including traditional LEACH and its variants like LEACH-C. Developed in Python, this tool provides a versatile and accessible platform for researchers and students to test, analyze, and refine their clustering algorithms in the context of wireless sensor networks. [code]

Skills

Applications

Altium Designer, LATEX, LabVIEW, MS Office, OrCAD PSpice, Wireshark

Language

- Spanish (Native)
- English (Proficient)

Progamming

- Python
- C Code
- MATLAB
- Git
- PyTorch
- Java
- Contiki-NG

Skills

Progamming

- Python 4.5/5
- C Code 4/5
- MATLAB 4/5
- Git 4/5
- PyTorch 3.5/5

- Java 4/5
- Contiki-NG 4.5/5

Language

- Spanish (Native)
- English (Proficient)

Applications

- Altium Designer nan/5
- MS Office nan/5
- LabVIEW nan/5
- Wireshark nan/5
- OrCAD PSpice nan/5
- LATEX nan/5

Professional Service

Journal Reviewer

- IEEE Internet of Things Journal
- IEEE Sensors Journal
- Journal of Network and Computer Applications
- Ad Hoc Networks, Elsevier
- Sensors, MDPI
- Eletronics, MDPI
- Transactions on Emerging Telecommunications Technologies, Wiley
- International Journal of Communication Systems, Wiley
- IEEE Journal of Selected Areas in Sensors

Conference Reviewer

- IEEE Global Communications Conference (GLOBECOM)
- National Conference on Communications (NCC)

Professional Memberships

- IEEE Member (2021)
- National Professional Council of Electrical, Mechanical Engineering and Related Professions, Colombia (2012)

References

Assoc. Prof. Xenofon Fafoutis Technical University of Denmark (DTU) xefa@dtu.dk

Prof. Ampalavanapillai Nirmalathas The University of Melbourne nirmalat@unimelb.edu.au

Prof. Paul Pop Technical University of Denmark (DTU) paupo@dtu.dk

For a full CV, please send me an email.