

Roilhi Frajo Ibarra-Hernández

Linkedin: Roilhi Ibarra
Github: github.com/roilhi

Email: roilhi@gmail.com
Mobile: (+52 1) 646 193 1633
ORCID: 0000-0002-2366-0234

PROFILE

Doctor of Science pioneering cutting-edge AI/ML frameworks for 5G/6G optimization including MIMO beamforming and RIS-aided intelligent surfaces with research published in different peer-reviewed papers. Passionate educator with 5+ years of experience who has mentored 50+ students at different institutions and early-career researchers in AI/ML, bridging theory with wireless industry challenges. Experience in funding acquisition, project leadership and strong collaboration with academics and industry. Strong experience in AI/ML optimization of wireless systems and the development of web applications integrated to the cloud computing services. Strong experience in developing and testing of AI/ML-based applications and pipelines.

SKILLS SUMMARY

- **Spoken Languages:** Spanish (mother tongue), English (Fluent), French (Beginner)
- **AI/ML for wireless communication:** Strong experience in developing optimization methods for 5G/6G communications in Physical layer, specialized on MIMO and RIS-aided systems enhancement
- **Programming (and markup) Languages:** Proficient in Python, C#, SQL, HTML-CSS, Javascript, C++, C (cmake), MATLAB, Julia, bash scripting, L^AT_EX
- **AI/ML Frameworks & OS:** Proficient in Scikit-learn, Pytorch, CUDA, Numpy, Pandas, Jupyter
- **DevOps tools:** Strong skills in Docker, Kubernetes for design of Web Applications
- **Database Management Tools:** Expertise with databases MySQL, MariaDB, MongoDB, SQLite
- **Another technical skills:** Strong experience in web applications development in Flask, Fastapi, Django, proficient in Linux-based OS
- **Soft Skills:** Leadership, Research, Writing, Public Speaking, Project Management, Knowledge sharing, Paper Publishing

AWARDS AND ACHIEVEMENTS

- **National System Of Researchers (SNI):** Candidate level award since 2022
- **Postdoctoral Research Scholarship:** Estancias Postdoctorales por México SEHCITI 2022-2025 (\$1.08M MXN)
- **Postdoctoral Research Scholarship:** Proyecto TZUKU Ciencia de Frontera (\$300k MXN)
- **Doctoral Visit Scholarship:** *Bourse de Mobilité des Doctorants* for Mobility in France 2018 €(2.1k)
- **Doctoral Visit Scholarship:** Beca Mixta CONAHCYT for Mobility in France 2018 (\$100k MXN)
- **Doctoral Scholarship:** CONACYT 2015-2019 (\$ 576k MXN)
- **M.Sc. Scholarship:** CONACYT 2012-2015 (\$ 192k MXN)

EDUCATION

- **Ensenada Center of Scientific Research and Higher Education (CICESE)** Ensenada, Mexico
PhD: Doctor of Science in Electronics and Telecommunications June 2019
Thesis: Development of techniques for the analysis and processing of cardiac sound signals
Supervisor: Dr. Miguel Ángel Alonso Arevalo
Design of ML-based algorithms (Support Vector Machines, Random Forest, Regression Trees, Gradient Boosting) for the detection of pathological states in cardiac sound signals (phonocardiograms). Publication of two research journal papers.
- **Ensenada Center of Scientific Research and Higher Education (CICESE)** Ensenada, Mexico
MSc: Master of Science in Electronics and Telecommunications November 2014
Thesis: Development of a codification scheme for the transmission of cardiac sound signals over low data rates
Supervisor: Dr. Miguel Ángel Alonso Arevalo
Development of a codec tailored for cardiac sound signals applying signal processing techniques (Matching Pursuit, Linear Predictive Coding). Conducting subjective (MUSHRA) and objective assessments to evaluate the codec performance.
- **Autonomous University of Zacatecas (UAZ)** Zacatecas, Mexico
Bachelor of Engineering in Communications and Electronics August 2012
Thesis: LZW Compression for a Wireless Communication System with MIMO-OFDM
Supervisor: Dr. Jorge Flores Troncoso
Implementation of a Lempel-Ziv Welch algorithm for the compression of MIMO-OFDM modulated transmission signals. Evaluation of the system performance and compression rate. Results were published in a scientific divulgation magazine.

EXPERIENCE

- **Postdoctoral Research Fellowship** Autonomous University of San Luis Potosi (UASLP)
Grant given by CONAHCYT, Mexico Oct 2022 - Current
 - **Research and Development:** Research on Machine Learning Methods for the enhancement of 6G Wireless Communication Systems (Python/Pytorch, bash scripting, Git, CUDA). Development in MATLAB/Python of signal detection schemes for MIMO and RIS-aided wireless communication systems. Research assistant in the CAMAZOT project of radar system design
 - **Teaching:** University Lecturer on Instrumentation for Electronics and Telecommunications Engineering programs
 - **Divulagation:** Participate in different activities to promote the Bachelors Degree of Telecommunications Engineering
- **Postdoctoral Research Projects** TZUKU project
Research Project founded by CONAHCYT Oct 2022-Current
 - **Research and Development:** Implementation of Deep Learning Methods for the classification of dog emotions using its barks (Python, Pytorch, CUDA)
 - **Teaching:** Professor's assistance for Computer Methods on Biomedical Instrumentation Grad Course in INAOE
- **PhD Research Projects** CICESE/INRIA Rennes, France
Full time 2015-2019
 - : Research on Machine Learning Methods for the heart sound signals classification to detect a pathological state: Naive Bayes, K-Nearest Neighbors, Support Vector Machines, Random Forest, SMOTE, Feature selection (CFS, Information Gain)
 - : Implementation of Signal Processing Methods for Heart Sounds Signal Modeling and Representation: sparse methods (Matching Pursuit) and Autorregressive Methods (LPC)
 - : Scientific publications in international and local conferences and scientific journal contribution
 - **International stay at INRIA Research Center:** Participate in PANAMA research group to continue PhD research about sound classification enhancement.
- **University Lecturer** UABC, UNIENS, UASLP, ITSJ
Part-time 2018-2023
 - (UASLP 2022-2025) **Telecommunications Engineering:** Electronics instrumentation
 - (Instituto Tecnológico Superior de Jerez ITSJ, Zacatecas 2023) **Mechatronics Engineering:** Numerical Methods
 - (Autonomous University of Baja California UABC 2020-2021) **Electronics Engineering:** Microcontrollers
 - (UABC 2019-2021) **Computers Engineering:** Control Systems & Automatization
 - (UABC 2020-2021) **Bachelor of Engineering:**
 - * Numerical Methods & Programming
 - * Vectorial Mechanics
 - (UNIENS 2019-2020) **Bachelor of administration:**
 - * Mathematics
 - * Probability and Statistics
 - * Quantitative Methods for Business
 - (UNIENS 2020-2021) **Industrial Engineering:**
 - * Probability and Statistics
 - * Numerical Methods
 - * Electricity & Magnetism
 - * Differential Calculus
 - * Multivariable Calculus
 - * Programming Methods
- **Mentoring**
Part-time
 - **Master of Science Thesis :**
 - **Franco Santos, Luis Alejandro.** : *Optimización de una herramienta de traducción en tiempo real basada en un modelo multimodal fundacional.* Centro de Enseñanza Técnica y Superior (CETYS), Ensenada, 2024. **Role:** Co-supervisor
 - **Aquino Martínez, Jorge Uriel.** : *Evaluación del desempeño de redes neuronales, regresión logística y random forest utilizando scikit-learn y tensorflow.* Instituto Tecnológico de Tlalnepantla (ITTLA), Estado de México, 2024. **Role:** Co-supervisor
 - **Serna Martínez, Jesús Felipe.** : *Desarrollo de capacidades y talento tecnológico en estudiantes de nivel secundaria, usuarios del programa de habilidades STEAM.* Universidad Autónoma de Ciudad Juárez (UACJ), 2023. **Role:** Member of committee
 - **Orozco Reyes, Leonel** : *Clasificación de la señal de audio cardiaco mediante análisis tiempo-frecuencia y aprendizaje de máquinas.* CICESE, 2022. **Role:** Member of committee

- **Orozco Inowe, Óscar Alfonso** : *Aplicación de Internet de las cosas y aprendizaje profundo para optimizar el proceso de riego en plantas herbáceas*. CETYS Ensenada, 2022. **Role**: Member of committee

- **IT HelpDesk Administrator**
Full-time

Universidad de Ensenada (UNIENS) - ITECI Preparatoria
Oct 2020 - Oct 2022

- **DevOps**: Deploy and Release of web applications on a VPS server using Docker and Kubernetes. Server maintainance. Pod and containers creation.
- **Support and Assistance**: Support to Computer Devices, hardware and software. Assistance in budgets, hardware care, software installing for all sectors: administrative, professors, students
- **Domain and e-mail servers sustaining**: Installation of domain servers and e-mail servers, installation of Google G-Suite Enterprise for education, accounts creation and sustaining
- **LMS development and sustaining**: Creation, installation and configuration of a Moodle-based Learning Management System, accounts creation and assistance. (Docker, Kubernetes)
- **Web development**: Design of Backend and Frontend for website of Universidad de Ensenada: HTML/CSS, Django, Flask, Javascript/React. Development of desktop and web apps for the academic and financial services: C#, MongoDB, MySQL, Django, Git

- **Software Engineer for the Electrical Test Department**
Software Developer (full-time)

Dialight
Apr 2021 - Dec 2021

- **Electrical Test Software Development**: sustaining and Development of C# Desktop Applications for the Electrical Test at Sub-assembly, Potting and Finished-Goods level for Solid State Lighting Products
- **Packing Software Development**: Support and Development of C# Desktop Applications for the automated process of Box Labels printing and packing registers updating in the MySQL ODBC database
- **Database Support and Development**: Support and development for database actions: insert, delete, update entries for Electrical Test and packing registers using a MySQL ODBC database. Connection of database with Python and C# for support to the engineering department and production line sustaining
- **Firmware Flashing Testing**: Testing of New Firmware Developments in production line of DIGI SBC Card based on Yocto-Linux
- **Software Documentation and Operations**: Writing of documentations for new software developments, update and control of versions using Git and Bitbucket

PROJECTS

- **Design of Deep Learning based methods for signal detection in MIMO and RIS-aided wireless systems**: Research conducted in Python and MATLAB with publications in indexed scientific journals and international conferences
- **An Automated Heart Sounds Classification Features Evaluation Framework**: Research development in MATLAB, Python: scikit-learn, numpy, pandas, Jupyter notebooks
- **Computer-based subjective evaluation for the sound quality**: GUI developed in MAX-MSP. Registered by the Mexican Author Institute: 03-2016-053110321100-01
- **Design of Learning, Education and Financial Management System for ITECI-UNIENS Institutes**: Development in Python, HTML, MySQL, Docker, Kubernetes

Project	Topic	Role	Founding
Web application for the subjective assesment of audio signals	Design of a graphic user interface (GUI) to evaluate the subjective audio quality based on the MUSHRA standard. The software was registered for the Mexican Institute of Intellectual Property.	contributor	CONAHCYT
TZUKU	Development of ML/DL based applications for the classification of contextual behavior of rescue and assistance dogs	contributor	SEHCITI
IA for the design of SM-MIMO RIS-aided communications for 6G	Application of AI and ML for the optimization and signal detecction in SM-MIMO and RIS-aided wireless communications	main researcher	SEHCITI
CAMAZOT	Design of a radar system for aerial vigilance	contributor	SEDENA

PUBLICATIONS

- **Journal Papers & Book Chapters**: 78 citations in Google Scholar
- **(2025, coauthor) Performance Optimization of Multiple RIS-Assisted Multiuser MIMO Communication Systems**: in *Reconfigurable Intelligent Surfaces for 6G and Beyond Wireless Networks*, pp 169-200 John Wiley & Sons, Inc. DOI: <https://doi.org/10.1002/9781394250141.ch5>
- **(2025, coauthor) A Deep-Learning Approach to Heart Sound Classification Based on Combined Time-Frequency Representations.**: *Technologies*, 13(4), 147. DOI: <https://doi.org/10.3390/technologies13040147>
- **(2025, coauthor)**: Verification of a Probabilistic Model and Optimization in Long-Range Networks. *Applied Sciences*, 15(4), 1873. DOI: <https://doi.org/10.3390/app15041873>

- **(2025, main author):** Efficient Deep Learning-Based Detection Scheme for MIMO Communication Systems. *Sensors*, 25(3), 669. DOI: <https://doi.org/10.3390/s25030669>
- **(2024, main author):** Machine Learning Strategies for Reconfigurable Intelligent Surface-Assisted Communication Systems—A Review, *Future Internet*, 16(5), 173. DOI: <https://doi.org/10.3390/fi16050173>
- **(2023, main author):** Comparison of Spectral and Sparse Feature Extraction Methods for Heart Sounds Classification, *Revista Mexicana de Ingeniería Biomédica*, Volumen 45. DOI: <https://doi.org/10.17488/RMIB.44.4.1>
- **(2023, coauthor):** Robust heart sound segmentation based on spectral change detection and genetic algorithms, *Biomedical Signal Processing and Control*, Volumen 63, 2021. DOI: <https://doi.org/10.1016/j.bspc.2020.102208>
- **(2017, main author):** Design and evaluation of a parametric model for cardiac sounds, *Computers in Biology and Medicine*, Volumen 89, 2017. DOI: <https://doi.org/10.1016/j.combiomed.2017.08.007>
- **Conference papers::** Presented at different national and international events
- **(2023, main author):** Clasificación contextual de vocalizaciones de perros de asistencia apoyada por segmentación automática. *Research in Computing Science* 152(6)
- **(2023, coauthor):** Clasificación de la señal de audio cardiaco mediante la transformada de Fourier de tiempo corto y aprendizaje profundo. *Research in Computing Science* Vol 151(7).
- **(2023, coauthor):** Evaluación de la regresión logística utilizando Scikit-learn y TensorFlow. *AvaCient* 13 (2), 139-148
- **(2018, main author):** A benchmark of heart sound classification systems based on sparse decompositions. *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series* (Vol. 10975).
- **(2015, main author):** A parametric model for heart sounds. *49th Asilomar Conference on Signals, Systems and Computers* (pp. 765-769). IEEE.
- **(2015, main author):** Desarrollo de un codificador para audio cardiaco”. *Memorias del Congreso Nacional de Ingeniería Biomédica* (Vol. 2, No. 1, pp. 157-160).
- **(2015, main author):** Reconstrucción de senales de audio cardiaco mediante Matching Pursuit. *Encuentro Nacional de Computación 2015*.
- **(2013, main author):** Compresion LZW en un sistema de comunicaciones MIMO inalámblico. *Difu100ci@, Revista de difusión científica, ingeniería y tecnologías*, 7(1), 17-24
- **(2012 coauthor):** Incidence of harmonic in asynchronous three-phase motors. *Procedia Engineering* 35, 14-21.

INVITED PRESENTATIONS

- **Instituto Potosino de Ciencia y Tecnología (IPICYT):** Integración de la IA en comunicaciones inalámbricas de última generación. La aplicación del supercómputo a la solución de problemas diversos, 2025.
- **National Institute of Astrophysics, Optics and Electronics (INAOE):** Métodos de clasificación automática de contextos en vocalizaciones de perros de búsqueda y asistencia. Primer Simposio Internacional en Inteligencia Computacional Aplicada al Análisis de la Conducta Animal, 2024.
- **Universidad de la Ciénega Michoacana (UCEMICH) :** Inteligencia Artificial: Usos, aplicaciones y novedades. Seminario de Ingeniería en Nanotecnología, 2024.
- **Universidad de Colima (UCol) :** Integración de la IA en las Comunicaciones Inalámbricas. Seminario de Industria 4.0 2024.
- **CICESE Research Center:** Integración de la IA en las comunicaciones inalámbricas de última generación. Seminario del posgrado en Electrónica y Telecomunicaciones del CICESE, 2024.
- **CICESE UT3 Research Center:** Desarrollo de métodos computacionales para la clasificación de patrones en vocalizaciones de perros de búsqueda y asistencia. Seminario Proyecto TZUKU, 2024.
- **ITSJ :** Inteligencia Artificial: usos, aplicaciones y novedades. XX Aniversario de la creación del Instituto Tecnológico Superior de Jerez, 2024.
- **UAZ :** Taller de Machine Learning Básico con Python. Segundo Ciclo de Conferencias: El Actuario y la Innovación Tecnológica. Unidad Académica de Matemáticas, 2023.
- **UASLP:** Integración de la IA en Comunicaciones Inalámbricas. Seminario de Ingeniería Electrónica, Biomédica y Telecomunicaciones (IEBT), 2023.
- **Instituto Tecnológico de Valle de Bravo:** Desarrollo de algoritmos para el análisis de audio cardiaco. 2do Congreso Nacional de Mecatrónica, Transformación en la Industria Digital 4.0, 2020.
- **UABC Facultad de Ciencias de la Ingeniería:** Desarrollo de algoritmos para el análisis de audio cardiaco. Simposio Virtual AEEQUS 2020. Tecate, BC.

PROFESSIONAL MEMBERSHIP, TECHNICAL PROGRAM COMMITTEE AND EXPERT REVIEWER

- **20th Mexican International Conference on Artificial Intelligence (MICAI) 2021:** Technical Committee
- **IEEE Transactions on Wireless Communications :** Regular reviewer
- **Wiley Transactions on Emerging Telecommunications Technologies :** Regular Reviewer
- **IEEE VTC 2025:** Reviewer
- **Sensors MDPI :** Regular reviewer
- **Mathematics MDPI :** Regular reviewer
- **Signals MDPI :** Regular reviewer
- **Applied Sciences MDPI :** Regular reviewer
- **Electronics MDPI :** Regular reviewer
- **Elsevier Computers in Biology and Medicine :** Regular reviewer
- **Revista Mexicana de Ingeniería Biomédica (RMIB) :** Regular reviewer
- **Elsevier Biocybernetics and Biomechanical Engineering :** Reviewer

LICENSES AND CERTIFICATIONS

- **Machine Learning in Python with scikit-learn:** Inria 30 May, 2022
- **Introduction to Tensorflow for Artificial Intelligence, Machine Learning and Deep Learning:** Coursera/DeepLearning.AI - Dec 2021
- **Numpy, Pandas, Matplotlib in Python for Machine Learning:** Udemy - Dec 2021

VOLUNTEERING

- **AI Mexico:** Core member from 2018-2022. Promotion of AI applications for society in Ensenada.
- **RedDic: Red por la dignificación de la Investigación Científica en México :** Core member from 2020. Promote the active participation of young researchers in Mexico.