Carlos A. Osorio Q.

PhD. R&D Senior Engineer.

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Profile

Ph.D. in Electronics Engineering from INAOE, Mexico (2022), with expertise in developing cutting-edge 2D/3D hyperspectral imaging systems using single-pixel cameras. My research has contributed to advancing computational imaging techniques, demonstrating strong problem-solving abilities in complex technical challenges. Beyond my academic research, I have extensive hands-on experience in FPGA applications, RF design, electric vehicle systems, and autonomous technologies. I am proficient in a wide range of programming and engineering tools, including Altium Designer, C/C++, Matlab, Python, Zemax (optical design), LabVIEW, Ansys, SolidWorks, VHDL, HFSS, and OpenCV for image processing. Additionally, my expertise in Linux and GNU-RADIO allows me to implement innovative solutions for signal processing and embedded systems. With a strong foundation in electronics engineering, computational imaging, and interdisciplinary research, I am well-equipped to contribute to projects at the intersection of emerging technologies and real-world applications.

Work experience

Postdoctoral Research | Computer Science — **08/2024-Present**

Electronics Department
Instituto Nacional de Astrofísica, Óptica y Electrónica-Mexico (INAOE)

Project:
Intelligent rescue system based on DL for UAVS.

Research Engineering Assistant| Ph.D. student — **01/2018 - 09/2022**

Electronics Department
Instituto Nacional de Astrofísica, Óptica y Electrónica-Mexico (INAOE)

Project:
Developing a hyperspectral vision system based on the single-pixel principle (NIR). In combination with thermal sensors, time-of-flight (ToF) and RADAR. These vision systems can work in hazardous weather conditions and have multiple fields of applications as sensor vision for autonomous vehicles, robots, UAVs, and other applications where the sensor vision is needed indoors/outdoors.

RF Design Engineer — **09/2017 - 12/2017**

Electronics Department
Instituto Nacional de Astrofísica, Óptica y Electrónica-Mexico (INAOE)

Project:
Development of terminal compact GSM for emergency communication and embedded systems FPGA/DSP.

Research Fellowship — **08/2016 - 04/2017**

Electronics Department
División de Ingenierías Campus Irapuato - Salamanca-Mexico.

Project:
Design a reconfigurable Filter using alloy GaEIn of metal Liquid for RF applications, design a portable Vector Network Analysis (VNA) for Space Applications.

Skills

- **Electronic design and PCB** 12+ yrs.
- **C/C++** 10+ yrs.
- **Python** 4+ yrs.
- **FPGA** 8+ yrs.
- **Solidworks** 6+ yrs.
- **ANSYS HFSS** 3+ yrs.
- **ANSYS ZEMAX** 4+ yrs.
- **Optical Design** 2+ yrs.
- **CUDA Python/C++** 3+ yrs.
- **Imaging Processing and ML/DL** 2+ yrs.
- **LoRa/M2M/IoT/IoD** 4+ yrs.
- **Remote Sensing** 4+ yrs.
- **Autonomous Vehicles (AV)** 4+ yrs.
- **Precision farming** 2+ yrs.
- **Spanish** L1
- **English** C1

Research and Development Engineer — **03/2015 - 06/2015**
GENTECA-Venezuela.

Project:
Development of the system of control and protection electronic

Development Engineer — **01/2014 - 08/2015**
Nanomovil Pluss-Venezuela.

Project:
Wireless application engineer.

Research and Development Engineer — **04/2014 - 09/2014**
Conexsol-Venezuela.

Project:
Development energy backup system.

Academic Assistant — **09/2011 - 12/2013**
Simón Bolívar University-Venezuela.

Courses:
Laboratory Project, Signal and System, Communication
Project:
Development of a charger system LiPO. For experimental hybrid vehicles (2015), design of Solar Car CS3 Catatumbo (2014), development of Solar Car Kai CS-2 (Atacama Solar Challenge in 2012), development of a class F amplifier type in the 3.5 GHz band for a Student Competition IEEE MTT-3 Baltimore, United States, in June 2011.

Research and Development Engineer — **04/2012 - 08/2012**
INFN - Laboratori Nazionali di Legnaro-Italy.

Project:
Control systems design for stage a particle filter for a particle accelerator Wein fourth-generation SPES project.

Research Assistant — **01/2004 - 07/2008**
Nuclear Physics group
Simon Bolivar University-Venezuela.

Project:
Automatization of a permutation DC Geoelectric SEV module (USB-2009).

Intership — **06/2003 - 08/2003**
Research Department
Ingenieria Virtual-Venezuela.

Project:
Development of a power mearurement virtual machine based on DSP and CS5460 PIC 16C63.

Intership — **04/2003 - 06/2003**
Research Department
C.A. Metro de Caracas-Venezuela.

Project:
Development of bank of the test for a system of break of trains 2th generation.

Education

03/2024-11/2024

University Diploma in Applied Geomatics

CONAE/UNC

Argentina Space Agents Training Program.

01/2018-09/2022

Electronic Engineering,Ph.D.

National Institute of Astrophysics, Optics and Electronics-Mexico (INAOE)
Doctorate's thesis: "Three-dimensional hyperspetral camera based on near-infrared single-pixel imaging".

08/2015-08/2017

Space Science and Technology, M.Sc.

National Institute of Astrophysics, Optics and Electronics-Mexico (INAOE)
Master's thesis: "Design and generation of a system detection of signal for applications in MINI-RADAR SAR (Synthetic Aperture RADAR)".

09/2015-06/2016

Diploma of Higher Education in electric car and hydrogen.

San Jorge University-Spain.

Diploma's thesis: "Development of a control system to a Multi-Level DC-AC Converter with PWM Wavelet Modulation (WPWM) for applications in stack PEM Hydrogen".

09/2012-03/2015

Electronic Master.

Simon Bolivar University-Venezuela

Master's thesis: "Design and implementation of an electronic system charging LIPO Batteries for a hybrid vehicle."

Certifications

- Computer Vision I (Python), Computer Vision II (Python), Computer Vision I (C++), Computer Vision II (C++), Deep Learning with PYTORCH, Deep Learning with TensorFlow & Keras (Opencv University).
- Deep Reinforcement Learning, Natural Language Processing (NLP), Large Language Models (LLMs) & Text Generation, Robotics Software Engineer, Sensor Fusión, Flying Car and Autonomous Flight Engineer, Self Driving Car Engineer (UDACITY).
- Introduction to Optical System Design and Certification with Zemax OpticStudio (SPIE).
- Space Mission Design and Operations (EPFL).
- Catia V5R21.
- Computer and Communications Security, Network Management and Services (CITECI).
- Certificate Linux Network Administrator (ARCL).
- Systems based on Machine Vision Inspection using IMAQ ™ Vision Builder issued by National Instrument (NI).
- Synchrotron Light Sources and their Applications, Terahertz Optics and Photonics, Systems-on-Chip Based on FPGA for Scientific Instrumentation and Reconfigurable Computing, Machine Learning on Low-Power Devices: Applications and Advanced Topics (ICTP).
- Ansys-CAE,Ansys-FEA, Ansys-HFSS, Ansys-Maxwell, Ansys-Python, Ansys-EnSight, Ansys-UDFs,Ansys-CFD, Ansys-FSI,Ansys-APDL, Structural Analysis of Welded Joints, Thermo-structural Modeling of the Welding Process, Ansys-Space Claim, Ansys-Chemkin-Pro, Ansys-Fluent, Ansys-ACP, Ansys-Non-lineal Analysis, Ansys-Materials Fatigue, ASME VIII, Ansys-Polyflow, Ansys-eMag, Antenna Analysis and 5G with Ansys HFSS, Low-Frequency Electromagnetic Analysis, Transformer Analysis Course with Ansys Maxwell.
- Nvidia Fundamentals of Accelerated Computing with CUDA Python.
- Nvidia Fundamentals of Accelerated Computing with CUDA C/C++.
- Remote Sensing Applied to Ocean Color-Introductory Level, SAR Remote Sensing, Introductory Level Optical Remote Sensing, Introductory Level, Introduction to HPC programming with Python and its applications to the field of image processing, Introduction to Remote Sensing with Cloud Processing Tools ,Reliability in space devices and systems I/II,Radar Image Interferometry and Applications, Forest Fire Management Using the Google Earth Engine Platform,Satellite Flight and Mission Segment, Thermal Analysis and Design ,Space Systems Operations, Mission Assurance , Synthetic Aperture Radar (SAR) Image ,Processing Space Data Analysis , Project Management for the Space Industry (CONAE/UNC).
- Digital Twin and applications (HKPolyUx).
- Introduction to Hyperspectral Remote Sensing, Imaging Spectroscopy for Agricultural Applications (EO College).
- SELPER/CEOS WGCAPD - Training Course-Remote Sensing applications to floods droughts, fires, and landslides SELPER/CEOS WGCAPD - Training Course-Remote Sensing applications to floods droughts, fires, and landslides (European Space Agency- ESA).
- Hyperspectral Thermal Image Unmixing, Overview of LiDAR; system variations, data interpretation & applications, Introduction to UAV mapping (GEO University).
- ANSYS Electromagnetics High Frequencies, ANSYS Low Frequency Electromagnetics, ANSYS Sherlock Getting Started, ANSYS HFSS for Antenna Design, ANSYS Fluent Heat Transfer Modeling, Finite Element Method (Grupo SSC).
- Advanced engineering materials derived from composite laminates (UPValenciaX).

01/2015-10/2015

Diploma of Higher Education in Mobile Communications.

UPEL-IPMJMSM-Venezuela.

Diploma's thesis: "State-of-Art antenna using in the spacecrafts".

08/2003-06/2009

BS in Electronics Engineering.

Simon Bolivar University-Venezuela

Bachelor's thesis:"Acquisition card design for a solar-powered vehicle with Labview MMI interface (USB-2007)".

08/1999-06/2003

Diploma of Higher Education Electronics.
I.U.T. Dr.Federico Rivero Palacios-Venezuela.
Bachelor's thesis: "Designed an electricity consumption of virtual monitoring system based on DSP".

Patents

- 3D-NIR enlarged creation image system and method,MX/a/2022/016091.
- Hybrid 3D imaging system,MX/a/2020/012197.

Chapter Book

- **Carlos Osorio Quero** and Jose Martinez-Carranza, "CNN-Quantized Based RF Signal Identification for UAV Disaster Navigation". *Taylor & Francis,CRC Press*. Chapter Book (Peer-Review)

Honor and Awards

- Associate Programme ICTP-Italy 2024-2029.
- Conacyt PhD scholarship 2018-2022.
- Conacyt Master scholarship 2015-2017.
- 5th Place CSA, Atacama Solar Challenge 2012.
- World Solar Challenge 2007.
- Award HP Technology Venezuela 2006.

Teaching experience

- Teaching assistant in Programming and Data Structure.
- Mentoring and teaching several undergraduate and graduate students. projects in instrumentation and control electric car.
- Co-tutor Bachelor's thesis, (Simon Bolivar University): "Design and impementation of a vehicle control system (VCS) for a electric vehicle with in-wheel motor and read powertrain (IRWD)".

Publications

- **C. A. O. Quero** and J. Martinez-Carranza. "Quantized SEFSNet: A Resource-Efficient Approach to RF Signal Identification for UAV-Assisted Disaster Navigation". In: *IEEE Transactions on Instrumentation and Measurement* (Peer-Review).
- **C. A. Osorio Quero** , Daniel Durini and J. Martinez-Carranza, "ViT-Based Classification and Self-Supervised 3D Human Mesh Generation from NIR Single-Pixel Imaging," In: *Applied Sciences* (Peer-Review).
- **C.O.Quero** and J. Martinez-Carranza. "Unmanned aerial systems in search and rescue: A global perspective on current challenges and future applications". In: International Journal of Disaster Risk Reduction (2025), p. 105199. issn: 2212-4209. doi: https://doi.org/10.1016/j.ijdrr.2025.105199.
- **C. A. Osorio Quero** ,I. R and J. Martinez-Carranza. "Improving NIR Single-Pixel Imaging: Using Deep Image Prior and GANs". In: *J. Opt. Soc. Am.* (Dic. 2024). url: https://opg.optica.org/josaa/abstract.cfm?doi=10.1364/JOSAA.541763.
- **C. A. Osorio Quero** and J. Martinez-Carranza. "Physics-Informed Machine Learning for UAV Control". In: *2024 21st International Conference on Electrical Engineering, Computing Science and Automatic Control (CCE)*. 2024, pp. 1–6. doi: 10.1109/CCE62852.2024.10770871.
- **Carlos Osorio Quero**, Daniel Leykam, and Irving Rondon Ojeda, "Res-U2Net: untrained deep learning for phase retrieval and image reconstruction," *J. Opt. Soc. Am. A 41*, 766-773 (2024)
- **C. O. Quero**, D. Durini, J. de Jesús Rangel-Magdaleno, J. Martinez-Carranza and R. Ramos-Garcia, "Emerging Vision Technology: SPI Camera an Overview," in IEEE Instrumentation & Measurement Magazine, vol. 27, no. 2, pp. 38-47, April 2024, doi: 10.1109/MIM.2024.10472984
- **Carlos Osorio Quero**, Daniel Durini, Jose Rangel-Magdaleno, Jose Martinez-Carranza, and Ruben Ramos-Garcia, "Enhancing 3D human pose estimation with NIR single-pixel imaging and time-of-flight technology: a deep learning approach," *J. Opt. Soc. Am. A 41*, 414-423 (2024)
- **C. O. Quero**, J. A. C. Martinez and R. Ramos-Garcia, "Res-U2Net: Augmenting 2D/3D Image Reconstruction through Untrained Deep Learning Models for Phase Retrieval Enhancement," 2023 *20th International Conference on Electrical Engineering, Computing Science and Automatic Control (CCE)*, Mexico City, Mexico, 2023, pp. 1-6, doi: 10.1109/CCE60043.2023.10332844.
- **Carlos Osorio Quero**,Daniel Durini, Jose Rangel-Magdaleno, Jose Martinez-Carranza, and Ruben Ramos-Garcia. "3D Human Pose Reconstruction Single-pixel Imaging". In: *14th edition of the International Micro Air Vehicle Conference and Competition (IMAV) 2023*. https://www.imavs.org/papers/2023/4.pdf.
- **Carlos Osorio Quero**, Daniel Durini, Jose Rangel-Magdaleno, Jose Martinez-Carranza, and Ruben Ramos-Garcia, "Deep-learning blurring correction of images obtained from NIR single-pixel imaging," *J. Opt. Soc. Am. A 40*, 1491-1499 (2023).
- **C. A. Osorio Quero**, D. Durini, R. Ramos-Garcia, J. de Jesus Rangel-Magdaleno and J. Martinez-Carranza. "2D NIR-SPI spatial resolution evaluation under scattering condition". In: *19th International Conference on Electrical Engineering, Computing Science and Automatic Control (CCE)* , Sept.7,2022. doi:10.1109/CCE56709.2022.9975875.
- **C. A. Osorio Quero**, D. Durini, R. Ramos-Garcia, J. de Jesus Rangel-Magdaleno and J. Martinez-Carranza. "Fast NIR-Single-Pixel-Imaging enhancement under scattering environment". In: *13th edition of the International Micro Air Vehicle Conference and Competition (IMAV) 2022*, September 13,2022. https://www.imavs.org/papers/2022/6.pdf.

- **C. A. Osorio Quero**, Durini D, Rangel-Magdaleno J, Martinez-Carranza J, Ramos-Garcia R. "Single-Pixel Near-Infrared 3D Image Reconstruction in Outdoor Conditions". *Micromachines*. 2022; 13(5):795. https://doi.org/10.3390/mi13050795.
- **C. A. Osorio Quero**, D. D. Romero, R. Ramos-Garcia, J. de Jesus Rangel-Magdaleno and J. Martinez-Carranza. "Method for 2D/3D single-pixel NIR image reconstruction under rain condition". In: *SPIE Future Sensing Technologies 2021*,Nov.14,2021. https://doi.org/10.1117/12.2601118.
- A. Manjarres Garcia, **C. Osorio Quero**, J. Rangel-Magdaleno, J. Martinez-Carranza and D. Durini Romero, "Parallel-Pipeline Fast Walsh-Hadamard Transform Implementation Using HLS," *2021 International Conference on Field-Programmable Technology (ICFPT), 2021*, pp. 1-4, doi: 10.1109/ICFPT52863.2021.9609874.
- **C. A. Osorio Quero**,A. Manjarres Garcıa, D. D. Romero, R. Ramos-Garcia, J. de Jesus Rangel-Magdaleno and J. Martinez-Carranza. "Toward a single-pixel near-infrared low-resolution 2D image reconstruction strategy". In: *18th International Conference on Electrical Engineering, Computing Science and Automatic Control (CCE)* ,doi:10.1109/CCE53527.2021.9633097.
- A. M. García, **C. O. Quero**, J. Rangel-Magdaleno, J. Martinez-Carranza and D. D. Romero, "Edge computing SoC implementation of compressive sensing algorithm for single-pixel cameras," 2021 18th International Conference on Electrical Engineering, Computing Science and Automatic Control (CCE), Mexico City, Mexico, 2021, pp. 1-5, doi: 10.1109/CCE53527.2021.9633023.
- **C. A. Osorio Quero**, D. D. Romero, R. Ramos-Garcia, J. de Jesus Rangel-Magdaleno and J. Martinez-Carranza. "3D Reconstruction based on NIR single-pixel for drone navigation under rainy condition". In: *12 th edition of the International Micro Air Vehicle Conference and Competition (IMAV) 2021*,Nov 24,2021, https://www.imavs.org/papers/2021/24.pdf.
- **C. A. Osorio Quero**, D. D. Romero, J. de Jesus Rangel-Magdaleno and J. Martinez-Carranza. "Single-Pixel Imaging: An overview of different methods to be used for 3D space reconstruction in harsh environments". In: *AIP Publishing*,Nov 5 , 2021, https://aip.scitation.org/doi/pdf/10.1063/5.0050358.
- **C. A. Osorio Quero**, D. D. Romero, R. Ramos-Garcia, J. de Jesus Rangel-Magdaleno and J. Martinez-Carranza. "Towards a 3D Vision System based on Single-Pixel imaging and indirect Time-of-Flight for drone applications". In: *17th International Conference on Electrical Engineering, Computing Science and Automatic Control (CCE)*,Nov. 11, 2020, doi: 10.1109/CCE50788.2020.9299125.
- **C. A. Osorio Quero**, D. D. Romero, R. Ramos-Garcia, J. de Jesus Rangel-Magdaleno and J. Martinez-Carranza. "Implementation of a hyperspectral integrated vision system combining radar technology and single-pixel optical principle for unmanned ground vehicles (UGV)". In: *Conference Proceedings of SPIE*, Apr. 28, 2020, https://doi.org/10.1117/12.2558929.
- **C. A. Osorio Quero**, D. D. Romero, R. Ramos-Garcia, J. de Jesus Rangel-Magdaleno and J. Martinez-Carranza. "Evaluation of a 3D imaging vision system based on a single-pixel InGaAs detector and the time-of-flight principle for drones". In: *Conference Proceedings of SPIE*, Apr. 27, 2020, https://doi.org/10.1117/12.2558918.
- **C. A. Osorio Quero**, D. D. Romero, R. Ramos-Garcia, J. de Jesus Rangel-Magdaleno and J. Martinez-Carranza. "Hardware parallel architecture proposed to accelerate the orthogonal matching pursuit compressive sensing reconstruction". In: *Conference Proceedings of SPIE*, Apr. 27, 2020,https://doi.org/10.1117/12.2558937.
- A. Vidal,G. Viesti,**C. Osorio**,F. Pino,A. Horvath,H. Barros,M. Caldogno,E. D. Greaves and L. Sajo-Bohus. "Multiphase Monitoring by Annihilation Radiation Coincidence Mode".In:*AIP Conference Proceedings*,Feb.29,2012,https://doi.org/10.1063/1.3688838.
- **C. Osorio**. "Telemetry System The Solar Car ARAGUANEY AUSB2009-130103". In:*VIII ASME Engineering Annual Congress USB 2009*, Nov.26, 2009, https://doi.org/10.13140/RG.2.1.1752.8400.
- **C. Osorio**,J. Bastardo,L. and Sajó-Bohus. "Modernization of the Physics Laboratory by using HP Mobile Technology". In: *Annual Worldwide HP Technology for Teaching Higher Education Conference*, Feb. 5, 2007.

https://www.hp.com/hpinfo/socialinnovation/us/programs/tech-teaching/hied-global-la.htmlvenezuela

- **C. Osorio**,L. Sajó-Bohus and J. K. Pálfalvi. "Nuclear Track Analyser with IMAQ™ Vision Builder 6 from National Instruments". In: *23rd International Conference on Nuclear Tracks in Solids Beijing (China)*, Nov. 9, 2006.
- **C. Osorio**,L. Sajó-Bohus and J. K. Pálfalvi. "Design and Construction an Automation System for Nuclear Track Analysis using LabVIEW". In: *Nuclear Techniques Seminar in Venezuela*, Apr. 27, 2005.