

Marco A. Rueda

Sr. Computer Vision/Deep Learning Research Engineer

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PERSONAL STATEMENT

Dedicated Senior Applied Research with over 8 years of experience in Computer Vision and AI, specializing in Robotics, Embedded Systems, Aerial/Satellite Imaging, and Cloud-based Microservices. Proven track record in translating research into commercial products, collaborating with industry leaders like Bosch, Vale mining, Capgemini, HP, Petrobras, and Volkswagen. Currently pursuing a PhD in Aerospace Engineering with a focus on Causal Machine Learning in satellite imagery.

ADVISORY & CONSULTING - PROJECTS

I have co-founded initiatives like the National Space Society Colombia and QSentinel, and led projects like, Trust in Space, and GeNFTs, described below.

- **QSentinel:** Technical Leader of a Video Management System utilizing AWS microservices, focusing on developing advanced video analytics and surveillance solutions.
- **National Space Society Colombia (NSSCO):** Co-founder of NSSCO, fostering a community for space exploration and development in Colombia, enhancing space education and engagement.
- **Trust in Space:** Co-founded this blockchain-based community for space navigation, enabling secure data sharing among Space Operators and Earth Observation systems, advancing space technology collaboration.
- **GeNFTs:** Co-founder of an innovative project combining genetics and blockchain, creating Non-Fungible Genetic Tokens (images) from the DNA of endangered species using AI, promoting biodiversity awareness and digital art exploration.

SKILLS

- **Programming & Development:** Proficiency in Python, C++, OpenCV, and ML libraries (Keras, TensorFlow, PyTorch). Experienced in Remote Sensing, ROS, Git, and Linux or Windows environments.
- **Platform Expertise:** Skilled in Satellite data Hubs, Cloud Computing (AWS), Embedded Systems (NVIDIA, Coral USB, Raspberry Pi), Digital Twin technology, Generative AI, and Hybrid Cloud solutions.
- **Leadership & Teamwork:** Award-winning project contributions, Scrum experience.
- **Languages:** Fluent in English, Spanish, and Portuguese.

EMPLOYMENT HISTORY

Oct/2021 – Currently

Senior Research Engineer in Computer Vision (R&D position) | Bosch Security Systems, Ovar, Portugal

- Lead and developed state-of-the-art computer vision systems to improve production efficiency in factory scenarios.
- Designed multi-modal 3D and 2D systems, enhancing system capabilities.
- Create the foundation of a new powerful artificial vision AIoT platform for industrial applications working in a Scrum environment.

Jan/2020 – Oct/2021

Advanced Research Engineer in Computer Vision (R&D position) | VORTEX-CoLab, Porto, Portugal

- Led scene understanding initiatives for the Argus project using state-of-the-art deep learning techniques. Developed and trained object detection and panoptic segmentation models, significantly enhancing autonomous vehicle project capabilities
- Pioneered the creation of comprehensive datasets for object detection, focusing on street and traffic signs and various segmentation tasks in European autonomous vehicle environments
- Innovated ROS submodules for tasks like automatic labeling and 3D image processing, substantially improving data processing efficiency and accuracy
- Formulated a novel approach to expedite interactive image segmentation, integrating dynamic programming and image partitioning, which markedly enhanced processing speed and accuracy
- Executed object detection and image classification projects using TensorFlow Lite and classical machine learning techniques, notably on embedded systems with Google Coral USB, aligning with GDPR and CNPD standards for data anonymization

Sep/2019 – Dez/2019

Computer Vision Researcher (R&D position) | INESC TEC, Porto, Portugal

- Developed a cutting-edge facial recognition application, capable of real-time performance on CPU platforms. This system integrated open-set recognition with demographic (gender, age) and emotional estimation analysis
- Conducted extensive performance evaluation of multiple state-of-the-art facial recognition methods, focusing on latency and accuracy, providing valuable insights for real-world deployment

Jun/2018 – Jun/2019 & Remote: Sep/2019 - Jan/2020

Consultant in Computer Vision (R&D position) | Brazilian Institute of Robotics - CIMATEC, Salvador, Brazil

- **“Geonosis project - Vale Institute of Technology”**: Conducted data processing from sensors as LiDAR, RGB cameras, and Hyperspectral cameras, using computer vision techniques for minerals qualification in open-pit mines
- **“Kamino project - Vale Institute of Technology”**: An intelligent vehicle system to assist drivers in low visibility conditions in open pit mines. Proposed new LiDARs and monocular cameras calibration methods, processed RGB-D images, and re-implemented a well-known CNN architecture for real-time semantic segmentation and object detection, working on ADAS sensors
- **“Intelligent measurement of concrete volume - Votorantim S.A.”**: The volume of concrete coming out of a truck discharging chute was estimated very accurately. For this, RGB-D frame sequences were processed to estimate the area per pixel and fluid velocity using only

computer vision techniques, including Particle Image Velocimetry. This embedded system estimated the concrete flow volume with very low CPU latency

- **“Samsung batteries qualification - Smart company”**: This Deep Learning system automatically assesses a set of batteries by processing 5K RGB images. It exploits instance segmentation, anomaly estimation and a regression subnet for accurately estimating the actual real size of each battery tab-cut without using camera calibration settings
- **“Civil works qualification” - Gráfico Empreendimentos construction company**: This mobile application evaluates the quality of civil works executions using BIM and Computer Vision. The software receives images from the camera of any device and generates an appraisal report of anomalies by running segmentation and anomaly detection

Jul/2016 – Jul/2018

Student Researcher | IVison Lab - Federal University of Bahia, Salvador, Brazil

- Focused on Smart Cities and Intelligent Transportation Systems, extending state-of-the-art object detectors for rotated bounding-box estimation for a submarine in underwater sonar images
- Contributed to the GET-IN project (Intelligent Traffic Manager) by implementing deep learning techniques for object detection and segmentation, enhancing traffic management efficiency
- Assisted in the development of a teeth detector system using instance segmentation from panoramic X-ray images and built a tool for creating multi-purpose synthetic datasets from 3D models

Jan/2012 – Dec/2015

Project planner and controller - Oil & Gas | CMK/PB LTDA/GIP SAS, Barrancabermeja, Colombia

- Oversaw the design and execution of several high-stakes engineering and consulting projects, demonstrating strong leadership and project management skills in a dynamic, fast-paced environment

Apr/2011 – Dec/2011

Systems engineer | Industrial University of Santander, Bucaramanga, Colombia

- Developed and implemented a comprehensive project management system based on PMBok, showcasing expertise in JAVA EE and C++ programming

EDUCATION

Feb/2023 – Currently

PhD: Aerospace Engineering

[Instituto Superior Técnico – University of Lisbon](#) | Lisbon, Portugal

Thesis: Causal Insights into Methane Emissions from Satellite Imagery

Jul/2016 – Jul/2018

MSc: Computer Science (Computer Vision and Machine Intelligence)

[Universidade Federal da Bahia](#) | Salvador, Brazil

Thesis: A tool for building multi-purpose and multi-pose synthetic 3D data sets

Grade: 9.46/10.0 (GPA: 3.78/4.0)

Apr/2015 – Apr/2017

MSc: Design, Operation and Project Management

[International Iberoamerican University](#) | Arecibo, Puerto Rico (USA)

[Universidad Europea del Atlántico](#) | Cantabria, Spain

Thesis: Analysis of the current state of competitiveness of companies in the digital photographic sector in Barrancabermeja, Colombia.

Grade: 8.44/10.0 (GPA: 3.58/4.0)

Jul/2004 – Mar/2011

BSc: Systems Engineering

[Universidad Industrial de Santander](#) | Bucaramanga, Colombia

Grade: 3.93/5.0 (GPA: 3.14/4.0)

PUBLICATIONS

- [Advances and Challenges in Methane Monitoring from Satellite Data: A Comprehensive Review](#). (In progress)
- [Low-latency Perception in Off-Road Dynamical Environments of Low Visibility](#). In: Expert Systems with Applications, 2022, Nelson Alves, **Marco Ruiz**, Marco Reis, et al. H-Index: 225 (Q1).
- [Software registration of quality control system for construction execution using BIM models](#). Instituto Nacional de Propriedade Industrial (NPI), Brasil, 2020, Dos Santos Liordino, Neto Rosalvo, Barros João, **Ruiz Marco**, et al.
- [Faster alpha-expansion via dynamic programming and image partitioning](#). In: IEEE International Joint Conference on Neural Networks (IJCNN), London, 2020, Fontinele Jefferson, Mendonça Marcelo, **Ruiz Marco**, et al. H-Index: 82 (Rank: A)
- [A tool for building multi-purpose and multi-pose synthetic data sets](#). In: VII ECCOMAS Thematic Conference on Computational Vision and Medical Image Processing (VipIMAGE 2019), Porto, 2019, **Ruiz Marco**, Fontinele Jefferson, Perrone Ricardo, et al. H-Index: 16 (Q4).
- [Rotated multi-object detection with forward-looking sonar in underwater applications](#). In: Expert Systems with Applications, 2019, Neves Gustavo, **Ruiz Marco**, Fontinele Jefferson, Oliveira Luciano. H-Index 225 (Q1).
- [Deep instance segmentation of teeth in panoramic X-ray images](#). In: IEEE Conference on Graphics, Patterns and Images (SIBGRAP'2018), Foz do Iguaçu, 2018, Jader Gil, Fontinele Jefferson, **Ruiz Marco**, et al. H-Index: 22.