Marco A. Rueda

Sr. Computer Vision/Deep Learning Research Engineer
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PERSONAL STATEMENT

Senior Applied Researcher with over 8 years of experience in real-time end-to-end lifecycle of Computer Vision and AI projects, specializing in Robotics, Remote Sensing, 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. Proven success in leveraging LLMs within vision systems to enhance decision-making capabilities and delivering stakeholder-focused results .

ADVISORY & CONSULTING

Led and co-founded initiatives focused on technological innovation and community engagement in fields spanning from Earth observation to biodiversity awareness.

- **CosmoMind**: Led the creation of an Earth Observation platform that supports vulnerable communities by integrating multimodal data (2D-3D ML/DL, LLMs) with remote sensing for real-time insights.
- **Shadow**: Developed an AI platform that transforms live video feeds into actionable insights with natural language alerts and multi-channel notifications, enhancing surveillance for 200+ cameras.
- **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**: Pioneered the fusion of genetics and blockchain through AI-driven image generation, creating Genetic NFTs from endangered species' DNA to raise awareness on biodiversity.

CORE SKILLS

- **Computer Vision & Deep Learning:** Skilled in multi-modal models for object detection, tracking, segmentation, and scene understanding. Expert in deploying real-time CV algorithms on robotics platforms for enhanced decision-making.
- **LLM Integration:** Proven success integrating LLMs (LangChain, OpenAI) to improve contextual analysis, anomaly detection, and regulatory compliance in industrial CV systems.
- **Programming & Development:** Advanced in Python and ML libraries (TensorFlow, PyTorch, Keras) and proficient in C++ for production-level applications. Experienced in optimizing CV systems on AWS and edge devices (NVIDIA, Coral).
- **Data & Pipeline Management:** Designed scalable data pipelines, data labeling, training, and evaluation protocols, enhancing model accuracy and deployment efficiency.

- **Leadership:** Recognized for effectively leading cross-functional teams in Agile/Scrum environments, with a record of award-winning projects and publications in top-tier conferences.
- **Languages:**
    - Fluent in English, Spanish, and Portuguese.

EMPLOYMENT HISTORY

Oct 2021 – Present

Senior Research Engineer in Computer Vision | Bosch Security Systems, Ovar, Portugal

I pioneered the development of a robust artificial vision AIoT platform tailored for industrial applications.. The system processes 100+ RGB cameras and some RGB-D streamings to determine and predict behaviors within a big size factory.

- **Industrial AIoT Platform**: Led the computer vision team for the design and development from scratch of a robust AIoT platform for industrial applications; processing **100+ RGB cameras and RGB-D streams** for behavior prediction in large factories, resulting in significant production gains.
- **Computer Vision Optimization**: Developed real-time 2D and 3D computer vision systems with **~95% accuracy** and **15+ FPS**, leveraging techniques like object detection, segmentation, tracking, and 3D reconstruction to optimize operations.
- **Real-Time Anonymization System**: Developed a GDPR-compliant system to anonymize hundreds of video streams with **98%** accuracy, significantly strengthening data security protocols.
- **Cusca Monitoring Tool**: Designed a monitoring tool to manage 150+ servers and camera nodes, reducing maintenance time by **60%** through real-time diagnostics and automated logging.

Jan/2020 – Oct/2021

Advanced Research Engineer in Computer Vision | VORTEX-CoLab, Porto, Portugal

- **Autonomous Vehicle Scene Understanding - Argus Project:** Led scene understanding initiatives using state-of-the-art detection and segmentation models, enhancing capabilities for autonomous vehicles in complex environments. Improved detection accuracy by **25%** for safe navigation and operational effectiveness.
- **Dataset Design and ROS Submodule Development:** Created comprehensive datasets for object detection tasks in European traffic environments, achieving a **30% increase in detection accuracy**. Developed ROS submodules for automated labeling, 3D image processing, and panoptic segmentation, improving efficiency and data accuracy.
- **Interactive Segmentation Innovation:** Developed a novel segmentation approach using dynamic programming, which boosted processing speed by **40%** and improved accuracy, ensuring efficient deployment on embedded systems.
- **TensorFlow Lite on Embedded Systems:** Executed object detection and classification projects on Google Coral USB with TensorFlow Lite, ensuring compliance with GDPR and CNPD data standards.

Jun/2018 – Jun/2019 & Remote: Sep/2019 - Jan/2020; Oct/2024 - Present

Consultant in Computer Vision | Brazilian Institute of Robotics - CIMATEC, Salvador, Brazil

- **Geonosis Project for Vale Institute of Technology:** Developed computer vision algorithms for an Automatic *Guided Vehicle* that performs real-time mineral qualification in open-pit mining using LiDAR, RGB, and hyperspectral imaging, achieving **95% accuracy** in mineral detection.
- **Kamino Project - Intelligent Vehicle System:** Improved safety in mining operations with an ADAS for low-visibility conditions, utilizing real-time LiDAR calibration, RGB-D image processing, and segmentation. The system reached **90% detection accuracy**.
- **Concrete Flow Measurement for Votorantim S.A.:** Developed a 3D system for precise, real-time concrete volume measurement, achieving **98% accuracy** and optimizing material handling in construction.
- **Samsung Battery Qualification System:** Designed a deep learning-based quality assessment tool for Samsung, increasing production line inspection precision by **60%.** The system analyzed 5K RGB images for accurate tab-cut real size measurement.
- **Bird Collision Detection System:** Engineered a real-time AI system to prevent bird collisions with antenna cables, using very high-resolution video analysis to mitigate risks in high-altitude environments in real time and more than **90% overall accuracy**.

Jul/2016 –Jul/2018

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

- **Object Detection for Submarine Navigation:** Created a rotated bounding-box estimation technique for sonar images, enhancing detection accuracy and navigation in underwater environments.
- **Intelligent Traffic Management - GET-IN Project:** Implemented deep learning techniques for traffic management, utilizing RGB camera inputs for enhanced detection and segmentation, improving traffic flow.
- **Dental Imaging System:** Assisted in the development of a dental imaging system using instance segmentation on panoramic X-rays and developed a versatile tool for creating synthetic 3D datasets for various applications.

Apr/2011 – Dec/2015

Early Career Experience:

- Managed large-scale engineering projects in Oil & Gas and developed project management systems using Java EE, demonstrating early leadership and technical expertise in high-stakes environments.

EDUCATION

Feb 2023 – Currently

PhD: Aerospace Engineering

Instituto Superior Técnico – University of Lisbon | Lisbon, Portugal

Thesis: Causal Insights into Methane Emissions from Satellite Imagery

July/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)

April/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)

March 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. 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.
- Efficient Segmentation with Dynamic Programming. 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 (SIBGRAPI'2018), Foz do Iguaçu, 2018, Jader Gil, Fontinele Jefferson, **Ruiz Marco**, et al. H-Index: 22.