JOSE EDUARDO RUIZ ROSERO

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LinkedIn, Google Scholar, GitHub

MACHINE LEARNING ENGINEER - DEVELOPER - DATA SCIENTIST

I'm a Ph.D. with over 11 years of experience in AI, nanotech, web/software dev, and semiconductors. My skills include ML, Python, agile methods, containers, and collaboration across teams from diverse backgrounds, countries, and cultures for innovative solutions, driven by a passion for scientific progress.

CORE COMPETENCES

- Over six years of experience in Python programming language, especially with libraries/frameworks for machine learning, data processing, data visualization, image processing, multiprocessing. (Keras, TensorFlow, TensorRT, Detectron2, Mask-RCNN, Matplotlib, Plotly, Seaborn, PyTorch, OpenCV, Pillow, NumPy, Pandas, SciKit-Learn, Multiprocessing).
- High experience in heterogeneous computing with GPU, and Multi-core for simulation and machine learning, including clusters based on the Slurm system.
- Significant experience with project management (PM) methodologies (Scrum), and PM tools (Jira, Slack, Trello).
- Extensive experience working in multidisciplinary and multicultural groups, both in academics and industry.
- Excellent technical documentation skills for the final customer and research publishing, using tools like MS Office suite, LaTeX, Corel (Draw, Photo-Paint), Adobe (Premiere, Illustrator, Photoshop), Origin.
- Over seven years of experience in researching semiconductor materials for solar cells and photodetectors devices for academic research and industry.
- Broad ability to understand, debug, and improve the existing source code.

EDUCATION

Ph.D., Electrical Engineering ***2015-2019***
Pontifical Catholic University of Rio de Janeiro, PUC-Rio, Rio De Janeiro, Brazil
Thesis: Precursors evaluation for GaInNAs growth by MOVPE technique for solar cells production.
Advisors: Ph.D. Patricia Lustoza de Souza (PUC-Rio).

Ph.D. internship ***2016-2018***
Fraunhofer Institute for Solar Energy Systems, ISE-Fraunhofer, Freiburg im Breisgau, Germany
Advisors: Ph.D. Frank Dimroth (ISE-Fraunhofer).

M.Sc., Electrical Engineering ***2013-2015***
Pontifical Catholic University of Rio de Janeiro, PUC-Rio, Rio De Janeiro, Brazil
Thesis: Optical and morphological characterization of InAs quantum dots.
Advisors: Ph.D. Patricia Lustoza de Souza (PUC-Rio) and Ph.D. Mauricio Pamplona Pires (UFRJ).

B.Sc., Electronic Engineer ***2006-2013***
University of Nariño, UDENAR, San Juan de Pasto, Colombia.
Thesis: Characterization of Piezoelectric Disk Displacement as a Function of Voltage with Hysteresis Correction and Drift Compensation using Closed-Loop Control, employing Interferometry.
Advisor: M.Sc. Dario Fernando Fajardo (UDENAR).

POSTDOCTORAL RESEARCHER

Postdoctoral Researcher ***2021 - Present***
Federal University of Rio de Janeiro - Physics Institute, IF-UFRJ, Rio De Janeiro, Brazil
Research: Nanostructured photodetectors development with artificial intelligence.
Advisors: Ph.D. Mauricio Pamplona Pires (UFRJ).

AWARDS / HONORS

Ph.D. Scholarship	Brazilian National Council for Scientific and Technological Development (CNPq). 2015.
Master Scholarship	Brazilian Coordination for the Improvement of Higher Education Personnel (CAPES). 2013.
Funding for student research	Vicerectorate for Research, Postgraduate and International Relations, University of Nariño (VIPRI - UDENAR). "Alberto Quijano Guerrero" Student Research Award, 2012.

SOFTWARE SKILLS

Programming languages	Python, JavaScript, Bash Script, C#.
Machine Learning Techniques	Data Acquisition, Cleaning, Preprocessing, Visualization, Analysis, Transformation, Augmentation, Synthetic Generation, Quality Assurance. Model Selection, Training, Hyperparameter Tuning, Transfer Learning, Model Evaluation, Model Deployment, Anomaly Detection, GPU Acceleration, Multiprocessing, High-Performance Computing
Machine Learning Libraries	Keras, TensorFlow, TensorRT, Detectron2, Matplotlib, Plotly, Seaborn, PyTorch, OpenCV, Pillow, NumPy, Pandas, Multiprocessing, SciKit-Learn.
Protocols and APIs	JSON, XML.
Numerical computing	Matlab.
Operating systems	Linux, Windows.
Documentation packages	Latex, MS Office.
Other tools	Docker, Git (GitHub, GitLab), Origin, Slurm, Singularity, Corel (Draw, Photo-Paint), Adobe (Premiere, Illustrator, Photoshop)

LANGUAGES

Spanish	native language
Portuguese	fluent level
English	professional level
Germany	basic level
French	beginner level

EXPERIENCE

Applied Computational Intelligence Laboratory (ICA), PUC-Rio. **May 2019 - Present**
Machine Learning Researcher / Developer / Data Scientist ***Rio De Janeiro, Brazil***

- Analyzed and Structured Datasets: Orchestrated the analysis and organization of diverse datasets for AI model training, spanning oil and gas reservoir data, extensive natural language processing datasets, and image/video datasets to facilitate various processing tasks.
- Data Quality Assurance: Implemented data cleaning and preprocessing procedures, ensuring the data's integrity and preparedness for AI model development, including meticulous data preparation for image and video datasets.

- Synthetic Data Generation: Enlarged dataset volumes through the generation of synthetic data, producing a wide array of images and videos to fortify model robustness in image and video processing applications.
- Machine Learning Model Training: Proficiently trained machine learning models, specializing in deep learning, for a range of tasks including well path prediction, reservoir behavior forecasting, natural language processing, and image/video analysis.
- Personnel Training: Provided comprehensive training for junior and semi-senior staff to enhance their proficiency in working with datasets and machine learning models, fostering their growth and skill development.
- Cutting-Edge Technology Exploration: Conducted comprehensive research on state-of-the-art AI technologies, focusing on advancements in image and video processing techniques, to remain at the forefront of industry innovations.
- High-Performance Computing: Employed parallel computing, cloud computing, and distributed computing using clusters and SLURM systems to expedite the processing of large-scale image and video datasets, consequently accelerating AI model training.
- GPU Optimization: Leveraged multiple GPUs across nodes and even employed multiple nodes to maximize the efficiency of processing, training, and inference tasks.
- Containerization: Utilized Docker and Singularity containers to streamline data processing workflows, ensuring seamless deployment across different environments, enhancing reproducibility and efficiency.
- Synthetic Dataset Development: Engineered extensive synthetic datasets tailored for text, image, and video processing tasks, bolstering the generalization capabilities of AI models.
- Framework Implementation: Employed frameworks such as "Detectron2" to train models for a variety of image analysis tasks, including detection, classification, segmentation, and semantic segmentation.
- Research Leadership: Took the helm in leading and managing research initiatives for text, numeric data, image, and video processing projects, providing expertise and guidance to achieve project objectives.
- Cross-Functional Collaboration: Collaborated closely with cross-functional teams, integrating AI-driven solutions into oil and gas exploration and production processes, natural language processing, and image/video analysis applications while concurrently nurturing the development of junior and semi-senior employees to enhance their skillsets in working with datasets and machine learning models.

Applied Computational Intelligence Laboratory (ICA), PUC-Rio. **March 2013 - April 2019**
Software and Web Developer ***Rio De Janeiro, Brazil***

- Developed Code (Python, C#, and MATLAB): Created code in Python, C#, and MATLAB for various projects, including artificial intelligence decision support systems, optimization using genetic algorithms, and simulations of solar cells.
- Utilized Genetic Algorithms for Optimization: Employed genetic algorithms for optimization purposes, optimizing well allocation in the artificial intelligence decision support system.
- Scientific Research: Engaged in scientific research activities, exploring cutting-edge advancements in various fields of artificial intelligence, ensuring relevance and innovation in project developments.
- Data Analysis: Conducted in-depth data analysis, extracting valuable insights to inform decision-making processes and project refinements.
- Data Collection and Preprocessing: Orchestrated data collection initiatives and meticulously preprocessed data to ensure its readiness for machine learning and artificial intelligence applications.
- Web Development (HTML, CSS, and JavaScript): Took charge of web development tasks, utilizing HTML, CSS, and JavaScript to craft interactive and user-friendly web pages, ensuring an engaging online experience for users.
- Video and Image Processing: Specialized in video and image processing techniques, enhancing visual elements and ensuring high-quality outputs for a variety of projects.
- State-of-the-Art Research: Vigorously studied the state of the art in diverse fields of artificial intelligence, keeping abreast of the latest advancements to integrate them into project development.
- Presentation Preparation: Prepared engaging and informative presentations to convey project findings, research outcomes, and innovations to various stakeholders, facilitating knowledge dissemination and collaboration.

Federal University of Rio de Janeiro (UFRJ) { Physics Institute **May 2021 - Present**
Postdoctoral Researcher ***Rio De Janeiro, Brazil***

- Created Python code for semiconductor structure simulations, focusing on photovoltaic photodetectors, to optimize their properties and responses.
- Utilized multiprocessing techniques to parallelize simulations on computers with multi-thread processors and on cloud computing platforms.
- Applied artificial intelligence, specifically evolutionary algorithms, to optimize simulations and propose novel device structures with improved performance.
- Developed extensive databases of simulation results to analyze and map the properties of the optimized devices for better understanding and insights.
- Assisted in preparing and organizing congresses, seminars, and scientific papers to disseminate research findings.
- Provided guidance and support to undergraduate, master's, doctoral students, and postdoctoral colleagues in their research projects.
- Translated Fortran code to Python, facilitating the implementation of complex physical process simulations in a user-friendly environment.
- Developed e-mulate software with a graphical user interface for electronic state calculations in quantum well heterostructures.
- Employed numerical methods like transfer matrix and Numerov algorithms to solve the Schrodinger equation for electronic states calculation.
- Validated e-mulate software by comparing calculated absorption spectra with experimental results for quantum Bragg mirror detectors, demonstrating its accuracy and reliability.

Escalab Academy **October 2021 - Present**
Python, Data Science and Machine Learning Tutor ***Chile***

- Python Programming Tutorship: Providing tutoring services focused on Python programming, emphasizing data manipulation, analysis, and machine learning techniques.
- Guiding Students: Responsibilities include guiding students through the complexities of Python, equipping them with essential skills for success in the evolving fields of data science and analytics.
- Creating a Supportive Learning Environment: A commitment to nurturing a conducive learning environment that fosters exploration and critical thinking, enabling learners to effectively apply their knowledge to real-world scenarios.
- Inspiring Future Data Enthusiasts: The primary goal is to inspire the upcoming generation of data enthusiasts, arming them with the tools and knowledge necessary to excel in today's technology-driven landscape.

Lucro Colombia **January 2022 - Present**
Machine Learning Consultant ***Colombia***

- Machine Learning Projects: Conducted numerous Machine Learning (ML) implementation and development projects for clients, collaborating effectively with cross-functional teams.
- Understanding Business Requirements: Ensured a comprehensive understanding of business requirements to tailor ML solutions accordingly.
- End-to-End Model Development: Undertook end-to-end development and deployment of ML models, which included data preprocessing, feature engineering, and rigorous model evaluation to optimize accuracy and performance.
- Synthetic Data Creation: Played a vital role in the development of synthetic data and the expansion of datasets through data augmentation techniques.
- Dataset Amplification: Successfully increased dataset size and diversity, ultimately enhancing the robustness and generalization of the ML models delivered.

Semiconductor Laboratory (LabSem), PUC-Rio **March 2015 - April 2019**
Ph.D. researcher and student ***Rio De Janeiro, Brazil***

- Semiconductor Materials and Solar Cell Research: The primary focus of the work revolved around semiconductor materials and their applications in solar cells using the MetalOrganic Vapour-Phase Epitaxy (MOVPE) reactor.
- Cutting-Edge Research: Conducted advanced research and fabrication of semiconductor materials, including GaAs, GaInAs, GaNAs, and GaInNAs, with a particular emphasis on their growth and characterization for solar cell development.

- Knowledge Impartation: Delivered knowledge on the utilization of Atomic Force Microscopy (AFM) for material characterization. Employed artificial intelligence techniques in microscopy image processing, script programming for data analysis, and effective data visualization methods for handling extensive datasets.
- Methodology Development: Developed methodologies, fabricated and validated samples, and conducted comprehensive analyses using AFM, Photoluminescence (PL), Electrochemical Capacitance Voltage (ECV), and in-situ MOVPE experiments to gain vital insights into material properties.
- Community Engagement: Actively interacted with the scientific community by curating and visually presenting research data and authored academic papers to disseminate findings.
- Multidisciplinary Approach: The Ph.D. journey embraced a multidisciplinary approach, encompassing semiconductor growth, material characterization, data analysis, and advanced imaging techniques. This approach contributed to advancing the understanding and application of semiconductor materials in solar cell technology.

Fraunhofer Institute for Solar Energy Systems (ISE-Fraunhofer) **October 2016 - October 2018**
Ph.D. student and assistant researcher ***Freiburg im Breisgau, Germany***

- Conducted semiconductor material research and growth for solar cell applications using MOVPE reactor.
- Performed characterization using AFM, PL, ECV, and in-situ MOVPE techniques.
- Handled the conceptualization, methodology, sample fabrication, validation, formal analysis, investigation, visualization, data curation, and paper writing within the scope of the work.
- Explored GaInNAs growth via metalorganic vapor phase epitaxy (MOVPE) with a focus on reducing carbon background in the material.
- Investigated the influence of various precursors and growth parameters on crystal morphology, carbon background, and element incorporation in the semiconductor.
- Implemented measures to reduce carbon background, ultimately leading to the growth of solar cells for material evaluation in devices.

Semiconductor Laboratory (LabSem), PUC-Rio **March 2013 - April 2015**
Master researcher and student ***Rio De Janeiro, Brazil***

- Semiconductor Characterization: Responsible for characterizing semiconductor structures with quantum dots through optical (PL) and morphological (AFM) methods, monitoring epitaxial growth of new semiconductor samples, and processing and analyzing AFM-acquired images.
- Data Analysis and Reporting: Structured data, analyzed trends in experimental results, prepared reports and presentations for knowledge dissemination, and stayed informed by reading scientific papers.
- Knowledge Sharing and Support: Conducted seminars on scientific articles and supported team members with measurements and sample/device characterization.

Pontifical Catholic University of Rio de Janeiro (PUC-Rio) **July 2015 - December 2015**
Teaching Assistant ***Rio De Janeiro, Brazil***

- Covered fundamental physical principles and various solar cell technologies.
- Conducted practical laboratory sessions to provide hands-on experience with solar panels.
- Assisted students in characterizing the properties of solar panels.
- Aimed to equip students with foundational knowledge and technical skills essential for working with photovoltaic solar energy.

Instrumentation and intelligent systems group, UDENAR **October 2011 - February 2013**
Researcher ***San Juan de Pasto, Colombia***

- Investigation into Michelson Interferometer: Conducted a comprehensive investigation into the principles of operation of a Michelson interferometer.
- Michelson Interferometer Setup Fabrication: Fabricated a Michelson interferometer setup based on acquired knowledge.
- Closed Loop Controller Design: Designed and implemented a closed-loop controller to precisely control the displacement of a piezoelectric disk at the nanometric scale, achieving a resolution of +- 1nm.

PUBLICATIONS

Journals articles and Proceedings

- **Mapping and Optimization of Oscillator Strength in Quantum Bragg Mirror Detectors as a Function of their Dimensions**
  Jose E. Ruiz; Pedro H. Pereira; Germano M. Penello; Guilherme M. Torelly; Patricia L. Souza; Mauricio P. Pires **In:** 2023 37th Symposium on Microelectronics Technology and Devices (SBMicro)
  DOI: https://doi.org/10.1109/SBMicro60499.2023.10302557
- **Cognitive Search: a free information retrieval web service to coronavirus scientific papers**
  Cristian Enrique Munoz Villalobos; Leonardo Alfredo Forero Mendoza; Renato Sayão da Rocha; Jose Eduardo Ruiz; Harold De Mello; Marco Aurélio Cavalcanti Pacheco **In:** IEEE ColCACI 2023: IEEE Colombian Conference on Applications of Computational Intelligence. 2023
  DOI: https://doi.org/10.1109/ColCACI59285.2023.10225924
- **A Free Web Service for Fast COVID-19 Classification of Chest X-Ray Images with Artificial Intelligence**
  Jose David Bermudez Castro; Jose E. Ruiz; Pedro Achanccaray Diaz; Smith Arauco Canchumuni; Cristian Muñoz Villalobos; Felipe Borges Coelho; Leonardo Forero Mendoza; Marco Aurelio C. Pacheco **In:** Computational Science and Its Applications - ICCSA 2022. ICCSA 2022. Lecture Notes in Computer Science, vol 13375. Springer, Cham. 2022
  DOI: https://doi.org/10.1007/978-3-031-10522-7_29
- **e-mulate: a user-friendly software to calculate optoelectronic properties of quantum well systems.**
  Pereira, P. H.; Torelly, G. M.; Lacerda, M. S.; Souza, D. R.; Ruiz, J. E.; Souza, V. R.; Chipana, L. A.; Souza, P. L.; Penello, G. M.; Pires, M. P. **In:** 2021 35th Symposium on Microelectronics Technology and Devices (SBMicro), Campinas, Brazil. p. 1-4. 2021
  DOI: https://doi.org/10.1109/SBMicro50945.2021.9585740
- **Nitrogen and carbon incorporation in GaNxAs1-x grown in a showerhead MOVPE reactor.**
  Ruiz, J. E.; Lackner, D.; Souza, P.L.; Dimroth, F.; Ohlmann, J. **In:** Journal of Crystal Growth, v 557, 125998. 2021
  DOI: https://doi.org/10.1016/j.jcrysgro.2020.125998
- **A free web service for fast COVID-19 classification of chest X-Ray images**
  Jose David Bermudez Castro; Ricardo Rei; Jose E. Ruiz; Pedro Achanccaray Diaz; Smith Arauco Canchumuni; Cristian Muñoz Villalobos; Felipe Borges Coelho; Leonardo Forero Mendoza; Marco Aurelio C. Pacheco **In:** arXiv 2009.01657. 2020
  DOI: https://doi.org/10.48550/arXiv.2009.01657
- **Otimizacão da malha metálica de dedos coletores para o contato elétrico frontal de células solares por algoritmos genéticos**
  PEJENDINO, R. C.; MICHA, D. N.; RUIZ, J. E.; WEINER, E. C.; PIRES, M. P.; SOUZA, P. L. **In:** VII Congresso Brasileiro de Energia Solar, 2018, Gramado/RS. VII Congresso Brasileiro de Energia Solar - CBENS. 2018
  Available at: https://anaiscbens.emnuvens.com.br/cbens/article/view/259
- **Optimization of contact grids for solar cells with genetic algorithms.**
  PEJENDINO, R. C.; RUIZ, J. E.; WEINER, E.; MICHA, D. N.; PIRES, M. P.; SOUZA, P. L. **In:** 32nd Symposium on Microelectronics Technology and Devices (SBMicro), Fortaleza, Brazil. p. 1. 2017
  DOI: https://doi.org/10.1109/SBMicro.2017.8112975
- **Optimization of digital image processing to determine quantum dots height and density from atomic force microscopy.**
  RUIZ, J. E.; PACIORNIK, S.; PINTO, L. D.; PTAK, F.; PIRES, M. P.; SOUZA, P. L. **In:** ULTRAMICROSCOPY, v. 184, p. 234-241. 2017
  DOI: https://doi.org/10.1016/j.ultramic.2017.09.004
- **Optimization in digital image processing to determine quantum dots heights from atomic force microscopy.**
  RUIZ, J. E.; SOUZA, P. L.; DORNELAS, L. P.; PIRES, M. P. **In:** XIV Brazil MRS Meeting, Rio de Janeiro. Proceedings of the XIV Brazil MRS Meeting, p. 222. 2015
  Available at: http://sbpmat.org.br/14encontro/anais/pdfs/plenary/ASEA.pdf
- **Early nucleation stages of low density InAs quantum dots nucleation on GaAs by MOVPE.**
  TORELLY, G.; JAKOMIN, R.; PINTO, L. D.; PIRES, M. P.; RUIZ, J.; CALDAS, P. G.; PRIOLI, R.; XIE, H.; PONCE, F. A.;

SOUZA, P. L. **In:** Journal of Crystal Growth, v. 434, p. 47-54. 2015
DOI: https://doi.org/10.1016/j.jcrysgro.2015.10.031

Conferences publications

- **Quantum Bragg Mirror Detector Optimization Applying Genetic Algorithms**
  Jose Ruiz; Pedro H. Pereira; Germano M. Penello; Guilherme M. Torelly; Patricia L. Souza; Mauricio P. Pires **In:** Autumn Meeting of the Brazilian Physical Society, Ouro Preto. 2023
  Available at: https://sec.sbfisica.org.br/eventos/eosbf/2023/sys/resumos/R0784-1.pdf
- **Mapping and Optimization of Oscillator Strength in Quantum Bragg Mirror Detectors as a Function of their Dimensions**
  Jose Ruiz; Pedro H. Pereira; Germano M. Penello; Guilherme M. Torelly; Patricia L. Souza; Mauricio P. Pires **In:** SBMicro - 37th symposium on microelectronics technology and devices - Chip in Rio. 2023
- **Dilute Nitride GaInNAs Growth with Low Decomposition Temperature Precursors by MOVPE.**
  RUIZ, J. E.; OHLMANN, J.; DIMROTH, F.; LACKNER, D. **In:** DGKK \Deutsche Gesellschaft fur Kristallwachstum und Kristallzuchtung" - Freiburg im Breisgau - Germany. 2017
  Available at: https://www.ise.fraunhofer.de/content/dam/ise/de/downloads/pdf/DGKK_2017_Homepage-Progra pdf
- **Simulacão e otimizacão de células solares simples e multijuncão com algoritmos genéticos.**
  PACHECO, M. A. C.; RUIZ, J. E.; GALVÃO, P. **In:** 2017. In: XIX CECEMM: Congresso dos Estudantes de Ciência e Engenharia de Materiais do MERCOSUL. 2017
- **Dependence of the strain of InAs/InGaAlAs QDs on their size.**
  RUIZ, J. E.; PIRES, M. P.; SOUZA, P. L. **In:** XIV Brazil MRS Meeting, 2015, Rio de Janeiro. Proceedings of the XIV Brazil MRS Meeting.2015
  Available at: http://sbpmat.org.br/14encontro/anais/pdfs/plenary/ASEV.pdf
- **From InAs extended monolayer flat 2D terraces to 3D islands grown on GaAs substrates.**
  Torelly, G; RUIZ, J.; JAKOMIN, R.; DORNELAS, L. P.; PIRES, M. P.; CALDAS, P. G.; PRIOLI, R.; XIE, H.; PONCE, F. A.; SOUZA, P. L. **In:** In: XIV Brazil MRS Meeting, Rio de Janeiro.2015

Chapters in books

- **Otimizacão da malha metálica de dedos coletores para o contato elétrico frontal de células solares por algoritmos genéticos.**
  Roberto Carlos Pejendino Jojoa; Daniel Neves Micha; Jose Eduardo Ruiz Rosero; Eleonora Cominato Weiner; Mauricio Pamplona Pires; Patrícia Lustoza de Souza **In:** Energia no Brasil. 1ed.: Editora Poisson, v. 1, p. 89-101. 2019
  DOI: https://doi.org/10.5935/978-85-7042-107-4

Patents

- **Method for Extracting and Structuring Information**
  In: BR 10 2021 023977-8. Issued Nov 26, 2021 - Journal number: 2662 - Section VI patents. 2021
  Available at: http://revistas.inpi.gov.br/rpi/