

LUIS FERNANDO TORRES TORRES

MACHINE LEARNING RESEARCHER

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PERSONAL PROFILE

Machine Learning Researcher with hands-on experience designing and evaluating deep learning algorithms and Gaussian Processes for medical imaging, time-series analysis, and model optimization. I am motivated by the challenge of designing high-quality and reliable machine learning models for real-world medical data, and I look forward to continuing to learn and contribute to high-impact research as I grow both professionally and academically.

EDUCATION

Undergraduate Electronic Engineering | Universidad de Antioquia (Colombia) **2025**
Master 2 SiVOS | Université de Rennes (France) **Current**

RESEARCH EXPERIENCE

{Research Intern: Measurement of the Salivary Reserve in ^{18}F -FDG PET Imaging in Patients with Head and Neck Cancer / Laboratoire Traitement du Signal et de l'Image (IMPACT team) Current

- Develop a method for the automatic detection of outliers to identify tumor invasion in salivary gland segmentations using Bayesian bootstrap probability aggregation to measure epistemic uncertainty across iterations on the ARTIX dataset (CEM).
- Construct an automatic voxel-based model to clean tumor apparitions from segmentations using imaging features (intensity, local neighborhood, texture/radiomics, gradient/boundary, probabilistic, and geometric/spatial).
- Predict xerostomia based on SUV information extracted from PET imaging and compare performance against the standard clinical assessment protocol used at Centre Eugène Marquis.

Co-authored Publication: "Uncertainty Makes It Stable: Curiosity-Driven Quantized Mixture-of-Experts" / Université de Rennes 2026

- Designed a curiosity-driven Bayesian routing algorithm for Mixture-of-Experts, using Monte Carlo dropout and KL divergence for adaptive, uncertainty-aware expert selection among heterogeneous quantized models.
- Achieved a 50% to **94%** reduction in F1 variance (**$p < 0.001$**) through interpretable, confidence-based expert selection, in which uncertain samples are automatically referred to more accurate models.
- Demonstrated 4 bit quantization preserving 99.9% of full-precision **F1 (0.858 vs 0.859)** with **4x** compression and **31% energy savings**, targeting responsible and sustainable edge deployment.

Undergraduate Thesis: "Gaussian Process-driven Hidden Markov Models for Early Diagnosis of Infant Gait Anomalies" / Machine Learning & Robotics Group (UdeA- Col) 2025

- Extracted biomechanical vectors of key points to represent joint movements during Gait Cycles using pre-trained pose estimation models (OpenPose, Pose2Sim, Halpe26).
- Designed and train multi-output Gaussian Processes to capture the temporal dynamics of gait and the interdependencies of gait signals, obtaining metrics of **MAE=1.659, R2 = 0.963, aDTW=34.920**.
- Implemented HMM-based gait phase segmentation for anomaly detection in infant gait temporal patterns, validated on clinical data.

PUBLICATIONS AND CONTRIBUTIONS

- L. F. Torres Torres, S. F. Osorio-Botero, X. Palard, R. De Crevoisier, L. Cubero, O. Acosta, J. Castelli, M. Rubeaux. "Inclusion of Ipsilateral Salivary Gland PET/CT Features Improves Xerostomia Prediction After Radiotherapy in Head and Neck Cancer." Highlight virtual poster, ESTRO 2026, Stockholm, Sweden. Presented by L. Cubero.
- S. A. Cajas Ordóñez, L. F. Torres Torres, M. J. Meni, C. A. Duran Paredes, E. Arazo, C. Bosch, R. S. Carbajo, Y. Lai, L. A. Celi. "[Uncertainty Makes It Stable: Curiosity-Driven Quantized Mixture-of-Experts](#)." arXiv preprint arXiv:2511.11743v3, 2026.
- L. F. Torres-Torres, J. Arias-García, H. F. García, A. F. López-Lopera, J. F. Vargas-Bonilla. "[Gaussian Process-driven Hidden Markov Models for Early Diagnosis of Infant Gait Anomalies](#)." IEEE EMBC 2025, Copenhagen, Denmark. DOI: 10.1109/EMBC58623.2025.11254881
- S. A. Cajas Ordóñez, L. F. Torres Torres, M. Bifulco, C. A. Durán, C. Bosch, R. S. Carbajo. "[Embedding-Aware Quantum-Classical SVMs for Scalable Quantum Machine Learning](#)." arXiv preprint arXiv:2508.00024, 2025.
- V. Aher*, S. A. Cajas Ordóñez*, L. García*, E. Salas Villa*, L. Torres*, V. K. Verma*. "Intensity-Based Prompt Generation for Multi-Modality 3D Medical Image Segmentation." CVPR 2025 Workshop (BiomedSegFM Challenge)
- H. F. García Arias, L. García-Mosquera, L. F. Torres-Torres, A. Passo, I. Uribe. "[Translational Telemedicine for Indigenous Health: A Community-Centered Approach in the Karmata Rúa Reservation](#)." 2025 IEEE Global Humanitarian Technology Conference (GHTC), 2025.

KEY ACHIEVEMENTS

- **Travel Grant.** Winner of the IEEE Signal Processing Society's Mentoring Experiences for Underrepresented Young Researchers (ME-UYR) program, awarded **\$4,000 USD** to attend ICASSP 2025.
- **Humanitarian Engineering:** Winner of the Tech 4 Good Challenge Colombia, awarded **\$10,000 USD** with IEEE to develop a baseline telemedicine project in the Karmata Rúa indigenous reservation, establishing primary care stations.
- **GCP Grant:** Awarded **\$5,000 USD** Google Cloud Research Credits Program under the award number *GCP19980904* for supporting Quantum Computing and Machine Learning model optimization projects.
- **Achieved 4th place** in the CVPR 2025 challenge on Foundation Models for Interactive 3D Biomedical Image Segmentation with the proposed MobileSeg3D framework, a lightweight solution for multi-modality 3D medical image segmentation.

EVENTS ATTENDED

- Tumour Targeting, Imaging, Radiotherapies Workshop 2025, Erquy, France, September 24–27, 2025. Oral presentation: "Measurement of the Salivary Reserve in ^{18}F -FDG PET Imaging in Patients with Head and Neck Cancer: A Multivariate Analysis for Xerostomia Prediction Using Machine Learning."
- IEEE ICASSP 2025, Hyderabad, India, April 6-11, 2025. Oral presentation as part of the IEEE Signal Processing Society Mentoring Experience for Underrepresented Young Researchers (ME-UYR) program. Project: "Analyzing and Tracking Children's Walk Pattern using Artificial Intelligence," mentored by Dr. Li Cheng (University of Alberta, Canada).

TECHNICAL SKILLS

Python / C++ / PyTorch / TensorFlow / Scikit Learn / GpyTorch / Statsmodel / SciPy / PyRadiomics / Pydicom / SITK

SOFT SKILLS

Assertive communication / Autodidact / Critical Thinking / Problem Solving / Adaptability / Commitment / Teamwork

VOLUNTEERING

- Student Chair of the Telemedicine Baseline Project within the IEEE Humanitarian Engineering Program in Colombia (2025).
- Co-founder of the EMBC student chapter at the Universidad de Antioquia (2025).
- President of the IEEE Student Branch at the University of Antioquia (2024).
- Leader and Co-founder of Machine Learning & Robotics UdeA student group (2022-2024).

LANGUAGES

- Spanish (native).
- English (intermediate/ professional working proficiency).
- German (basic).
- French (basic).

REFERENCES

- Mathieu Rubeaux: Principal supervisor, M2 research internship, Laboratoire Traitement du Signal et de l'Image (LTSI), Université de Rennes, France. mathieu.rubeaux@univ-rennes.fr
- Oscar Acosta Tamayo: Co-supervisor, M2 research internship, Laboratoire Traitement du Signal et de l'Image (LTSI), Université de Rennes, France. oscar.acosta@univ-rennes.fr
- Hernán Felipe García Arias: Undergraduate thesis supervisor, Universidad de Antioquia (UdeA), Medellín, Colombia. hernanf.garcia@udea.edu.co