Javier Murgoitio-Esandi

Ph.D. Candidate · Machine Learning Scientist · University of Southern California
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Profile: Machine learning scientist with over 4 years of experience specializing in the theory and application of generative deep learning methods. Published in prestigious venues such as CMAME and NeurIPS. Thesis: *Deep generative models for Anomaly Detection and Uncertainty Quantification*.

SKILLS

Generative AI: expertise in state-of-the-art generative models including diffusion models, GANs, EBMs, VAEs.

Computer Vision: extensive experience in image processing and deep learning-based vision models such as CNNs and ViTs.

Foundation models: extensive experience building and training foundation models using ViTs and contrastive learning.

Large Language Models (LLMs): expertise in the development, fine-tuning and optimization of LLMs.

Deep learning systems: proficient building pipelines for training and inference of deep learning models.

Software development: skilled developing machine learning software.

Machine learning libraries and tools: TensorFlow, PyTorch, SciPy, Weights and Biases.

Programming languages: Python, C++.

EXPERIENCE

Uncertainty Quantification and Machine Learning Researcher, Intern. *September 2023 – May 2024*
Sandia National Laboratories, Livermore CA

- **Software development:** developed a PyTorch-based software library for uncertainty quantification in deep learning.
- **Uncertainty quantification in deep learning:** demonstrated the improved performance of novel architectures in uncertainty quantification which led to studies presented at conferences.

Graduate Research Assistant. Computation and Data Driven Discovery Group. *August 2020 – Present*
University of Southern California, Los Angeles CA

- **Generative models for uncertainty quantification:** solved imaging inverse problems in biomechanics using conditional generative methods such as conditional score-based diffusion models and GANs.
- **Anomaly detection for cancer detection:** developed a deep learning-based framework to detect cancer-related cells in liquid biopsy images using denoising auto-encoders.
- **Optimizing LLM for cancer diagnosis:** optimized and fine-tuned a LLaMA model using image embeddings derived from liquid biopsy images of both cancer and healthy patients, resulting in improved testing accuracy.
- **Foundation models:** designed, implemented and trained a foundation model tailored to liquid biopsy images.

Computational Modelling and Structural Engineer. *September 2016 – August 2020*
London Marine Consultants and AECOM, London, United Kingdom

- Led technical analysis and optimization of complex structures, managing multiple concurrent projects and stakeholders.

EDUCATION

Ph.D. in Mechanical Engineering. Research area: Generative AI. GPA: 4.00. *August 2020 – Present*
University of Southern California, Los Angeles, USA

Master of Research, Research area: Fluid mechanics. GPA: 3.80 *September 2017 – September 2019*
University College London, London, United Kingdom

Master of Science, Civil Engineering. GPA: 3.80 *September 2015 – September 2016*
University College London, London, United Kingdom

Bachelor of Engineering, Civil Engineering. GPA: 3.61. *September 2011 – August 2015*
University of Basque Country, San Sebastian, Spain

PATENTS

- Systems and methods for identification of rare events in biological samples (Patent No. 63/716,845, issued on November 6, 2024). Co-inventor. The patent relates to a rare event identification method that can be used to determine a patient's disease state. The method is based on an unsupervised deep learning approach.

SELECTED PUBLICATIONS AND CONFERENCES

- Murgoitio-Esandi, J., …, Oberai, A. A. (2025). Unsupervised Detection of Rare Events in Liquid Biopsy Assays. (submitted to Nature Communications and currently available in bioarxiv)
- Murgoitio-Esandi J., Dasgupta, A., Ramaswamy H., Foo, K., Kennedy, B., Li, R., Zhou, Q., Oberai, A. A. (2024). Inferring mechanical properties of tissue with quantified uncertainty using conditional generative models. WCCM 2024.
- Ray, D., Murgoitio-Esandi, J., …, & Oberai, A. A. (2023). Solution of physics-based inverse problems using conditional generative adversarial networks with full gradient penalty. *Computer Methods in Applied Mechanics and Engineering*.
- Dasgupta, A., Murgoitio-Esandi, J., Ray, D., Oberai, A. A. (2023). Conditional score-based generative models for solving physics-based inverse problems. NeurIPS 2023 Workshop on Deep Learning and Inverse Problems.

RESEARCH AWARDS

- Murgoitio-Esandi, J., Zhang, J., Zhou, Q. & Oberai, A.A. (2022). An adversarial deep learning approach to measure the biomechanical properties of the optic nerve head. Future Vision Forum Poster Award.