

# Javier Murgoitio-Esandi

Ph.D. Student · University of Southern California

murgoiti@usc.edu; <https://jmurgoitioesandi.github.io>

**Profile:** Ph.D. student specializing in the application of deep learning techniques to scientific problems.  
Experienced with deep learning techniques such as GANs, Diffusion Models, autoencoders and PINNs.

## SKILLS

Machine learning libraries: TensorFlow, PyTorch, Scipy.

Scripting and programming languages: Python, C++ and Matlab.

## RESEARCH EXPERIENCE

My main research focus is in applying deep learning models to solve engineering and scientific problems. The following are three projects that represent my research:

- Developing **Conditional Generative Adversarial Network (cGAN)** models to obtain the biomechanical properties of the optic nerve head using ultrasound elastography measurements.
- Using probabilistic deep learning models (**GANs** and **VAEs**) to detect rare cells in liquid biopsy images with the goal of early cancer detection.
- Developing uncertainty quantification methodologies to improve posterior sampling using Hamiltonian Monte Carlo in Bayesian deep learning problems.

## PROFESSIONAL HISTORY

**Uncertainty Quantification and Machine Learning in Physics Models, Intern**

*September 2023 – Present*

*Sandia National Laboratories, Livermore, California*

## EDUCATION

**Ph.D. in Mechanical Engineering**

*August 2020 – Present*

**Research area: Scientific Machine Learning.**

*University of Southern California, Los Angeles, USA*

**Master of Research, Research: Ocean Waves**

*September 2017 – September 2019*

*University College London, London, United Kingdom*

**Master of Science, Civil Engineering**

*September 2015 – September 2016*

*University College London, London, United Kingdom*

**Bachelor of Engineering, Civil Engineering**

*September 2011 – August 2015*

*University of Basque Country, San Sebastian, Spain*

**Study Abroad Program (Erasmus)**

*September 2014 – August 2015*

*Fachhochschule Münster, Münster, Germany*

## PUBLICATIONS

- ❖ Ray, D., Murgoitio-Esandi, J., Dasgupta, A., & Oberai, A. A. (2023). Solution of physics-based inverse problems using conditional generative adversarial networks with full gradient penalty. preprint arXiv:2306.04895. (Accepted for publ.).
- ❖ Murgoitio-Esandi, J., Xu, B.Y., Song, B.J., Zhou, Q. & Oberai, A.A. (2022). A mechanistic model of aqueous humor flow to study effects of angle closure on intraocular pressure. *Translational Vision Science and Technology*.
- ❖ Zhang, J., Murgoitio-Esandi, J., Qian, X., Li, R., Gong, C., Nankali, A., Hao, L., Xu, B.Y., Oberai, A.A. & Zhou, Q. (2022). High Frequency Ultrasound Elastography to Assess the Nonlinear Elastic Properties of the Cornea and Ciliary Body. *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*
- ❖ Esandi, J. M., Buldakov, E., Simons, R., & Stagonas, D. (2020). An experimental study on wave forces on a vertical cylinder due to spilling breaking and near-breaking wave groups. *Coastal Engineering*, 162, 103778.

## CONFERENCES

- ❖ 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*. (Accepted)
- ❖ Murgoitio-Esandi, J., Ray, D., Oberai, A. A. (2023). A novel conditional Wasserstein Generative Adversarial Network for inverse problems. *U.S. National Congress of Computational Mechanics 17*.

## RESEARCH AWARDS

- ❖ (Poster award, 3<sup>rd</sup> price). 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*.
- ❖ (De Paepe Willems awards, 2<sup>nd</sup> price) Esandi, J. M. *PIANC De Paepe-Willems Award 2019–Shared Second Place ASSESSMENT OF OVERTOPPING VERTICAL RIVER WALLS. DPWA Winners*, 37.