Francisco Caetano

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Currently pursuing a PhD at the Eindhoven University of Technology. I hold a BSc and an MSc from FEUP. My research focuses on practical, deployable generative solutions for image generation and editing, domain adaptation, and out-of-distribution detection, to tackle real-world problems in medical imaging. I now plan on extending my research into NLP and have been exploring autoregressive and diffusion-based language models.

Education

Eindhoven University of Technology (TU/e) *Eindhoven, Netherlands*
PhD in Generative Modeling *Jan 2024 – Present*

- My PhD research began with the use of Generative AI for tailored synthetic image generation and has since evolved toward broader applications in image editing, domain adaptation, and out-of-distribution detection
- Under the supervision of dr.ir. Fons van der Sommen (Associate Professor at TU/e)

Faculty of Engineering of the University of Porto (FEUP) *Porto, Portugal*
MSc in Electrical Engineering *Sep 2020 – Feb 2023*

- GPA: 18/20
- Specialized in Automation.
- Achieved a grade of 20/20 with the thesis Visual Data Processing for Anomaly Detection, under the supervision of Prof. Jaime Cardoso (Full Professor at FEUP)

Chalmers University of Technology *Gothenburg, Sweden*
Erasmus Exchange *Aug 2020 – Jan 2021*

- Took 4 courses from the MSc in Systems, Control and Mechatronics

Faculty of Engineering of the University of Porto (FEUP) *Porto, Portugal*
BSc in Electrical Engineering *Sep 2017 – Jul 2020*

- GPA: 18/20

Experience

PhD Candidate, Lecturer and Teaching Assistant *Eindhoven, Netherlands*
Eindhoven University of Technology *Jan 2024 – Present*

- Worked with Healthcare and Automotive Industry partners in the TASTI Project
- Co-organized the RARE Challenge at MICCAI 2025
- Gave the lectures on Flow Matching and wrote the computer class notebooks on DDPMs, GANs, SGMs, and FM models for the course Neural Networks for Computer Vision
- Co-advised the MSc Thesis Crack detection in paintings by Vincent van Gogh using a machine learning approach

Computer Vision Researcher *Porto, Portugal*
Fraunhofer Portugal AICOS *Mar 2023 – Dec 2023*

- Developed algorithms for automatic in-line visual inspection in the semiconductor industry
- Built an internal framework for training and evaluating multiple anomaly detection algorithms and annotating data

Research Assistant *Porto, Portugal*
INESC-TEC *May 2022 – Feb 2023*

- Recognition of in-vehicle human activity with occlusion-handling
- Development of improved solutions for video anomaly detection

Vulcanus in Japan Fellow *Tokyo, Japan*
EU-Japan Centre for Industrial Cooperation *Sep 2021 – Jan 2022*

- Selected to participate in the Vulcanus in Japan programme, which included a four-month-long intensive

Japanese course and an 8-month internship at the NTT Communication Science Labs
- Due to the COVID travel restrictions, I was unable to start the internship

Selected Publications

Symmetrical Flow Matching: Unified Image Generation, Segmentation, and Classification with Score-Based Generative Models (2025). **F. Caetano**, C. Viviers, P.H.N. de With, F. van der Sommen. **arXiv**

DisCoPatch: Taming Adversarially-driven Batch Statistics for Improved Out-of-Distribution Detection (2025). **F. Caetano**, C. Viviers, L. Mondragon, P.H.N. de With, F. van der Sommen. **ICCV 2025**

MedShift: Implicit Conditional Transport for X-Ray Domain Adaptation (2025). **F. Caetano**, C. Viviers, P.H.N. de With, F. van der Sommen. **ICCV 2025 (Workshop)**

Zero-Shot Image Anomaly Detection Using Generative Foundation Models (2025). L. Abdi, A. Valiuddin, **F. Caetano**, C. Viviers, F. van der Sommen. **ICCV 2025 (Workshop)**

MedSymmFlow: Bridging Generative Modeling and Classification in Medical Imaging through Symmetrical Flow Matching (2025). **F. Caetano**, L. Abdi, C. Viviers, A. Valiuddin, F. van der Sommen. **MICCAI 2025 (Workshop)**

Robust Early Detection of Barrett's Neoplasia: Addressing Low-Prevalence Challenges with Generative Modeling (2025). T.J.M. Jaspers, **F. Caetano**, C.H.B. Claessens, C.H.J. Kusters, H. Middeljans, M.R. Jong, R.A.H. van Eijck van Heslinga, F. Slooter, A.J. de Groof, J.J. Bergman, P.H.N. De With, F. van der Sommen. **MICCAI 2025 (Workshop)**

Out-of-Distribution Detection in Medical Imaging via Diffusion Trajectories (2025). L. Abdi, **F. Caetano**, A. Valiuddin, C. Viviers, H. Joudeh, F. van der Sommen. **MICCAI 2025 (Workshop)**

AdverX-Ray: Ensuring X-Ray Integrity Through Frequency-Sensitive Adversarial VAEs (2025). **F. Caetano**, C. Viviers, L. Filatova, P.H.N. de With, F. van der Sommen. **SPIE Medical Imaging 2025**

Can Your Generative Model Detect Out-of-Distribution Covariate Shift? (2024). C. Viviers, A. Valiuddin, **F. Caetano**, L. Abdi, L. Filatova, P.H.N. de With, F. van der Sommen. **ECCV 2024 (Workshop)**

For a full list of publications, please check Google Scholar or my Personal Page

Projects

Generative Zoo *Project Page*
- The Generative Zoo is a collection of generative algorithms and techniques implemented in Python using PyTorch, focused on Computer Vision tasks
- The TASTI Project partners have adopted the Zoo to simplify the training and benchmarking of their generative solutions

Recognitions & Awards

Runner-up 2025 Robert F. Wagner All-Conference Best Student Paper Award, at SPIE Medical Imaging 2025

Runner-up 2023 CTM Best Master Thesis Award, at INESC-TEC

Winner 2019 CTM Best Summer Internship Award, at INESC-TEC

Skills

Portuguese (Native) and English (Proficient)

Python, PyTorch, Docker, FastAPI, Git