

Luca Lumetti

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EDUCATION

Department of Engineering Enzo Ferrari, Unimore

Ph.D. in ICT - Healthcare applications of AI, Computer Vision, and Medical Imaging

Modena, IT

November 2022 – October 2025

Department of Engineering Enzo Ferrari, Unimore

MSc in Artificial Intelligence Engineering 110/110 with honors

Modena, IT

September 2020 – October 2022

Department of Engineering Enzo Ferrari, Unimore

BSc in Computer Engineering 100/110

Modena, IT

September 2017 – July 2020

PUBLICATIONS

Jianning Li, Antonio Pepe, Christina Gsaxner, Gijs Luijten, Yuan Jin, ..., [Luca Lumetti](#) et al. | **MedShapeNet – A Large-Scale Dataset of 3D Medical Shapes for Computer Vision** | *ArXiv preprint* arXiv:2308.16139.

Gianpaolo Bontempo, [Luca Lumetti](#), Angelo Porrello, Federico Bolelli, Simone Calderara, Elisa Ficarra | **Buffer-MIL: Robust Multi-instance Learning with a Buffer-based Approach** | *International Conference on Image Analysis and Processing* 2023 (pp. 1-12)

[Luca Lumetti](#), Vittorio Pipoli, Federico Bolelli, Costantino Grana | **Annotating the Inferior Alveolar Canal: the Ultimate Tool.** | *International Conference on Image Analysis and Processing* 2023 (pp. 525-536)

Federico Bolelli, [Luca Lumetti](#), Mattia Di Bartolomeo, Shankeeth Vinayahalingam, Alexandre Anesi, Bram van Ginneken, Costantino Grana | **Tooth Fairy: A Cone-Beam Computed Tomography Segmentation Challenge** | *26th International Conference on Medical Image Computing and Computer Assisted Intervention* 2023

Di Bartolomeo M, Pellacani A, Bolelli F, Cipriano M, [Lumetti L](#), Negrello S, Allegretti S, Minafra P, Pollastri F, Nocini R, Colletti G, Chiarini L, Grana C, Anesi A. | **Inferior Alveolar Canal Automatic Detection with Deep Learning CNNs on CBCTs: Development of a Novel Model and Release of Open-Source Dataset and Algorithm.** | *Applied Sciences*. 2023; 13(5):3271

EXPERIENCE

Contract Employment

University of Modena and Reggio Emilia, Unimore

Modena, IT

November 2023 - December 2023

- Coordination of group work and tutoring for students of the B.Sc. degree in Computer Engineering.
- Duration of the contract: 20 days

Honorary Fellow

Department of Engineering Enzo Ferrari, Unimore

Modena, IT

March 2023 - Ongoing

- Honorary fellow of the course “Multimedia Data Processing” of the M.Sc. degree in Computer Engineering of the University of Modena and Reggio Emilia.
- Honorary fellow of the course “Data structures and Algorithms” of the B.Sc. degree in Computer Engineering at the University of Modena and Reggio Emilia.
- Honorary fellow of the course “Foundations of Informatics” of the B.Sc. degree in Computer Engineering of the University of Modena and Reggio Emilia.

Teaching Assistant

Department of Engineering Enzo Ferrari, Unimore

Modena, IT

February 2023 - Ongoing

- Teaching assistant for 250 hours with Prof. Federico Bolelli and Prof. Maurizio Vincini in the exam “Data structures and algorithms” of the B.Sc. degree in Computer Engineering course of the University of Modena and Reggio Emilia.
- Selected for the project “Fondo Sostegno Giovani” (Youth Support Fund) for the the A.Y. 2022-2023 and A.Y. 2023-2024. The project is funded by MIUR - “Ministero dell’Istruzione, dell’Università e della Ricerca” (Ministry of Education, University and Research).

Contract Employment

Artificial Intelligence Research and Innovation Center AIRI, Unimore

Modena, IT

January 2023 - February 2023

- Written a survey about the state-of-the-art in image stitching techniques and implemented in Python a pipeline to perform the stitching of big images (2000px × 4000px) for an external company.
- Duration of the contract: 10 days

Student Internship

AImageLab

Modena, IT

March 2022 - August 2022

- University internship under the supervision of Prof. Costantino Grana and Prof. Federico Bolelli about the development of a novel deep learning architecture for the segmentation of the Inferior Alveolar Canal in CBCT volumes.
- Conducted some research about the presence of biases in skin lesion datasets.

High School Professor

Highschool I.S.S. Alessandro Volta

- Taught 6h a week IT subjects to fifth year students.

Sassuolo (MO), IT

November 2021 - June 2022

Fullstack Developer/Sysadmin

Web Team Ubuntu-IT

- Contributed to the development and translation of the website and the management of the servers.

Remote

September 2014 - November 2017

OPEN SOURCE CONTRIBUTIONS

PyTorch (<https://github.com/pytorch/pytorch>) | *PyTorch, Python*

- Fixed a bug in TorchGen that caused some keyword arguments to be wrong in `torch.where()`
- Changed the documentation accordingly.

TorchIO (<https://github.com/fepegar/torchio>) | *PyTorch, Medical Imaging*

- Contributed to the development by adding Hann window functions to reduce edge-effects in a patch based training.
- Contributed to the documentation.

Hyprpicker (<https://github.com/hyprwm/hyprpicker>) | *C*

- Fixed a bug that would cause wrong color output in some particular kind of shells.

PROJECTS

Large Scale Training for WSI Classification (Code not yet released) | *PyTorch, Torch-Geometrics*

- Implemented a state-of-the-art neural network for the classification of Whole-Slide Images.
- Refactored the codebase of the training pipeline to make it from single-GPU and single-node to multi-GPU and multi-node.
- Using Leonardo supercomputer, trained the network on 32 GPUs distributed across 8 different nodes, obtaining a $\times 80$ speed-up in the training process while keeping the same values in the metrics.

IAN Annotation Tool (https://github.com/AImageLab-zip/IAN_annotation_tool) | *Qt5, Scikit-Image, OpenCV, Scipy*

- A tool used to produce 3D annotation of the Inferior Alveolar Canal, used to create the Maxillo Dataset and ToothFairy Dataset (<https://ditto.ing.unimore.it>).
- Improved the tool by adding many additional features, as local contrast stretching and prediction of a deep learning model, that helped us to fix 40% of previously annotated data that contained some errors in the segmentation mask.

Alveolar Canal (https://github.com/AImageLab-zip/alveolar_canal) | *PyTorch, OpenCV, TorchIO*

- Inferior alveolar canal segmentation of cone beam computed tomography (CBCT) using deep learning.
- Implementation of many deep neural network architectures, loss functions, and other novel computer vision algorithms, obtaining an improvement w.r.t. the state-of-the-art by 3 points in the DICE score and achieving 70% faster training time.

Deep Facial Inpainting (<https://github.com/LucaLumetti/Deep-Facial-Inpainting>) | *PyTorch, OpenCV, Scikit-Image*

- Built a dataset, combining CelebA and FFHQ (100k images in total), and developed a pipeline to detect, segment and inpaint a surgical mask in a given photo of a face of a person.
- Developed a FCNN to inpaint an image containing a person face with a surgical mask, trained on 3 nodes with 2 GPUs each.

DQNTS (<https://github.com/LucaLumetti/DQNTS>) | *PyTorch, Pandas, Scipy, Numpy*

- Pipeline to solve the Max Mean Dispersion Problem (NP-hard) by combining a Graph Neural Network and a Tabu Search, achieving SOTA results in large instances (≥ 5000 nodes), increasing up to 12% in objective score.

SmartGate | *Node.js, MongoDB, OpenCV, Tensorflow, Aedes, Raspberry PI, Arduino*

- Given a camera placed above a garage door, real-time reading of car licence plate using custom YoloV4, Tesseract OCR and OpenCV. Everything has been deployed on a Raspberry PI 4, reaching a performance of 2 FPS, which is above the requirements we had fixed.
- Web application written in Node.js, deployed on Raspberry PI 4 and communicating with an Arduino to manage the garage door.

OTHER ACTIVITIES AND HOBBIES

- Participated in to different computer vision conferences (MICCAI2023, ICIAP2022, ICIAP2023) where i presented my works, and summer schools (ICVSS2023, ELLIS2023), where I got involved into group projects with other students.
- Achieved 2nd place at the CTF competition held at the University of Modena and Reggio Emilia.
- Competed in many competitive programming challenges, like AdventOfCode, Google FooBar, Reply, etc., both individually and in a team.
- Took part in the Math Olympiads during high school, achieving 4th place in the regional phase and a participation up to the national phase.