# Federico Bolelli

*Curriculum Vitae*

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*github.com/prittt*
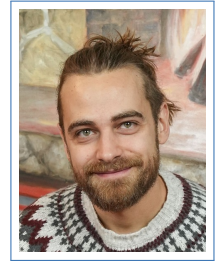
Last update on September 24, 2024

## CV Summary

This section provides a brief **overview** of the various **scientific and educational activities** detailed below.

Federico Bolelli obtained his high school diploma in 2011, graduated (on time, cum laude), and obtained the qualification to practice as an engineer in 2018 (Italian law). He obtained his research doctorate in 2019. During his doctorate, he receives economic support from national projects and an H2020 project on medical imaging (DeepHealth). He is the holder of a research assignment in 2019, had the role of Research Associate since 2022, and has been a Tenure-Track Professor since 2023.

He has been carrying out **teaching activities** (**seminars and laboratory exercises**) since the academic year 2016-2017. Since 2019, he has been an **adjunct professor** of 'Multimedia Data Processing' and, since 2020, of 'Fundamentals of Computer Science'. Since 2021 (as **Research Associate**), he has been a teacher of the courses 'Multimedia Data Processing' and 'Algorithms and Data Structures', and since 2023 (as **Tenure-Track Assistant Professor**), he has been the teacher of the courses 'Industrial IOT and Artificial Intelligence' and 'Computer Science', for a total of 152 hours of compulsory frontal teaching. He has taught in **three university masters**. He was the **supervisor** of a total **of 32 theses**.

As regards **scientific activity**, together with Prof. Ficarra, he is coordinating the UNIMORE activity for WP2 and WP9 in the five-year **European project Horizon 2020** - DECIDER (Improving Clinical Decisions in Cancer – 965193 - €1,000,000.00). **In the past**, he officially participated and worked actively in **one H2020 project** and in **7 research projects funded by private companies**. He has **organized 3 Workshops** and **2 Challenges** at an international level. He was the **winner of university and departmental funding** for a total amount of ∼ 90,000 €.

Federico Bolelli has published **15 journal papers**, **2 book chapters**, **33 conference papers**, **4 workshops**, and **2 challenges**. Overall (Google Scholar data as of September 24, 2024), his works have received **981 citations**, and the **h-index is 21**. Details at https://scholar.google.com/citations?user=p7-GDykAAAAJ.

Of particular note is the production of algorithms for image processing. In particular, the algorithm proposed in 2019 on IEEE Transactions on Image Processing for the calculation of Connected Components is the fastest in the world, and it is the algorithm used by default within the open-source library OpenCV. The latest work, published in IEEE Transactions on Pattern Analysis and Machine Intelligence, further improves the state of the art and the benchmarking framework created (https://github.com/prittt/YACCLAB) allows researchers to apply it and reproduce the results on any system.

For what concerns the **refereeing activities**, Federico Bolelli has been the **official reviewer of** multiple **top-notch conferences** (CVPR - 2 editions, MICCAI - 2 editions, WACV, ISBI, and ICPR) **and journals** (IEEE TIP, IEEE TMI, MEDIMA, PR, and PRL) for a total of $\sim$ 80 verified peer reviews. Details at publons.com/a/1528925/.

Federico Bolelli carries out **coordination activities within a research group currently made up of 9 collaborators**: seven PhD students (Luca Lumetti, Vittorio Pipoli, Giacomo Capitani, Gianpaolo Bontempo, Kevin Marchesini, Francesca Miccolis and Enrico Vezzali) and two research fellows (Gabriele Rosati and Ettore Candeloro). The group is mainly involved in the development of AI algorithms and software for Medical Imaging.

## Education

2016–2019 **Ph.D.**, *University of Modena and Reggio Emilia*, Modena, Italy.
Research topic: Optimization of Binary Image Processing Algorithms.
Supervisor: Prof. Costantino Grana.

Dec. 2018 **Graduation to Professional Engineer in Computer Science (Italian Legislation)**, *University of Modena and Reggio Emilia*, Modena, Italy.

2014–2016 **Master Degree in Computer Engineering**, *University of Modena and Reggio Emilia*, Modena, Italy.
Mark: 110/110 cum laude.
Thesis title: A Benchmarking Tool for Connected Components Labeling.'
Supervisors: Prof. Costantino Grana, Prof.Lorenzo Baraldi.

2011–2014 **Bachelor Degree in Computer Engineering**, *University of Modena and Reggio Emilia*, Modena, Italy.
Mark: 110/110 cum laude.
Thesis title: Progetto ed Implementazione di un Database per la Gestione di Metadati di Campioni/Esperimenti Genomici (Design and Implementation of a Database for Controlling Metadata of Genomic Sample/Experiments).
Supervisor: Prof. Domenico Beneventano.

2006–2011 **Scientific High School Diploma**, *Scientific Technological High School "F. Corni (I.T.I.S.)"*, Modena, Italy.
Mark: 100/100.

## Languages

Mothertongue Italian

Other Lang.s English

## Vocational Experiences

**Mar. 2024– On Going** **Adjunct Professor at the "Enzo Ferrari" Department of Engineering (RTT, Italian Legislation)**, *University of Modena and Reggio Emilia*, Modena, Italy.

**Mar. 2022– Feb. 2024** **Adjunct Professor at the "Enzo Ferrari" Department of Engineering(RTD-A, Italian Legislation)**, *University of Modena and Reggio Emilia*, Modena, Italy.
Research activity within *DECIDER* H2020 European Project - G.A. n. 965193: "Improved Clinical Decision via Integrating Multiple Data Levels to Overcome Chemotherapy Resistance in High-Grade Serous Ovarian Cancer".

**Nov. 2019– Feb. 2022** **Postdoctoral Research Fellow at the "Enzo Ferrari" Department of Engineering**, *University of Modena and Reggio Emilia*, Modena, Italy.
"Development and testing of Image Processing and Computer Vision software libraries, DeepHealth - WP3 project": development of the ECVL (European Computer Vision Library) and its ecosystem within the *DeepHealth* H2020 European Project.

**Dec. 2021– Feb. 2022** **Contract Employment ("Collaborazione Occasionale")**, *University of Modena and Reggio Emilia*, Modena, Italy.
"Porting di database e frontend web su architettura virtualizzata" project. Duration of the activity: 20 days.

**Dec. 2019– Feb. 2020** **Contract Employment ("Collaborazione Occasionale")**, *University of Modena and Reggio Emilia*, Modena, Italy.
"INGEGNERIA.POT - School guidance and tutoring plans" project. Duration of the activity: 20 days.

**Mar. 2018** **Contract Employment ("Collaborazione Occasionale")**, *University of Modena and Reggio Emilia*, Modena, Italy.
Code optimization for *Connected Components Labeling*. Duration of the activity: 15 days.

**Aug.–Oct. 2016** **Research Fellow**, *University of Modena and Reggio Emilia*, Modena, Italy.
"SACHER: Smart Architecture for Cultural Heritage in Emilia Romagna": The project is designed with the intention of extending to a much wider audience of scholars, or even simply curious people, the possibility to access a variety of historical documents published online. To that purpose, the project developed an innovative data capturing technique able to extract document indexes in quasi-automatic mode from their handwritten contents. The devised solution intervenes after the dematerialisation action of scanning the historic documents and obtaining one image per couple of adjacent pages, and it is intended to be especially applied to a long series of documents such as the large number of civil registries that are available since the constitution of the Italian state.

**Jan.–Jun. 2016** **Software Developer for "SUGAR-ME310" project**, *University of Modena and Reggio Emilia in Collaboration with Stanford University*.
Development of web applications and software for smart micro-controllers.

## Teaching Activities

### Official University Teaching

**2023– On Going** **Teaching Position for the Course of "Computer Science"**, *University of Modena and Reggio Emilia*, Military Academy of Modena, Italy.
Teaching activity (120 hours) for the "Computer Science" course of the Degree in "Scienze Strategiche" (AY 2023-2024), details available at https://personale.unimore.it/rubrica/insegnamenti/f.bolelli.

2023– On **Teaching Position for the Course of "Industrial IOT and Artificial Intelligence"**, *University of Modena and Reggio Emilia*, Carpi, Italy.
Going
Teaching activity (102 hours) for the "Industrial IOT and Artificial Intelligence" course of the Master Degree in Sustainable Industrial Engineering(AY 2023-2024), details available at https://personale.unimore.it/rubrica/insegnamenti/f.bolelli.

2022– On **Teaching Position for the Course of "Data Structures and Algorithms"**, *University of Modena and Reggio Emilia*, Modena, Italy.
Going
Teaching activity (79 hours) for the "Data Structures and Algorithms" course of Bachelor Degree in Computer Engineering (AY 2022-2023), details available at https://personale.unimore.it/rubrica/insegnamenti/f.bolelli.

2021– On **Teaching Position for the Course of "Multimedia Data Processing"**, *University of Modena and Reggio Emilia*, Modena, Italy.
Going
Teaching activity (42 hours) for the "Multimedia Data Processing" course of Master Degree in Computer Engineering (AY 2021-2022, 2022-2023), details available at https://personale.unimore.it/rubrica/insegnamenti/f.bolelli.

2020–2021 **Adjunct Professor for the module "ICT for Smart Products" of the "Smart Technologies for Sustainable Design Lab."**, *University of Ferrara*, Ferrara, Italy.
Teaching activity (50 hours) for the module "ICT for Smart Products" of the Master Degree in "Innovation Design" (AY 2020-2021).

2020–2022 **Adjunct Professor for the Course of "Fundamentals of Computer Science II"**, *University of Modena and Reggio Emilia*, Modena, Italy.
Teaching activity (54 hours) for the "Fundamentals of Computer Science II" course of Bachelor Degree in Computer Engineering (AYs. 2020-2021 e 2021-2022).

2019–2021 **Adjunct Professor for the Course of "Multimedia Data Processing"**, *University of Modena and Reggio Emilia*, Modena, Italy.
Teaching activity (48 hours) for the "Multimedia Data Processing" course of Master Degree in Computer Engineering (AYs. 2019-2020 and 2020-2021).

\* **Official Teaching Summary**, The student evaluation (OPIS) takes into account question D14 ("Are you overall satisfied with how the teaching was carried out?"). The course "Strutture Dati e Algoritmi", previously "Fondamenti di Informatica II e Lab.", changed the name during the accademic year 2022-2023.

| | | L-8 (UNIMORE) Strutture Dati e Algoritmi* | LM-32 (UNIMORE) Multimedia Data Processing | LM-12 (UNIFE) ICT for Smart Products | LM-33 (UNIMORE) Industrial IOT and Artificial Intelligence | L/DS (UNIMORE) Informatica | Tot. Ore |
|---|---|---|---|---|---|---|---|
| A.A. 24/25 | Ore OPIS | 27 N/A | | | 70 N/A | 60 N/A | 152 |
| A.A. 23/24 | Ore OPIS | 54 94% | 6 N/A | | 32 94% | 60 94% | 152 |
| A.A. 22/23 | Ore OPIS | 54 96% | 6 88% | | | | 60 |
| A.A. 21/22 | Ore OPIS | 27 94% | 30 86% | | | | 57 |
| A.A. 20/21 | Ore OPIS | 27 92% | 24 88% | 50 92% | | | 101 |
| A.A. 19/20 | Ore OPIS | | 24 N/A | | | | 24 |
| | | | | | | | **394** |

## University Level Teaching

2016– On **Honorary Fellow in "Fundamentals of Computer Science I"**, *University of Modena and Reggio Emilia*, Italy, Bachelor Degree in Computer Engineering.
going

| | |
|---|---|
| 2021-2022 | **Seminar lessons for the "School in AI: Deep Learning, Vision and Language for Industry"**, *University of Modena and Reggio Emilia*, Modena, Italy.<br>Seminar lessons (11 hours) of *Computer Vision* and *Image Processing* (Editions 2021, 2022). The school was organized by University of Modena and Reggio Emilia with the partnership of AIACADEMY, AImageLab, and Artificial Intelligence Research and Innovation Center and hosted at the "Enzo Ferrari" Department of Engineering. |
| 2018–2020 | **Seminar lessons for the Short Master "Machine Learning - Theoretical and Practical Course"**, *University of Modena and Reggio Emilia*, Modena, Italy (Virtual).<br>Seminar lessons (24 hours) of *Computer Vision* (Editions 2018, 2019, 2020). Course organized by Democenter foundation. |
| 2017– 2020 | **Honorary Fellow in "Fundamentals of Computer Science II"**, *University of Modena and Reggio Emilia*, Italy, Bachelor Degree in Computer Engineering. |
| 2016–2020 | **Graduate Teaching Assistant for the Course of "Fundamentals of Computer Science II"**, *University of Modena and Reggio Emilia*, Italy, Bachelor Degree in Computer Engineering.<br>Seminar lessons (420 hours) held for the "Fundamentals of Computer Science II" course of the Bachelor Degree in Computer Engineering as selected student of the project "Fondo Sostegno Giovani" (Youth Support Fund) for the the Academic Years 2016-2017, 2017-2018, 2018-2019 and 2019-2020. The project is funded by MIUR - "Ministero dell'Istruzione, dell'Università e della Ricerca" (Ministry of Education, University and Research). |
| 2016–2019 | **Honorary Fellow in "Multimedia Data Processing"**, *University of Modena and Reggio Emilia*, Italy, Master Degree in Computer Engineering. |
| May 2018 | **Lecturer for the Seminar about "Connected Components Labeling"**, *University of Modena and Reggio Emilia*, Modena, Italy.<br>Seminar lessons (4 hours) about "Connected Components Labeling" for the *Computer Vision* course of the Master Degree in Computer Engineering. |
| Sep.–Nov. 2017 | **Seminar lessons for the University Master "Mumet: Digitalization and Retrival Multimedia Data - Visual Computing and Multimedia Technologies in the Deep Learning Era"**, *University of Modena and Reggio Emilia*, Modena, Italy.<br>Seminar lessons (12 hours) of *Computer Vision*. |
| Oct.–Dec. 2016 | **Undergraduate Teaching Assistant for the Course of "Computer Science"**, *University of Modena and Reggio Emilia*, Italy, Bachelor Degree in Civil Engineering.<br>Teaching support (80 hours) for the "Fundamentals of Computer Science" course of the Bachelor Degree in Civil and Environmental Engineering as selected student of the project "Fondo Sostegno Giovani" (Youth Support Fund) for the the Academic Year 2016-2017. The project is funded by MIUR - "Ministero dell'Istruzione, dell'Università e della Ricerca" (Ministry of Education, University and Research). |
| * | **Summary of University Level Teaching**. |

| | University Masters | Seminar Lessons | Tutorship | Tot. Hours |
|---|---|---|---|---|
| Ore | 51 | 420 | 80 | **551** |

## Other Teachings

**Jun. 2023– Sep. 2023** **Lecturer for the Training Course "Advanced Python"**, *Marchesini*, Bologna, Italy).

From C++ to Python (26 hours). Course organized by BI-REX (Big Data Innovation & Research Excellence) for the Marchesini group (Editions I e II)

**Jun. 2022– Jul. 2022** **Lecturer for the Training Course "Computer Vision and Deep Learning"**, *CNH*, Modena, Italy).

Fundamentals of Computer Vision and Image Processing (26 hours).

**2018– 2022** **Lecturer for the Course "Tecnico della Progettazione e Sviluppo di Applicazioni Informatiche" (Technician of Design and Development of IT Applications**, *CFI*, Ferrara, Italy.

Object-oriented programming lessons with Python (62 hours. The courses (four editions) have been funded by the Emilia Romagna Region and the European Social Fund.

**Nov.– Dec. 2020** **Lecturer for the Course "Tecnologie e Software per il Trattamento dei Big Data" (Technologies and Software for Big Data Processing)**, *IFOA*, Reggio Emilia, Italy (Virtual).

Object-oriented programming lessons with Python (22 hours). The course has been funded by the Emilia Romagna Region and the European Social Fund.

**2019–2020** **Teacher for the Introductory Course to Arduino Programming**, *"Dante Alighieri" Middle School*, Nonantola, Modena, Italy.

C programming lessons with Arduino (20 hours, two editions).

**Oct.– Dec. 2019** **Lecturer for the Course "Data Protection Officer & Analyst"**, *IFOA*, Reggio Emilia, Italy.

Object-oriented programming lessons with Python (32 hours). The course has been funded by the Emilia Romagna Region and the European Social Fund.

**2019** **Lecturer for the Course "Anticipare la Crescita con le Nuove Competenze Sui Big Data" (Anticipating Growth with New Skills on Big Data)**, *Nuova Didactica, CIS, IFOA*, Modena, Reggio Emilia, Italy.

Object-oriented programming lessons with Python (96 hours). The courses (two different editions organized by different centers) have been funded by the Emilia Romagna Region and the European Social Fund.

## Thesis Supervision

Federico Bolelli was thesis supervisor or co-supervisor for 32 students. He is currently supervising the work of 5 undergraduates.

**2024** *Jacopo Venanzi* (BSc) - Sviluppo di una Libreria C per lo Unit Testing sulla Piattaforma OLJ. (Development of a Unit Testing C Library for the OLJ Platform.).

*Riccardo Vecchi* (BSc) - Progetto, Implementazione e Deployment di un Applicativo Web Basato su Django per la Generazione di QR Dinamici (Design, Implementation, and Deployment of a Django-based Web Application for Dynamic QR-code Generation).

*Mario Coppola* (BSc) - Visualizzazione Dinamica di Volumi 3D in Applicazioni Client (Dynamic Visualization of 3D Volumes in Client-based Applications).

*Giuseppe Bellissimo* (BSc) - BeerRecipes: Progetto e Implementazione di un Applicativo Django per la Gestione di Ricette e Inventario delle Materie Prime (Beer Recipes: Design and Implementation of a Django-based Application for Recipes and Raw Material Inventory Management).

*Filippo Cavalieri* (BSc) - Sviluppo e Integrazione di Funzionalità Aggiuntive per la Piattaforma OLJ (Development and Integration of Additional Features for the OLJ Platform).

*Giacomo Gherardini* (BSc) - Applicazioni Mobile Cross Platform: Studio e Analisi di Dart e del Framework Flutter per l'Implementazione dell'Applicazione PlayerManager (Cross Platform Mobile Applications: Study and Analysis of Dart and the Flutter Framework for the Implementation of the PlayerManager Application).

*Davide Di Benedetto* (BSc) - Sviluppo e Integrazione di Funzionalità Aggiuntive per l'Applicativo di Creazione Dinamica di Curriculum "Curriculator" (Development and Integration of Additional Features for the Resume Creation Application "Curriculator").

2023 *Ettore Candeloro* (MSc) - Skin Lesion Classification Explained with Generative Adversarial Networks .

*Gabriele Rosati* (MSc) - Prediction of Kidney Failure with Deep Neural Networks Fusing WSI and Immunofluorescence Images .

*Matteo Di Bari* (BSc) - Progettazione e Sviluppo di un Linguaggio per la Creazione e la Visualizzazione di Diagrammi di Flusso (Design and Development of a Language for Creating and Visualizing Flow Diagrams).

*Davide Santoli* (BSc) - Sviluppo e Integrazione di Funzionalità di Proctoring Avanzate per la Piattaforma OLJ (Development and Integration of Advanced Proctoring Features for the OLJ Platform).

*Donato Santacroce* (BSc) - Progetto e Implementazione di un Applicativo Web per la Pianificazione degli Appelli di Esame (Design and Implementation of a Web Application for Planning Exams).

*Filippo Bologna* (BSc) - Progettazione e Sviluppo di un Applicativo per la Gestione degli Accessi agli Edifici Universitari (Design and Development of an Access Control Application).

*Luca Montanari* (BSc) - Progettazione, Implementazione e Configurazione di un Applicativo Web per la Costruzione e la Traduzione in Codice Eseguibile di Diagrammi di Flusso (Design, Implementation and Configuration of a Web Application for Drawing and Converting Flowcharts into Executable Code).

2022 *Luca Lumetti* (MSc, currently Ph.D. Student) - Inferior Alveolar Canal Segmentation Using Deep Neural Networks .

*Davide Lugli* (BSc) - Progetto e Sviluppo di un Applicativo Web per la Creazione Intelligente di Curriculum Vitae (Design and Development of a Web Application for an Intelligent Creation of Curriculum Vitae).

*Francesco Zampirollo* (BSc) - Progettazione, Implementazione e Configurazione di un Applicativo web per la Creazione Dinamica di Curriculum (Design, Implementation and Configuration of a Web Application for Dynamic Curriculum Creation).

*Davide Secco* (BSc) - Implementazione di Funzionalità Aggiuntive per la Piattaforma OLJ Basata sul Web Framework Django (Implementation of Additional Features for the OLJ Platform Based on Django Web Framework).

*Michele Mosca* (BSc) - Progettazione, Implementazione e Configurazione di un Applicativo Web per la Raccolta di Dati Clinici Attraverso Sondaggi (Design, Implementation and Configuration of a Web Application for the Collection of Clinical Data Through Surveys).

*Francesco Zanella* (BSc) - Installazione e Configurazione di Overleaf su Piattaforma Docker (Overleaf Installation and Configuration on a Docker platform).

2021    *Riccardo Benini* (BSc) - Progetto e Implementazione di un'Applicazione Python per l'Estrazione degli Appelli d'Esame di Esse3 e la Creazione di un Apposito Calendario su Google Calendar (Python Application for Extrapolating Esse3 Exam Sessions and Creating a Specific Google Calendar - Design and Implementation).

2020    *Cristian Mercadante* (MSc) - Development of a Cone Beam Computed Tomography Annotation Tool for Automatic Detection of the Inferior Alveolar Nerve Canal through Deep Learning .

*Luca Benzi* (MSc) - Deep Learning Techniques for Medical Imaging .

*Maximilian Söchting* (MSc, Erasmus+ from the Hasso Plattner Institute of Potsdam University) - Using Heuristics for Decision Tree Generation in Image Processing .

*Ilaria Manghi* (BSc) - Framework Django per la Progettazione di una Web Application per la Gestione di Tesi e Attività Progettuali (Django Framework for the Design of a Thesis and Project Activities Management Web Application).

*Fabio Romagnolo* (BSc) - Progetto, Implementazione, Configurazione e Manutenzione della Piattaforma Web Tirocini di Ingegneria Informatica ("Computer Engineering Internships" Web Application: Design, Implementation, Configuration and Maintenance).

*Sara Sarto* (BSc) - Sviluppo di un'Applicazione Web in Django per Gestire Domanda e Offerta di Tesi e di Attività Progettuali (Development of a Django Web Application to Manage Demand and Supply of Theses and Project Activities).

2019    *Stefano Allegretti* (MSc, former Ph.D. Student) - Optimization of Connected Components Labeling Algorithms on Binary Images for CPUs and GPUs .

*Andrea Polastri* (BSc) - RaspMostat: Termodensimetro Digitale per il Controllo Remoto del Processo di Fermentazione (RaspMostat: Digital Thermodensimeter to Remotely Control the Fermentation Process).

2018    *Cristian Mercadante* (BSc) - Installazione e Configurazione di Sharelatex su Piattaforma Docker (Installation and configuration of Sharelatex on Docker Platform).

2017    *Federico Pollastri* (MSc, former Ph.D. Student) - Impact of a Generative Adversarial Network synthetic dataset on fully convolutional-deconvolutional networks for automatic skin lesion segmentation training .

*Michele Cancilla* (MSc, former Research Fellow) - Parallelization of Connected Components Labeling Algorithms .

## Miscellaneous Experiences

**2011–2019**  **Private Teacher**, Modena, Italy.
Private teacher of Maths, Physics, Chemistry, and Computer Science for high school and university students

**2016–2020**  **Beer Brewing and Beer Tasting (Sommelier) Teacher**, *Unionbirrai Cultural Association*, Modena, Italy.

## Speaker Activities at National and International Conferences

**2023**  MICCAI - 26th International Conference on Medical Image Computing and Computer Assisted Intervention, Vancouver, Canada (Oral).

ICIAP - 22nd International Conference on Image Analysis and Processing, Udine, Italy (Poster).

**2022**  ICIAP - 21st International Conference on Image Analysis and Processing, Lecce, Italy (Spotlight + Poster).

**2021**  ICPR - 25th International Conference on Pattern Recognition, Milan, Italy (Poster, Virtual).

**2019**  ICIAP - 20th International Conference on Image Analysis and Processing, Trento, Italy (Spotlight + Poster).

CAIP - 18th International Conference on Computer Analysis of Images and Patterns, Salerno, Italy (Oral).

**2018**  IPAS - Third IEEE International Conference on Image Processing, Applications and Systems, Sophia-Antipolis, France (Oral).

CBMS - 31st IEEE CBMS International Symposium on Computer-Based Medical Systems, Karlstad, Sweden (Poster).

IRCDL - 14th Italian Research Conference on Digital Libraries, Udine, Italy (Oral).

**2017**  IRCDL - 13th Italian Research Conference on Digital Libraries, Modena, Italy (Poster).

ICIAP - 19th International Conference on Image Analysis and Processing, Catania, Italy (Poster).

## Invited Talks

**Nov. 2020**  **Pipelines for Medical Imaging Use Cases & Requirements for Benchmarking**, *European Big Data Value Forum (EBDVF) - Session 2: A Project Perspective on Big Data and AI Architectural Pipelines and Benchmarks*, Berlin, Germany (Virtual).

**Feb. 2020**  **The DeepHealth European Project and the Research on Medical Imaging at AImageLab**, *University of Modena and Reggio Emilia, "Enzo Ferrari" Department of Engineering*, Modena, Italy.

## Participation in the Drafting of International Projects

**2022**    **H2022 - CAREPRO: "Contactless AI-Assisted Radar Sensing of Breath and Respiration Rates for Proactive Diagnosis"**, *Reviewed under the call HORIZON-EIC-2022-PATHFINDERCHALLENGES-01.*

The *CAREPRO* project aims at developing a proof-of-concept of an innovative millimeter wave (mmwave) radar-based system for the life-long continuous and contactless monitoring of the heart rate (HR) and the breath rate (BR), and for the early detection of the deterioration of vital signs in high-risk patients (suffering from pulmonary and/or cardiac diseases).

**2020**    **H2020 - HIPPOCRATES: "Supporting Early Diagnosis and Treatment of Cancer by AI"**, *Reviewed under the call SC1-FA-DTS-2018-2020.*

The *HIPPOCRATES* project aims at supporting early detection, diagnosis and treatment of several types of cancer through the design and deployment of a full ecosystem for research, development, validation and exploitation of AI-based solutions.

**2019**    **H2020 - DEEPHEALTH: "Deep-Learning and HPC to Boost Biomedical Applications for Health"**, *Accepted and funded under the call ICT-11-2018-2019.*

The *DeepHealth* project will provide HPC computing power at the service of biomedical applications, and will apply Deep Learning (DL) techniques on large and complex biomedical datasets to support new and more efficient ways of diagnosis, monitoring and treatment of diseases. Among the other things, UNIMORE is responsible for the development of the European Computer Vision Library (ECVL), one of the core elements of the project.

## Participation in National and International Research Projects

**2021-On Going**    **H2020 - DECIDER: "Clinical Decision via Integrating Multiple Data Levels to Overcome Chemotherapy Resistance in High-Grade Serous Ovarian Cancer"**, *Grant agreement ID: 965193*, https://cordis.europa.eu/project/id/965193, Project Duration: 01/02/2021 - 31/01/2026.

Design and development of the web-based application explainer/oncodash for the integrated visualization of genomic, clinical and histological data. Integration of genomic data and images for predicting PFI and other relevant clinical information.

**2023-2024**    **PBL**, Project Duration: 5 months.

Study of computer vision and deep learning techniques for the identification of impurities in pharma vials' liquid. Scientific manager of the project.

**2022-2023**    **CNH - Vitisensing**, Project Duration: 15/06/2022 - 14/06/2023.

Study of computer vision and deep learning techniques for the wstimation of vineyards quality parameters.

**VEDI – Valore Estratto Dalle Immagini (Value Extracted From Images)**, Project Duration: 17/06/2022 - 17/06/2023.

Implementation of techniques for the real time image stitching in multiple core applications i.e., retail, T&L and manufacturing.

**2019-2022**    **H2020 - DEEPHEALTH: "Deep-Learning and HPC to Boost Biomedical Applications for Health"**, *Grant agreement ID: 825111*, Project Duration: 01/01/2019 - 31/06/2022, https://cordis.europa.eu/project/rcn/219938.

WP3 software development coordinator.

**2019-2020**    **Deep Learning for Dermoscopy**, *Medici Medical SRL*, Project Duration: 24/09/2019 - 23/01/2020.

Design and development of an AI module, integrated with VIDIX dermoscopic examination machines, for skin lesions classification from dermoscopic images.

2018 **Game of Drones**, *Redox SRL*, Project Duration: 28/03/2018 - 28/09/2018.
Design and development of a drone positioning and flight control system for light loads.

2016 **SACHER: Smart Architecture for Cultural Heritage in Emilia Romagna**, *POR FESR 2014-2020*, Project Duration: 01/04/2016 - 31/07/2018.
Design and development of an innovative Cloud platform for the tangible cultural heritage life cycle management.

## Organization of Workshops and International Challenges

2024 **RRPR 2024: Fifth Workshop on Reproducible Research in Pattern Recognition** - **RRPR 20224**, *Fifth edition of the RRPR workshop organized in conjunction with the 27th International Conference on Pattern Recognition - ICPR 2024*, Kolkata, India.

**ToothFairy2: Multi-Structure Segmentation in CBCT Volumes** - **ToothFairy2 Challenge**, *Second edition of the international challenge organized in conjunction with the 27th International Conference on Medical Image Computing and Computer Assisted Intervention - MICCAI 2024*, Marrakech, Morocco.

2023 **ToothFairy: A Cone-Beam Computed Tomography Segmentation Challenge** - **ToothFairy Challenge**, *International challenge organized in conjunction with the 26th International Conference on Medical Image Computing and Computer Assisted Intervention - MICCAI 2023*, Vancouver, Canada.

2022 **Binary is the New Black (and White)** - **BNBW Workshop**, *1st International Workshop on Binary Image Processing organized in conjunction with the 21st International Conference on Image analysis and processing - ICIAP 2022*, Lecce, Italy.

**Deep Learning and High Performance Computing to Boost Biomedical Applications** - **DeepHealth Workshop**, *International Workshop organized in conjunction with the 21st International Conference on Image analysis and processing - ICIAP 2022*, Lecce, Italy.

## Third Mission and Service Activities at the University

2020–On going **OLJ - OnLine Judge**.
Design, development and maintenance of an online automated judge for remote and face to face examinations. Developed during the global pandemic of COVID-19, the web application is currently employed by different subjects of Bachelor and Master Degree in Computer Engineering at the University of Modena and Reggio Emilia: "Fundamentals of Computer Science I", "Fundamentals of Computer Science II", "Data Structures and Algorithms", "Fundamentals of Operating Systems", "Fundamentals of Computer Science for Electronics" and "Multimedia Data Processing". Along with the automated judge, OLJ provides a chat mechanism to easily communicate with students and a virtual proctor to monitor and record user desktop, thus becoming a suitable and useful tool for remote examinations. Multiple choice/quiz exams are also supported by OLJ.

2019–On going **Missioni**.
Design, development and maintenance of a *Django*-based web application for the semi-automatic travel reimbursement forms filling, thus saving personnel working time and reducing possible errors. The application is primarily addressed to "Enzo Ferrari" Department of Engineering staff, but can be easily extended to many other types of form modules.

2018–On **AImageLab Server Cluster Maintenance**.
going Configuration and maintenance of the AImageLab XCP-ng based server cluster, running virtual machines that host many web services of the "Enzo Ferrari" Department of Engineering: Tutorato, OLJ, Missioni, MyData, Sharelatex, etc.

2017 **Master Mumet Opening Ceremony**.
Organization of the opening ceremony for the second edition of Master "Mumet: Visual Computing and Multimedia Technologies in the Deep Learning Era".

## Grants and Awards

### Grants

2024 Two projects funded (22.500,00 €in total) under FARD 202 — "Fondo di Ateneo per la Ricerca" —, calls CURIOSITY DRIVEN and INFRASTRUCTURE IMPROVEMENT (within AImageLab). The first grant (10.000,00 €) is mainly devoted to the creation and curation of datasets related to the segmentation of maxillofacial structures, while the second (12.500,00 €) is reserved to increase the cooling power of AImageLab server infrastructure.

2023 Project funded (10.000,00 €) under FARD 2023 — "Fondo di Ateneo per la Ricerca" —, call CURIOSITY DRIVEN. The grant is mainly devoted to the study and development of artificial intelligence algorithms for the advanced analysis of confocal and whole-slide images to support the clinical practice.

2022 Project funded ($\sim$ 10.000,00 €) under FARD 2022 — "Fondo di Ateneo per la Ricerca" —, call STARTER KIT. The grant is mainly devoted to the development of ML/AI algoritmhs for classifying skin lesion images from mobile devices.

2020 (Within the AImagelab research group - UNIMORE) Hardware funded by UNIMORE (20,000.00 €) under FAR 2020 — "Fondo di Ateneo per la Ricerca" (University Fund for Research) —, call for equipment. Also thanks to the financial contribution of Prof. Giovanni Pellacani, Prof. Riccardo Magistroni, and Dr. Alexandre Anesi research teams, we will equip our lab with a new server system ( 162 TFLOPS) to train AI models for Medical Imaging.

2020 (Within the AImagelab research group - UNIMORE) Project funded (30,000.00 €) in the call "Alte Competenze per la Ricerca e il Trasferimento Tecnologico" (High Skills for Research and Technological Transfer): our research project "Automated detection of the Inferior Alveolar nerve Canal (IAC) in Cone Beam Computed Tomography (CBCT) using deep-learning techniques" has been selected for funding.

### Awards

2023 MICCAI STudent-Author Registration (STAR) Award at the *26th International Conference on Medical Image Computing and Computer Assisted Intervention*, MICCAI.

2019 Best paper award at the *18th International Conference on Computer Analysis of Images and Patterns*, CAIP.

2019 (Within the AImagelab research group - UNIMORE) Third place out of 64 research groups at the *2019 International ISIC Challenge* on Skin Lesion Classification. Online leaderboard: https://challenge2019.isic-archive.com/leaderboard.html.

2013–2016   Best (graduate) students award of University of Modena and Reggio Emilia for the academic years 2013-2014 and 2015-2016. Rankings available at https://www.unimore.it/bandi/stulau-gradpremistudio.html.

2011–2015   Best (undergraduate) students award of University of Modena and Reggio Emilia for the academic years 2011-2012, 2012-2013, and 2014-2015. Rankings available at https://www.unimore.it/bandi/stulau-gradpremistudio.html.

## Refereeing Activities

2024   **Official Reviewer**, *WIEEE/CVF Winter Conference on Applications of Computer Vision - WACV*, Tucson, Arizona.

**Official Reviewer**, *27th International Conference on Medical Image Computing and Computer Assisted Intervention - MICCAI*, Morocco, Africa.

**Official Reviewer**, *IEEE/CVF Conference on Computer Vision and Pattern Recognition - CVPR*, Seattle, USA.

**Official Reviewer**, *IEEE International Symposium on Biomedical Imaging - ISBI*, Athens, Greece.

2023   **Official Reviewer**, *IEEE/CVF Conference on Computer Vision and Pattern Recognition - CVPR*, Seattle, USA.

**Official Reviewer**, *22nd International Conference on Image Analysis and Processing - ICIAP*, Udine, Italy.

**Official Reviewer**, *IEEE/CVF Conference on Computer Vision and Pattern Recognition - CVPR*, Vancouver, Canada.

2020   **Referee for the "Document and Media Analysis" track**, *25th International Conference on Pattern Recognition - ICPR*, Milan, Italy.

## Journal Reviewing

IEEE Transactions on Image Processing

IEEE Transactions on Medical Imaging

Medical Image Analysis - Elsevier

Pattern Recognition Journal - Elsevier

IEEE Access - The Multidisciplinary Open Access Journal

Multimedia Tools and Applications Journal

IEEE Open Journal of the Computer Society

Artificial Intellingence in Medicine

IET Computer Vision

Energies - MDPI

KES Journal

**Reviews verified on *Publons* at** publons.com/a/1528925/

## Contributions to Open Source Libraries

**OpenCV** Significant contributions to *connectedComponents* and *connectedComponentsWithStats* functions inside *imgproc* module, changes available since version 3.2.0, 3.4.0, and 4.5.2. which includes the "Spaghetti Labeling" algorithm published at IEEE Transactions on Image Processing. Source code on GitHub at https://github.com/opencv/opencv/blob/master/modules/imgproc/src/connected-components.cpp

**YACCLAB** Developer of the YACCLAB benchmark for connected component labeling algorithms eveluation. Source code available on GitHub at https://github.com/prittt/YACCLAB, 200 *stars* as of September 24, 2024.

**Adaptive Wiener Filter** Developer of a software module that implements the adaptive Wiener filter for noise removal. The module is based on the OpenCV library and makes use of integral images. Source code available on GitHub at https://github.com/prittt/AdaptiveWienerFilter, 56 *stars* as of September 24, 2024.

**ECVL** Developer of the Computer Vision and Image Processing Library ECVL (European Computer Vision Library) within the European project H2020 DeepHealth. Source code available on GitHub at link https://github.com/deephealthproject/ecvl.

**GRAPHGEN** Developer of the GRAPHGEN framework for the optimization of algorithms that can be modeled using decision tables. The framework allows you to automatically apply various optimization techniques, taking the definition of a problem in terms of conditions to be verified and actions to be performed as input and producing the $C++$ code as output. Source code available on GitHub at https://github.com/prittt/GRAPHGEN.

**THeBE** Developer of the THeBE benchmark for evaluating binary image skeleton extraction algorithms. Source code available on GitHub at https://github.com/prittt/THeBE

## Publications

Total citations: 981; h-index: 21 (source: Google Scholar, as of September 24, 2024). The publications are divided as follows: 15 journal articles, 2 book chapters, 1 book, 33 conference papers, 4 workshops, 2 challenges, and 2 abstracts, for a total of 59 publications.

### Journal Articles

**2024** L. LUMETTI, V. PIPOLI, F. BOLELLI, E. FICARRA, and C. GRANA, Enhancing Patch-Based Learning for the Segmentation of the Mandibular Canal, *IEEE Access* (2024), 1–12.

F. BOLELLI, S. ALLEGRETTI, L. LUMETTI, and C. GRANA, A State-of-the-Art Review with Code about Connected Components Labeling on GPUs, *IEEE Transactions on Parallel and Distributed Systems* (2024), 1–20.

2023  M. Di Bartolomeo, A. Pellacani, <u>F. Bolelli</u>, M. Cipriano, L. Lumetti, S. Negrello, S. Allegretti, P. Minafra, F. Pollastri, R. Nocini, G. Colletti, L. Chiarini, C. Grana, and A. Anesi, 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* **13** (2023).

G. Bontempo, <u>F. Bolelli</u>, A. Porrello, S. Calderara, and E. Ficarra, A Graph-Based Multi-Scale Approach with Knowledge Distillation for WSI Classification, *IEEE Transactions on Medical Imaging* (2023), 1–10.

G. Bianchi, S. Puliatti, N. Rodriguez, S. Micali, L. Bertoni, L. Reggiani Bonetti, S. Caramaschi, <u>F. Bolelli</u>, M. Pinamonti, D. Rozze, and C. Grana, Artificial intelligence evaluation of confocal microscope prostate images: our preliminary experience, *Minerva Urology and Nephrology* **75** (2023), 545–547.

2022  F. Testa, F. Fontana, F. Pollastri, J. Chester, L. Marco, G. Francesco, F. Gualtieri, G. Silvia, G. Ligabue, <u>F. Bolelli</u>, E. Mancini, M. Nordio, G. Alfano, L. Gesualdo, S. Cimino, D. Gabriele, C. Grana, and R. Magistroni, Automated Prediction of Kidney Failure in IgA Nephropathy with Deep Learning from Biopsy Images, *Clinical Journal of the American Society of Nephrology* **17** (2022), 1316–1324.

M. Cipriano, S. Allegretti, <u>F. Bolelli</u>, M. Di Bartolomeo, F. Pollastri, A. Pellacani, P. Minafra, A. Anesi, and C. Grana, Deep Segmentation of the Mandibular Canal: a New 3D Annotated Dataset of CBCT Volumes, *IEEE Access* **10** (2022), 11500–11510.

2021  F. Pollastri, M. Parreño, J. Maroñas, <u>F. Bolelli</u>, R. Paredes, D. Ramos, and C. Grana, A Deep Analysis on High Resolution Dermoscopic Image Classification, *IET Computer Vision* **15** (2021), 514–526.

<u>F. Bolelli</u>, S. Allegretti, and C. Grana, One DAG to Rule Them All, *IEEE Transactions on Pattern Analysis and Machine Intelligence* **44** (2021), 3647–3658.

2020  G. Ligabue, F. Pollastri, F. Fontana, M. Leonelli, L. Furci, S. Giovanella, G. Alfano, G. Cappelli, F. Testa, <u>F. Bolelli</u>, C. Grana, and R. Magistroni, Evaluation of the Classification Accuracy of the Kidney Biopsy Direct Immunofluorescence through Convolutional Neural Networks, *Clinical Journal of the American Society of Nephrology* **15** (2020), 1445–1454.

2019  <u>F. Bolelli</u>, S. Allegretti, L. Baraldi, and C. Grana, Spaghetti Labeling: Directed Acyclic Graphs for Block-Based Connected Components Labeling, *IEEE Transactions on Image Processing* **29** (2019), 1999–2012.

S. Allegretti, <u>F. Bolelli</u>, and C. Grana, Optimized Block-Based Algorithms to Label Connected Components on GPUs, *IEEE Transactions on Parallel and Distributed Systems* **31** (2019), 423–438.

F. Pollastri, <u>F. Bolelli</u>, R. Paredes, and C. Grana, Augmenting Data with GANs to Segment Melanoma Skin Lesions, *Multimedia Tools and Applications* **79** (2019), 15575–15592.

2018   S. Pini, M. Cornia, <u>F. Bolelli</u>, L. Baraldi, and R. Cucchiara, M-VAD Names: a Dataset for Video Captioning with Naming, *Multimedia Tools and Applications Journal* **78** (2018), 14007—14027.

F. Bolelli, M. Cancilla, L. Baraldi, and C. Grana, Towards reliable experiments on the performance of Connected Components Labeling algorithms, *Journal of Real-Time Image Processing* **17** (2018), 229–244.

229–244

## Book Chapters

2022   D. Oniga, B. Cantalupo, E. Tartaglione, D. Perlo, M. Grangetto, M. Aldinucci, F. Bolelli, F. Pollastri, M. Cancilla, L. Canalini, C. Grana, C. Alcalde, F. A. Cardillo, and M. Florea, Applications of AI and HPC in the Health Domain, in *HPC, Big Data, and AI Convergence Towards Exascale: Challenge and Vision* (O. Terzo and J. Martinovic, eds.), CRC Press, 2022, pp. 217–241.

2021   M. Aldinucci, D. Atienza, <u>F. Bolelli</u>, M. Caballero, I. Colonnelli, J. Flich, J. A. Gómez, D. González, C. Grana, M. Grangetto, S. Leo, P. López, D. Oniga, R. Paredes, L. Pireddu, E. Quiñones, T. Silva, E. Tartaglione, and M. Zapater, The DeepHealth Toolkit: A Key European Free and Open-Source Software for Deep Learning and Computer Vision Ready to Exploit Heterogeneous HPC and Cloud Architectures, in *Technologies and Applications for Big Data Value* (E. Curry, S. Auer, A. J. Berre, A. Metzger, M. S. Perez, and S. Zillner, eds.), Springer Cham, 2021, pp. 183–202.

## Books

2021   <u>F. Bolelli</u> and M. Vincini, Amazon Kindle Direct Publishing, Apr 2021.

## Conference Papers

2024   E. Vezzali, <u>F. Bolelli</u>, S. Santi, and C. Grana, BarBeR: A Barcode Benchmarking Repository, in *2024 27th International Conference on Pattern Recognition (ICPR)* (Kolkata, India), Springer, Dec 2024, pp. 1–1.

G. Rosati, K. Marchesini, L. Lumetti, F. Sartori, B. Balboni, F. Begarani, L. Vescovi, <u>F. Bolelli</u>, and C. Grana, Identifying Impurities in Liquids of Pharmaceutical Vials, in *2024 27th International Conference on Pattern Recognition (ICPR)* (Kolkata, India), Springer, Dec 2024, pp. 1–1.

L. Lumetti, V. Pipoli, <u>F. Bolelli</u>, E. Ficarra, and C. Grana, Location Matters: Harnessing Spatial Information to Enhance the Segmentation of the Inferior Alveolar Canal in CBCTs, in *2024 27th International Conference on Pattern Recognition (ICPR)* (Kolkata, India), Springer, Dec 2024, pp. 1–1.

<u>F. Bolelli</u>, L. Lumetti, K. Marchesini, E. Candeloro, and C. Grana, Investigating the ABCDE Rule in Convolutional Neural Networks, in *2024 27th International Conference on Pattern Recognition (ICPR)* (Kolkata, India), Springer, Dec 2024, pp. 1–1.

G. Capitani, <u>F. Bolelli</u>, A. Porrello, S. Calderara, and E. Ficarra, ClusterFix: A Cluster-Based Debiasing Approach without Protected-Group Supervision, in *IEEE/CVF Winter Conference on Applications of Computer Vision (WACV)* (Hawaii, USA), IEEE, 2024, pp. 4858–4867.

2023    G. Bontempo, A. Porrello, <u>F. Bolelli</u>, S. Calderara, and E. Ficarra, DAS-MIL: Distilling Across Scales for MIL Classification of Histological WSIs, in *Medical Image Computing and Computer Assisted Intervention − MICCAI 2023* (Vancouver, Canada), Springer, Oct 2023, pp. 248–258.

L. Lumetti, V. Pipoli, <u>F. Bolelli</u>, and C. Grana, Annotating the Inferior Alveolar Canal: the Ultimate Tool, in *Image Analysis and Processing - ICIAP 2023* (Udine, Italy), Springer, Sep 2023, pp. 525–536.

G. Bontempo, L. Lumetti, A. Porrello, <u>F. Bolelli</u>, S. Calderara, and E. Ficarra, Buffer-MIL: Robust Multi-instance Learning with a Buffer-based Approach, in *Image Analysis and Processing - ICIAP 2023* (Udine, Italy), Springer, Sep 2023, pp. 1–12.

G. Bontempo, N. Bartolini, M. Lovino, <u>F. Bolelli</u>, A. Virtanen, and E. Ficarra, Enhancing PFI Prediction with GDS-MIL: A Graph-based Dual Stream MIL Approach, in *Image Analysis and Processing - ICIAP 2023* (Udine, Italy), Springer, Sep 2023, pp. 550–562.

2022    M. Cipriano, S. Allegretti, <u>F. Bolelli</u>, F. Pollastri, and C. Grana, Improving Segmentation of the Inferior Alveolar Nerve through Deep Label Propagation, in *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)* (New Orleans, USA), IEEE, Jun 2022, pp. 21105–21114.

<u>F. Bolelli</u>, S. Allegretti, and C. Grana, Connected Components Labeling on Bitonal Images, in *Image Analysis and Processing - ICIAP 2021* (Lecce, Italy), **13232**, Springer, May 2022, pp. 347–357.

2021    W. Lee, S. Allegretti, <u>F. Bolelli</u>, and C. Grana, Fast Run-Based Connected Components Labeling for Bitonal Images, in *2021 Joint 10th International Conference on Informatics, Electronics & Vision (ICIEV) and 2021 5th International Conference on Imaging, Vision & Pattern Recognition (icIVPR)* (Kitakyushu, Fukuoka, Japan), IEEE, Aug 2021, pp. 1–8.

F. Pollastri, M. Cipriano, <u>F. Bolelli</u>, and C. Grana, Long-Range 3D Self-Attention for MRI Prostate Segmentation, in *2022 IEEE 19th International Symposium on Biomedical Imaging (ISBI)* (Kolkata, India), IEEE, Mar 2021, pp. 1–5.

C. Mercadante, M. Cipriano, <u>F. Bolelli</u>, F. Pollastri, M. Di Bartolomeo, A. Anesi, and C. Grana, A Cone Beam Computed Tomography Annotation Tool for Automatic Detection of the Inferior Alveolar Nerve Canal, in *Proceedings of the 16th International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications - Volume 4: VISAPP* (Vienna, Austria), **4**, SciTePress, Feb 2021, pp. 724–731.

M. Söchting, S. Allegretti, <u>F. Bolelli</u>, and C. Grana, A Heuristic-Based Decision Tree for Connected Components Labeling of 3D Volumes, in *2020 25th International Conference on Pattern Recognition (ICPR)* (Milan, Italy), IEEE, Jan 2021, pp. 7751–7758.

F. Pollastri, J. Maroñas, <u>F. Bolelli</u>, G. Ligabue, R. Paredes, R. Magistroni, and C. Grana, Confidence Calibration for Deep Renal Biopsy Immunofluorescence Image Classification, in *2020 25th International Conference on Pattern Recognition (ICPR)* (Milan, Italy), IEEE, Jan 2021, pp. 1298–1305.

M. Cancilla, L. Canalini, <u>F. Bolelli</u>, S. Allegretti, S. Carrión, R. Paredes, J. A. Gómez, S. Leo, M. E. Piras, L. Pireddu, A. Badouh, S. Marco-Sola, L. Alvarez, M. Moreto, and C. Grana, The DeepHealth Toolkit: A Unified Framework to Boost Biomedical Applications, in *2020 25th International Conference on Pattern Recognition (ICPR)* (Milan, Italy), IEEE, Jan 2021, pp. 9881–9888.

S. Allegretti, <u>F. Bolelli</u>, F. Pollastri, S. Longhitano, G. Pellacani, and C. Grana, Supporting Skin Lesion Diagnosis with Content-Based Image Retrieval, in *2020 25th International Conference on Pattern Recognition (ICPR)* (Milan, Italy), IEEE, Jan 2021, pp. 8053–8060.

2020   S. Allegretti, <u>F. Bolelli</u>, and C. Grana, A Warp Speed Chain-Code Algorithm Based on Binary Decision Trees, in *2020 Joint 9th International Conference on Informatics, Electronics & Vision (ICIEV) and 2020 4th International Conference on Imaging, Vision & Pattern Recognition (icIVPR)* (Kitakyushu, Fukuoka, Japan), IEEE, Aug 2020, pp. 1–8.

2019   L. Canalini, F. Pollastri, <u>F. Bolelli</u>, M. Cancilla, S. Allegretti, and C. Grana, Skin Lesion Segmentation Ensemble with Diverse Training Strategies, in *Computer Analysis of Images and Patterns* (Salerno, Italy), **11678**, Springer, Sep 2019, pp. 89–101.

S. Allegretti, <u>F. Bolelli</u>, M. Cancilla, F. Pollastri, L. Canalini, and C. Grana, How does Connected Components Labeling with Decision Trees perform on GPUs?, in *Computer Analysis of Images and Patterns* (Salerno, Italy), **11678**, Springer, Sep 2019, pp. 39–51.

S. Allegretti, <u>F. Bolelli</u>, M. Cancilla, and C. Grana, A Block-Based Union-Find Algorithm to Label Connected Components on GPUs, in *Image Analysis and Processing - ICIAP 2019* (Trento, Italy), **11752**, Springer, Sep 2019, pp. 271–281.

<u>F. Bolelli</u> and C. Grana, Improving the Performance of Thinning Algorithms with Directed Rooted Acyclic Graphs, in *Image Analysis and Processing - ICIAP 2019* (Trento, Italy), **11752**, Springer, Sep 2019, pp. 148–158.

2018   S. Allegretti, <u>F. Bolelli</u>, M. Cancilla, and C. Grana, Optimizing GPU-Based Connected Components Labeling Algorithms, in *2018 IEEE International Conference on Image Processing, Applications and Systems (IPAS)* (Inria Sophia Antipolis, France), IEEE, Dec 2018, pp. 175–180.

<u>F. Bolelli</u>, L. Baraldi, and C. Grana, A Hierarchical Quasi-Recurrent approach to Video Captioning, in *2018 IEEE International Conference on Image Processing, Applications and Systems (IPAS)* (Inria Sophia Antipolis, France), IEEE, Dec 2018, pp. 162–167.

F. Bolelli, L. Baraldi, M. Cancilla, and C. Grana, Connected Components Labeling on DRAGs, in *2018 24th International Conference on Pattern Recognition (ICPR)* (Beijing, China), IEEE, Aug 2018, pp. 121–126.

F. Pollastri, F. Bolelli, R. Paredes, and C. Grana, Improving Skin Lesion Segmentation with Generative Adversarial Networks, in *2018 IEEE 31st International Symposium on Computer-Based Medical Systems (CBMS 2018)* (Karlstad, Sweden), IEEE, Jun 2018, pp. 442–443.

F. Bolelli, G. Borghi, and C. Grana, XDOCS: an Application to Index Historical Documents, in *Digital Libraries and Multimedia Archives* (Udine, Italy), **806**, Springer, Jan 2018, pp. 151–162.

2017  F. Bolelli, M. Cancilla, and C. Grana, Two More Strategies to Speed Up Connected Components Labeling Algorithms, in *Image Analysis and Processing - ICIAP 2017* (Catania, Italy), **10485**, Springer, Sep 2017, pp. 48–58.

F. Bolelli, G. Borghi, and C. Grana, Historical Handwritten Text Images Word Spotting through Sliding Window HOG Features, in *Image Analysis and Processing - ICIAP 2017* (Catania, Italy), **10484**, Springer, Sep 2017, pp. 729–738.

F. Bolelli, Indexing of Historical Document Images: Ad Hoc Dewarping Technique for Handwritten Text, in *Digital Libraries and Archives* (Modena, Italy), **733**, Springer, Feb 2017.

2016  C. Grana, F. Bolelli, L. Baraldi, and R. Vezzani, YACCLAB - Yet Another Connected Components Labeling Benchmark, in *2016 23rd International Conference on Pattern Recognition (ICPR)* (Cancun, Mexico), Springer, Dec 2016, pp. 3109–3114.

C. Grana, L. Baraldi, and F. Bolelli, Optimized Connected Components Labeling with Pixel Prediction, in *Advanced Concepts for Intelligent Vision Systems* (Lecce, Italy), **10016**, Springer, Oct 2016, pp. 431–440.

Workshop Papers

2024  G. Capitani, L. Bonicelli, F. Bolelli, S. Calderara, and E. Ficarra, Beyond the Surface: Comprehensive Analysis of Implicit Bias in Vision-Language Models, in *Fairness and Ethics towards transparent AI: facing the chalLEnge through model Debiasing (FAILED)* (Milan, Italy), Springer, Sep 2024, pp. 1–18.

2022  F. Bolelli, S. Allegretti, and C. Grana, Quest for Speed: The Epic Saga of Record-Breaking on OpenCV Connected Components Extraction, in *Image Analysis and Processing - ICIAP 2022 Workshops* (Lecce, Italy), Springer, May 2022, pp. 107–108.

2021  F. Bolelli, S. Allegretti, and C. Grana, A Heuristic-Based Decision Tree for Connected Components Labeling of 3D Volumes: Implementation and Reproducibility Notes, in *International Workshop on Reproducible Research in Pattern Recognition, RRPR 2021* (Milan, Italy), Springer, Jan 2021, pp. 139–145.

2019  F. Bolelli, M. Cancilla, L. Baraldi, and C. Grana, Connected Components Labeling on DRAGs: Implementation and Reproducibility Notes, in *Reproducible Research in Pattern Recognition* (Beijing, China), **11455**, Springer, May 2019, pp. 89–93.

## Challenges

2024   F. Bolelli, L. Lumetti, S. Vinayahalingam, M. Di Bartolomeo, N. van Nistelrooij, K. Marchesini, A. Anesi, and C. Grana, ToothFairy2: Multi-Structure Segmentation in CBCT Volumes, in *Structured Challenge* (Marrakech, Morocco), Structured Challenge, Oct 2024.

2023   F. Bolelli, L. Lumetti, M. Di Bartolomeo, S. Vinayahalingam, A. Anesi, B. van Ginneken, and C. Grana, Tooth Fairy: A Cone-Beam Computed Tomography Segmentation Challenge, in *Structured Challenge* (Vancouver, Canada), Structured Challenge, Sep 2023.

## Abstracts

2024   P. Perliti, A. Giovanetti, F. Bolelli, and C. Grana, Sustainable Use of Resources in Hospitals: A Machine Learning-Based Approach to Predict Prolonged Length of Stay at the Time of Admission, in *Proceedings of 12th IHIET International Conference* (Venice, Italy), Aug 2024.

J. Dreo, S. Lobentanzer, E. Gaydukova, M. Baric, I. Maarala, T. Muranen, J. Oikkonen, F. Bolelli, V. Pipoli, V.-M. Isoviita, J. Hynninen, and B. Schwikowski, High-level Biomedical Data Integration in a Semantic Knowledge Graph with OncodashKB for finding Personalized Actionable Drugs in Ovarian Cancer, in *Cancer Genomics, Multiomics and Computational Biology* (Bergamo, Italy), European Association for Cancer, Apr 2024.