

Andrea Loddo**EDUCATION**

01/10/2015 – 27/02/2019

PhD (EQF Level 8)

PhD in Computer Science at the University of Cagliari, Italy;

Thesis title: "Microscopic Blood Images Analysis by Computer Vision Techniques" [Th.1];

Supervisors: prof. Cecilia Di Ruberto, prof. Michel Kocher;

Revisers: prof. Maria De Marsico, prof. Giovanni Maria Farinella.

Research: I focused my research on Image Processing, Biomedical Image Analysis, Computer Vision and Machine Learning fields. In particular, I studied different algorithms and topics related to the segmentation, detection, feature extraction and classification of blood cells and histopathological images. The works realised during my PhD are devoted to the development of a robust algorithm for Red and White blood cells segmentation, counting and classification. The research has been published in the journal "Machine Vision and Applications (MVA)" [J.1], while correlated research has been published in the following articles: [J.2], [C.1], [C.2], [C.3], [C.4], [C.5], [C.6], [C.7].

Visiting Period Abroad: I did an internship at the Groupe Vision Industrielle of the institut d'Automatisation industrielle (iAi), applied research and development institute of the Haute Ecole d'Ingénierie et de Gestion du Canton de Vaud (HEIG-VD) under the supervision of prof. Michel Kocher as part of my PhD program. I have acquired, studied and analysed malaria-affected blood cells images from real blood samples, thanks to a collaboration with Dr Guy Prod'hom of the Microbiologie Department at Centre Hospitalier Universitaire Vaudois (CHUV). I have also realised a public malaria parasites dataset, containing all the types and stages of parasites and related stages-of-life. Moreover, I started my research oriented to malaria parasites detection. This collaboration brought to the publication of articles [J.2] [C.7].

01/10/2012 – 28/11/2014

Master's Degree – Laurea Magistrale in Informatica (EQF Level 7)

Master's Degree in Computer Science at the University of Cagliari, Italy; Thesis title: "Learning by Sampling for Blood Cell Images Segmentation"; Supervisor: prof. Cecilia Di Ruberto.

Score: 106/110

Courses: Image Analysis, Networking Architectures, Semantic of Programming Languages, Operative Systems 2, Geometric Algorithms and Spatial Data Structures, Data Mining, Network Computation, Databases 2, Computational Mathematics, Fundamentals of Security, Biometry and Security, Operations Research, Computer Architecture 2.

- 01/10/2009 – 19/07/2012 **Bachelor's Degree – Laurea in Informatica (EQF Level 6)**
Bachelor's Degree in Computer Science at the University of Cagliari, Italy.
Score: 109/110
Courses: Discrete Mathematics, Computer Programming 1, Fundamentals of Computer Science, Physics, Computer Architecture 1, Automata and Formal Languages, Differential and Integral Calculus, Algorithms and Data Structures 1, System Administration, Computer Programming 2, Fundamentals of Law and Economy, Statistic, Operative Systems 1, Computer Networks, Databases 1, Informative Systems Programming, Human-Computer Interaction, Programming Languages, Numeric Methods, Software Engineering.
- 15/09/2004 – 07/07/2009 **Technical High School Diploma – Maturità Tecnica Industriale (EQF Level 4)**
Istituto Tecnico Industriale Statale Othoca, Oristano (Italy)
Score: 100/100

CONTRACTS AND RESEARCH ACTIVITIES

- 04/06/2020 – ongoing **Honorary Fellow – Cultore della materia**
Department of Mathematics and Computer Science - University of Cagliari, Cagliari, Italy.
I was awarded a nonsalaried Honorary Fellowship in Computer Science (SDS – SSD: INF/01) at the Department of Mathematics and Computer Science of the University of Cagliari, and continue to serve in that capacity today.
- 23/09/2020 – 22/12/2020 **Postdoctoral Researcher – Borsista di Ricerca**
Department of Electrical and Electronic Engineering (DIEE) - University of Cagliari, Cagliari, Italy.
Duration: 3 months
- 11/07/2019 – 20/09/2020 **Postdoctoral Researcher – Assegnista di Ricerca**
Department of Mathematics and Computer Science - University of Cagliari, Cagliari, Italy.
I am a Postdoctoral Researcher at Department of Mathematics and Computer Science of the University of Cagliari.
I worked on biomedical and seed images analysis with image processing, computer vision, machine learning and deep learning techniques. In particular, my research has been focused to the realization of new tools for malaria parasites and leukemic cells detection and a framework to provide automatic seeds feature extraction and classification.
I have also supervised, along with Prof. Di Ruberto, seven bachelor's thesists regarding the following biomedical projects: alzheimer's disease classification from MRI images, glaucoma detection from retinal images, malaria parasite and leukaemia classification from blood smear images, MRI image retrieval with invariant moments.
I've also worked to the following articles: [C.9], [J.3], [J.4].
Bando di selezione: D.R. n.497 del 09/05/2019, "STUDIO E SVILUPPO DI ALGORITMI VELOCI ED ACCURATI PER L'IMAGING SCIENCE, CON APPLICAZIONI NELL'AMBITO BIOMEDICO", Durata: 1 anno, Responsabile scientifico: Prof. Giuseppe Rodriguez. Provvedimento di Graduatoria: D.R. n.753 del 04/07/2019, , Università di Cagliari.
Duration: 1 year, 2 months.

- 23/07/2019 – 22/09/2019 **Collaboration contract**
 Department of Mathematics and Computer Science - University of Cagliari, Cagliari, Italy.
 The objective of this work aimed at realising a new dataset of online scams, e.g. Ponzi schemes, in order to build a machine learning classification system able to recognize several kinds of fraud.
 Bando di selezione Prot. n. 152060/2019 del 01/07/2019, Responsabile scientifico: Prof. Massimo Bartoletti. Provvedimento di Graduatoria: D.D. n.283 bis del 16/07/2019, Università di Cagliari.
 Duration: 2 months.
- 18/06/2019 – 17/07/2019 **Collaboration contract**
 Department of Mathematics and Computer Science - University of Cagliari, Cagliari, Italy
 This work was devoted to the creation and validation of a plugin for ImageJ for the analysis and classification of seeds in the biological field. The choice to use the ImageJ framework has certainly brought its advantages: being a free and easily expandable tool in terms of functionality, it was easy to create a plugin in which to insert the features required for this project. This tool is easy to use by non-IT experts. In fact, image analysis software is often complex or usable only through the knowledge of programming languages. Moreover, considering the results obtained, the goodness and correctness of the features implemented and inserted in the plugin have been validated. This contract brought to the following article: [C.8].
 Bando di selezione Prot. n. 119572/2019 del 29/05/2019, Responsabile scientifico: Prof. Cecilia Di Ruberto. Provvedimento di Graduatoria: D.D. n.248 bis del 18/06/2019, Università di Cagliari.
 Duration: 1 month.
- 23/04/2019 – 22/05/2019 **Collaboration contract**
 Department of Mathematics and Computer Science - University of Cagliari, Cagliari, Italy
 The work was oriented to the analysis and publication of the technical-statistical results regarding the experimental phase of the project "PICASSO - Bric INAIL 2017".
 Bando di selezione Prot. n. 95007/2019 del 05/04/2019, durata: 1 mese, Responsabile scientifico: Prof. Gianni Fenu. Provvedimento di Graduatoria: D.D. n.178 bis del 19/04/2019, Università di Cagliari.
 Duration: 1 month.
- 01/10/2018 – 15/03/2019 **Postdoctoral researcher**
 Department of Mathematics and Computer Science - University of Cagliari, Cagliari, Italy
 I collaborated with the software house Maxtrino. My research tasks were oriented to image analysis field. In particular, I realised two different MATLAB tools: one to perform automatic handwritten signature detection and classification and one to recognize a document type with a template matching strategy, by using a combination of Harris corner, SIFT (Scale Invariant Feature Transform) and SURF (Speed Up Robust Features) features. At the same time, I continued to work on my own research in Image Analysis field, started with my PhD program. In detail, it regarded white blood cells detection and classification.
 Bando n. 21/2018 per n. 1 Borsa di ricerca dal titolo "STUDIO E SVILUPPO DI ALGORITMI PER APPLICAZIONI DI RICONOSCIMENTO IMMAGINI E DATI CON ACQUISIZIONE". Responsabile Scientifico: prof. Gianni Fenu.
 Duration: 1 year.
- 01/10/2015 – 30/09/2018 **PhD scholarship – Borsa di dottorato**
 Department of Mathematics and Computer Science - University of Cagliari, Cagliari, Italy
 Duration: 3 years

HEIG-VD, Yverdon-les-Bains, Canton de Vaud, Switzerland

I was invited by prof. Michel Kocher, with an official invitation letter, for a visiting student period during my PhD at the Groupe Vision Industrielle of the institut d'Automatisation industrielle (iAi), applied research and development institute of the Haute Ecole d'Ingénierie et de Gestion du Canton de Vaud (HEIG-VD) under the supervision of prof. Michel Kocher. The period was founded by either my PhD scholarship and the "Swiss-European Mobility Programme" adopted by HEIG-VD. I did an internship under the supervision of prof. Michel Kocher as part of my PhD programme. I have acquired, studied and analysed malaria-affected blood cells images from real blood samples, thanks to a collaboration with Dr Guy Prod'hom of the Microbiologie Department at Centre Hospitalier Universitaire Vaudois (CHUV). I have also realised a public malaria parasites dataset, containing all the types and stages of parasites and related stages-of-life. Moreover, I started my research oriented to malaria parasites detection. This collaboration brought to the publication of articles [J.2] [C.7].

PARTICIPATION TO RESEARCH PROJECTS

AGRIFOOD - IAPC
(Ingegnerizzazione e Automazione del Processo di produzione tradizionale del pane Carasau mediante l'utilizzo di tecnologie IOT)

I worked in the AGRIFOOD Project (IAPC), in particular for the engineering process and automation of "Pane Carasau" production with IOT technologies.

Technical Director: Alessandro Fanti.

CUP: B21B19000640008

Financier: Ministero dello Sviluppo Economico, Fondo per la Crescita Sostenibile "AGRIFOOD" PON I&C 2014-2020.

Duration: 2019 – 2023.

Work period: From 23/09/2020 to 22/12/2020, during the Postdoctoral Researcher contract held at the University of Cagliari, financed by the project.

AMIS (Algoritmi e Modelli per l'Imaging Science)

I worked in the AMIS Project, which aims at studying, realizing and testing robust and innovative algorithms to perform biomedical image analysis. I am currently working on blood smear segmentation, detection and classification, alzheimer's MRI classification, glaucoma detection.

Technical Director: Prof. Giuseppe Rodriguez.

Financier: Regione Autonoma della Sardegna (grant ID: RASSR57257).

Work period: From 11/07/2019 to 20/09/2020, during the Postdoctoral Researcher contract held at the University of Cagliari, financed by the project.

Natura 2000

I participated to the Natura 2000 Project, with a research activity to develop a tool for blood cells counting from microscopical images.

Technical Director: Prof. Gianni Fenu.

Financier: Regione Autonoma della Sardegna (L.R. 7/2007 Annualità 2013).

Work period: From 01/09/2016 to 01/12/2016, during the PhD research activity at the University of Cagliari.

DENIS (Dataspace
Enhancing the Next Internet
in Sardinia)

I participated to the DENIS Project, with a research activity for image processing and machine learning approaches applied to medical and biomedical images.

Technical Director: Prof. Nicoletta Dessì.

Financier: Regione Autonoma della Sardegna (Project CRP-17615).

Work period: From 01/03/2015 to 29/02/2016, before and during the PhD research activity at the University of Cagliari, partially financed by the project.

PHD SCHOOLS

I attended the following PhD schools:

- BigDat 2016 - 2nd International Winter School on Big Data, topics: Big Data, Decision Trees, Machine intelligence, Data integration;
- MISS 2016 - Medical Imaging Summer School, topics: Machine Learning, Deep Learning, Image Processing, Medical Image Analysis.
- VISUM 2018 - 6th International Summer School on VISion Understanding and Machine intelligence, topics: Deep Learning, Machine Learning, Computer Vision Neuroimaging;

TALKS AND POSTERS

I presented the following talks and posters:

- Doctoral Consortium of 11th Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications, VISIGRAPP 2016: I presented my PhD research project proposal.
- Signal Image Technology & Internet Based Systems, SITIS 2016: I presented the work "A Computer-Aided System for Differential Count from Peripheral Blood Cell Images" (part of my PhD research project).
- 19th International Conference on Image analysis and processing, ICIAP 2017: I presented the work "Histological image analysis by invariant descriptors" (part of my PhD research project).
- 13th International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications, VISAPP 2018: I presented the work "White Blood Cells Counting Via Vector Field Convolution Nuclei Segmentation" (part of my PhD research project).
- 21st International Conference on Medical Image Computing and Computer Assisted Intervention, MICCAI 2018, Sipaim workshop: I presented the work "MP-IDB: The Malaria Parasite image database for image processing and analysis" (part of my PhD research project).
- 28th IEEE International Conference on Enabling Technologies: Infrastructure for Collaborative Enterprises, WETICE 2019: I presented the work "An Open Source Plugin for Image Analysis in Biology" (part of my postdoctoral research).
- 20th International Conference on Image analysis and processing, ICIAP 2019: I presented the work "A region proposal approach for cells detection and counting from microscopic blood images" (part of my postdoctoral research).

TEACHING

01/03/2019 – 30/09/2020

Information and Elaboration Systems

Adjunct Professor of "Information and Elaboration Systems" at the Department of Medicine and Surgery of the University of Cagliari for two academic years (2018-2019 and 2019-2020). I taught computer science topics regarding signal theory, information and communication technologies, image analysis, databases and computer networks. The course had 100 attending students in the first year and 50 in the second one. The entire course is worth a total of 3 credits of the Master's Degree. I taught for 18 hours per year.

Bando di selezione Prot. n. 168030/2018 del 06/09/2018 per la copertura, tra gli altri, dell'incarico di insegnamento "SISTEMI DI ELABORAZIONE DELLE INFORMAZIONI" del SSD ING-INF/05 per i CdL in Scienze delle professioni sanitarie tecniche diagnostiche e in "Scienze infermieristiche e Ostetriche" della Facoltà di Medicina e Chirurgia, vacante per l'A.A. 2018-2019 (rinnovato per l'A.A. 2019-2020). Provvedimento di Graduatoria: n.193431 del 17/10/2018, Università di Cagliari.

01/03/2016 – ongoing

Algorithms and Data Structures

Teaching assistant in the "Algorithms and Data Structures" course of the Bachelor's Degree in Computer Science at the University of Cagliari, for five academic years (2015/2016, 2016/2017, 2017/2018, 2018/2019, 2019/2020). I taught in the laboratory part of the course. The entire course is worth a total of 9 credits of the Bachelor's Degree. The course has 150 attending students per year. I teach for 36 hours per year and I evaluate the final laboratory projects, realised by the student in C language.

01/03/2013 – 01/06/2015

Computer Networks

Teaching assistant in the "Computer Networks" course of the Bachelor's Degree in Computer Science at the University of Cagliari, for two academic years (2013/2014, 2014/2015). I taught in the laboratory part of the course. The entire course is worth a total of 9 credits of the Bachelor's Degree. The course has 150 attending students per year. I taught for 36 hours per year.

01/07/2015 – 31/08/2015

iOS Developer

I worked as iOS developer at Eventa, a software house in Cagliari, Italy. I contributed to the development of an iOS mobile app.

01/06/2014 – 30/06/2015

Android, iOS, Web Developer

I worked as a mobile programmer and web developer at FlossLab, a software house in Cagliari, Italy.

01/11/2014 – 30/06/2015

Teacher

I taught, as Unitel Sardegna employer, computer science topics to the owners of agricultural-related businesses. It was part of the project named "Tecnologie ICT a supporto dell'azienda agricola – TISAA", finances by "Misura 111 del Programma di sviluppo rurale 2007-2013" of Regione Autonoma della Sardegna.

PUBLICATIONS

Journal

- [J.1] "A leucocytes count system from blood smear images: Segmentation and counting of white blood cells based on learning by sampling". C. Di Ruberto, A. Loddo, L. Putzu. Machine Vision and Applications; Volume 27, Issue 8, November 2016, Pages 1151-1160.
- [J.2] "Recent Advances of Malaria Parasites Detection Systems Based on Mathematical Morphology". A. Loddo, C. Di Ruberto, M. Kocher. Sensors. Volume 18, number 2, Pages 513, 2018.
- [J.3] "Detection of red and white blood cells from microscopic blood images using a region proposal approach". C. Di Ruberto, A. Loddo, L. Putzu. Computers in Biology and Medicine; Volume 116, Article 103530, 2020 - Funding sponsor: Regione Autonoma della Sardegna (grant ID: RASSR57257).
- [J.4] "Blob Detection and Deep Learning for Leukemic Blood Image Analysis". C. Di Ruberto, A. Loddo, G. Puglisi. Applied Sciences, Volume 10, Issue 3, Article 1176, 2020 - Funding sponsor: Regione Autonoma della Sardegna (grant ID: RASSR57257).

Conference

- [C.1] "A multiple classifier learning by sampling system for white blood cells segmentation". C. Di Ruberto, A. Loddo, L. Putzu. Proceedings of the 16th International Conference on Computer Analysis of Images and Patterns, CAIP 2015; Volume 9257, 2015, Pages 415-425.
- [C.2] "Learning by sampling for white blood cells segmentation". C. Di Ruberto, A. Loddo, L. Putzu. Proceedings of the 18th International Conference on Image Analysis and Processing, ICIAP 2015; Volume 9279, 2015, Pages 557-567.
- [C.3] "Peripheral blood image analysis". C. Di Ruberto, A. Loddo, L. Putzu. Proceedings of the Doctoral Consortium, 11th Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications, VISIGRAPP 2016; Pages 15-23.
- [C.4] "A Computer-Aided System for Differential Count from Peripheral Blood Cell Images". C. Di Ruberto, A. Loddo, L. Putzu, G. Fenu. Proceedings of the 12th International Conference on Signal Image Technology & Internet-Based Systems; Pages 112-118.
- [C.5] "Histological image analysis by invariant descriptors". A. Loddo, C. Di Ruberto, L. Putzu. Proceedings of the 19th International Conference on Image Analysis and Processing, ICIAP 2017; Pages 345-356.
- [C.6] "White Blood Cells Counting Via Vector Field Convolution Nuclei Segmentation." S. Porcu, C. Di Ruberto, A. Loddo, L. Putzu. Proceedings of the 13th International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications, VISAPP 2018.
- [C.7] "MP-IDB: The Malaria Parasite image database for image processing and analysis". A. Loddo, C. Di Ruberto, M. Kocher., G. Prod'Hom. Sipaim - 2018 MICCAI Biomedical Workshop; Pages 57-65, 2018.
- [C.8] "An Open Source Plugin for Image Analysis in Biology". G. Campanile, A. Loddo, C. Di Ruberto. 2019 IEEE 28th International Conference on Enabling Technologies: Infrastructure for Collaborative Enterprises (WETICE); Pages 162-167, 2019.
- [C.9] "A region proposal approach for cells detection and counting from microscopic blood images". C. Di Ruberto, A. Loddo, L. Putzu. Proceedings of the 18th International Conference on Image Analysis and Processing, ICIAP 2019; Pages 47-58, 2019 - Funding sponsor: Regione Autonoma della Sardegna (grant ID: RASSR57257).

Thesis

- [Th.1] "Microscopic Blood Images Analysis by Computer Vision Techniques". Andrea Loddo. Ph.D. Thesis, University of Cagliari, 2019.

EDITORIAL AND REVIEW ACTIVITIES

Guest Editor

- Applied Sciences – Special Issue "Image Processing Techniques for Biomedical Applications" (ISSN 2076-3417), "Applied Biosciences and Bioengineering" section. MDPI (2019 – 2020).
- Applied Sciences – Special Issue "Advancing Biomedical Image Retrieval and Classification for Computer Aided Diagnosis" (ISSN 2076-3417), "Applied Biosciences and Bioengineering" section. MDPI (2020 – ongoing).

Chair

The 13th International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications, VISAPP 2018: Session chair of "motion, tracking and stereo video" session.

Reviewer for international journals

- Applied Sciences: member of the Reviewer Board.
- The 23th International Conference on Medical Image Computing and Computer Assisted Intervention, MICCAI 2020: reviewer in "Microscopy Image Analysis" subject area.
- The 22nd International Conference on Medical Image Computing and Computer Assisted Intervention, MICCAI 2019: reviewer in "Microscopy and Histology Image Analysis" and "Machine Learning and Artificial Intelligence" subject areas.
- ASM mSystems: reviewer in "Microscopy Image Analysis" section.
- Elsevier Artificial Intelligence in Medicine: reviewer.
- Elsevier Biocybernetics and Biomedical Engineering: reviewer in "Microscopy Image Analysis" section.
- Elsevier Computers in Biology and Medicine: reviewer in "Microscopy Image Analysis" section.
- Elsevier Pattern Recognition Letters: reviewer.
- IEEE Transactions on Emerging Topics in Computing: reviewer.
- MDPI Algorithms: reviewer in "Evolutionary Algorithms and Machine Learning" section.
- MDPI Remote Sensing: reviewer.
- MDPI Symmetry: reviewer.

SKILLS

Mother Language Italian

Foreign Languages **English:** B2 QCER level.
Certificate released by the University Language Centre (CLA) of the University of Cagliari.
Examination session: 04th July 2014.

Skills Experience in group working. The majority of the academic projects I have worked on have been carried out with four other collaborators, while all of my research papers have been conducted with one or two co-authors.
Experience in presenting projects carried out in Power Point presentations with different types of audiences.

Digital Skills Excellent computer science skills gained during the last fifteen years of studies, research and in the free time. Consolidated experience on image analysis and machine learning techniques. Consolidated expertise in the development of applications using MATLAB and Java languages.

My code contributions can be found on my GitHub page: github.com/andrealoddo.
Work and academic experience: MATLAB, Java, Python. Didactic and academic experience: C. Work and academic experience:

- Operating Systems: Windows (from XP to 10), Mac OS X (from 10.8 to 10.15), Linux-based (Ubuntu, Mint).
- Client side: HTML, CSS, JavaScript, JQuery.
- Server side: Apache, SQL (on MySQL and PostgreSQL), PHP, XML, Bash.
- Mobile development: Android (up to API level 23), iOS with Swift (up to 2.0), cross-platform (PhoneGap).
- IDEs: CLion, Netbeans, Eclipse, IntelliJ IDEA, XCode, Android Studio, Qt Creator, Jupyter, PyCharm, MATLAB (in particular Image Processing, Computer Vision, Bioinformatics, Statistical and Optimization Toolboxes).
- Version control systems: BitBucket, Git.
- Documents and presentations tools: LaTeX, Google Drive, LibreOffice, Microsoft Office, Open Office.
- Virtualization tools: VirtualBox, VMWare.

Academic experience only: C++, UML, OCaml. Work experience only: .NET framework.

ADDITIONAL INFORMATION

Driving licence Type B

Blood donor Sardinia is one of the areas with the highest concentration of thalassemia patients (12% of population). Blood transfusions as well as blood availability are crucial. My aim is to donate my blood every 3 months.

Consapevole che – ai sensi dell'art. 76 del D.P.R. 445/2000 – le dichiarazioni mendaci, la falsità negli atti e l'uso di atti falsi sono puniti ai sensi del codice penale e delle leggi speciali, dichiaro che le informazioni rispondono a verità. Autorizzo il trattamento dei miei dati personali ai sensi del Dlgs 196 del 30 giugno 2003 e dell'art. 13 GDPR (Regolamento UE 2016/679) ai fini della ricerca e selezione del personale.

Cagliari, 24/06/2020