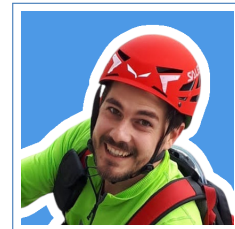# Marco Carletti

Curriculum Vitae

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Personal Information

Date of Birth	May 10, 1989
Place of Birth	Verona, Italy
Nationality	Italian
Gender	Male

Education

May 2020	**Ph.D. in Computer Science**, *University of Verona*, Verona (IT). XXXII cycle (2016-2019) Active Object Recognition, Machine Learning (Deep Learning), Computer Vision
October 21, 2015	**Master in Computer Science and Engineering (LM-32)**, *University of Verona*, Verona (IT). Curriculum: Visual Computing *Key courses*: Image Processing and multiresolution analysis, Advanced pattern recognition, Computer vision, Signal and system analysis, Advanced algorithms and Computational complexity, Human-Computer interaction.
March 21, 2012	**Bachelor in Computer Science (L-31)**, *University of Verona*, Verona (IT). Curriculum: Multimedia *Key courses*: Linear algebra, Calculus, Signal and system analysis, Image and sound processing, Pattern recognition, Computer graphics, Programming, Algorithms.
July 3, 2008	**High School Diploma**, *Liceo Scientifico G. Galilei*, Verona (IT). Curriculum: Applied Sciences

PhD Thesis

Title	*Saliency-based approaches for multidimensional explainability of deep networks*
Supervisor	Marco Cristani
Description	We describe an approach to cope with the interpretability problem of a convolutional neural network and propose our ideas on how to exploit the visualization for applications like image classification and active object recognition. Firstly, we describe how visual saliency can be effectively used in the 2D domain (e.g. RGB images) to boost image classification performances. Then, we present a 3D active recognition system that allows to consider different views of a target object, overcoming the single-view hypothesis of classical object recognition, making the classification problem much easier in principle. We adopt such attention maps by building a 3D dense saliency volume, a continuous proxy for a given classifier. Finally, we show how to inject this representations in a real world application, so that an agent (e.g. robot) can move knowing the capabilities of its classifier.

Master Thesis

Title	*Filtraggio a particelle con modelli di riferimento variabili in contesti di tracking biomedicale*
Supervisor	Marco Cristani

Description	Tracking of hepatic vessels in sequences of ultrasound images. The proposed solution is a template matching algorithm based on a particle filter, which likelihood function uses a dynamic dictionary of reference templates to estimate the confidence of each particle. The main contributions are the template vocabulary, used to solve the problem of the model drifting, and a rescue procedure applied in the evaluation stage of the algorithm. *[Matlab]*

Bachelor Thesis

Title	*Integrazione di sistemi per l'animazione in tempo reale di modelli antropomorfi*
Supervisor	Umberto Castellani
Description	Animation of 3D avatar for real time applications using the Kinect technology. The avatar was a 3D scanned human body reconstructed via structured light. *[VS10 (C++), Unity3D, Meshlab, Blender]*

Achievements

February 2016	A part of my Master thesis has been published as a conference paper at VISAPP International Conference. The paper has been accepted as an oral presentation, that I presented at the conference on February 2016. See Publications section for more details.
May 2015	The academic project for the course in Computer Vision has been accepted by the committee of the Svilupparty 2015 [1] (Bologna, Italy), one of the most important italian event on Computer Graphics and Videogames. I presented as exhibitor in the venue. My project has been cited in two web articles by Redbull.com [2] and Wired.it [3].
January 2015	The academic project for the course in Robotics has been accepted at Roboval (Grezzana, Verona, Italy) and was cited on the Twitter page of the event [4].
2012-2015	As a student, I had the opportunity to work in three different European projects: AdOpTeCH, SAFROS and I-SUR (see the Research Experience section for more details). Thanks to these experiences I learned to work in different international teams.

Other Academic Projects

Master projects

May 2015	**Augmented Reality Game: AR-Goose**. Course: Computer Vision (Umberto Castellani). *Programming of a real time demo of an augmented reality game to demonstrate the potentiality of the pervasive gaming. The project was presented at the* Svilupparty 2015 [1] *(Bologna, Italy) and was cited in two web articles on* Redbull.com [2] *and* Wired.it [3]. *[VS13 (C++, OpenGL, GLSL)]*
April 2015	**Evaluation of a tracking system**. Course: Pattern Recognition (Marco Cristani). *Test and integrate the ROMOT tracking system and evaluate the influence of a background subtractor algorithm in a software for people and vehicle detection and tracking. The project was developed with the collaboration of* EVS srl. *[VS13 (C++), Matlab, QtCreator (Qt, C++)]*
January 2015	**Mapping between a 5 DOF manipulator and the user workspaces**. Course: Robotics (Paolo Fiorini). *Creating a visual system for tracking the user hand and mapping its coordinates in a 5 DOF robot workspace. The robot was controlled via ROS and the system was tested both in simulation and real environment. The project was presented at* Roboval *(Grezzana, Verona, Italy) and was cited on the Twitter page of the event* [4]. *[Ubuntu 12.04, Sublime Text (ROS, C++)]*
November 2014	**Scattering teleoperation**. Course: Robotics (Riccardo Muradore). *Develop a scattering algorithm working on a system composed by two electric engines. The project aimed to improve the control algorithm starting from the students' suggestions. [Ubuntu 12.04 (Xenomai), Sublime Text (C++)]*

May 2014	**Leap Motion user experience**. Course: Human Computer Interaction (Andrea Giachetti). *The project's purpose was the creation of a software to test the user experience with the Leap Motion system used as mouse. [VS10(C++), QtCreator (Qt, C++)]*

Bachelor projects

2011	**Sound quantizator**. Course: Sound Processing (Carlo Drioli). *Create a quantizer for sound files using the dithering techniques to reduce the perception of the quantization error. [Matlab]*
2011	**Web Application**. Course: Database and Web (Alberto Belussi). *Website and DB design. [Ubuntu Bash, HTML, CSS, SQL, Tomcat, JSP]*
2010	**Software design**. Course: Software Engeneering (Luca Vigano'). *Design the class diagram and develop a demo of a software that manages an ideal air pollution control system. [Ubuntu Bash, Java, BlueJ]*
2010	**Concurrent programming**. Course: Operating Systems (Graziano Pravadelli). *The project was partitioned in three parts: 1) bash scripting for define a new shell command, C programming to learn 2) interrupts, 3) memory management, race conditions and threads. [Ubuntu Bash, C]*
2009	**Low level programming**. Course: Embedded System Design (Franco Fummi). *The projects aimed to program, first in SIS than in Assembly, an airbag control system. [Ubuntu Bash, Assembly (AT&T), SIS]*

Scientific Interests

Machine Learning, Pattern Recognition, Computer Vision, 3D Reconstruction, Augmented Reality, Computer Graphics, (Medical) Image Processing, Visual Servoing and Robotics.

Reviewer activity

In parenthesis the number of accomplished reviews.

Journals
- PLOS ONE (1)
- Neurocomputing (1)
- PR Letters (6)
- CVIU (1)

Conferences
- NIPS 2018 (2)
- ICML 2018 (1)
- ICPR 2018 (1)
- ACM-MM 2016 (1)

Specialization courses

May 2019	**Advanced Topics in Deep Learning** *University of Verona, 5 days (22 hours)* Speakers: Dr. Timothy M. Hospedales and Dr. Henry Gouk, University of Edinburgh.
September 2018	**Machine Learning Summer School (MLSS)** *Universidad Autónoma de Madrid, 10 days*
July 2018	**International Computer Vision Summer School (ICVSS)** *Computer Vision after Deep Learning, 1 week (30 hours)*
May - June 2018	**Learning in Multi-Agent Worlds** University of Verona, 24 hours Speaker: Prof. Georgios Chalkiadakis, University of Crete. The course gives an overview about [Non] Cooperative game theory, [Multiagents] Reinforcement Learning and Deep Learning.
July 2017	**International Computer Vision Summer School (ICVSS)** *From Representation to Action and Interaction, 1 week (30 hours)*

Fall 2016	**Deep Learning by Google** Udacity, 3 months
	Speaker: Vincent Vanhoucke, Google. In this course, I learned how to design intelligent systems that learn from complex and/or large-scale datasets. I learned how to train and optimize basic neural networks and CNNs.
June - July 2015	**Image Registration: Feature-Based and Intensity-Based Methods** University of Verona, 20 hours
	Speaker: Prof. Shahriar Negahdaripour, University of Miami. The goal of this course was to provide an overview of image registration techniques for a wide range of applications, including photo-mosaicing in building relatively large visual maps and deformable registration of medical images.

Research Experience

Oct-Nov 2018, Feb 2019	**Scientific Researcher**, IIT ISTITUTO ITALIANO DI TECNOLOGIA, IT-GE. As part of my PhD, I worked in IIT with prof. Alessio Del Bue on 3D object recognition and active recognition. My job consisted in the definition of an active recognition pipeline integrating an image classifier and a pose estimator for robot movement strategy. *Detailed achievements*: ○ Robot manipulation ○ Paper writing ○ Dataset acquisition ○ ICCV Workshop accepted paper
March-April 2015	**Collaborator**, EVS EMBEDDED VISION SYSTEMS SRL, IT-VR. Free collaboration after the related academic project. The academic project of the Pattern Recognition course, taught by prof. Marco Cristani, gave me the opportunity to work with the EVS company [5], working on one of their software about people and vehicle detection. My job consisted in proposing two improvements of the software: the implementation of a background subtractor algorithm and the evaluation of a new tracking method. The final technical report was evaluated positively by the company, which is now moving my solutions to embedded hardware. *Detailed achievements*: ○ Work on third-party software ○ Propose and develop new ideas ○ Produce a technical report
2012-2015	**Research Assistant**, ALTAIR LABORATORY, *University of Verona*, IT-VR. I have collaborated in the programming of a surgical simulator (SAFROS European Project), then I developed a new solution based on image processing techniques to estimate the pose of the surgical instruments in a synthetic and real environment (I-SUR European Project). At the end of the collaboration, a paper has been published at the STAG Conference (EuroGraphics) as an oral presentation that I presented on October 2015. This working experience was founded by three research grants: CO23/12, BO11/13, BO16/14). *Detailed achievements*: ○ Teamwork ○ Propose, test and develop new ideas ○ Write a technical report ○ Graphics programming (OpenGL, GLSL, Cairo) ○ Computer Vision programming (OpenCV, ArUco)

April-June 2012	**Research Assistant**, OᴘDᴀTᴇ Lᴀʙᴏʀᴀᴛᴏʀʏ, *University of Verona*, IT-VR.

I set the microprofilometry system, deciding how to mount and integrate two piezoelectric slides and a laser probe for microscopic distance measurements. I developed a software (Qt, C++) to measure a planar scene within the above setup. My job was part of the AdOpTeCH European Project. This working experience was founded by the research grant: CO14/12.
Detailed achievements:
- Jobs autonomy
- Controllers programming
    - Mercury C-863 Servo Controller
    - PI M-414 High-Load Precision Stage
    - PI M-531 Heavy-Duty Micropositioning Stage

International Collaboration

September 2012	**Collaborator**, Hᴏʟᴏɢʀᴀꜰɪᴄᴀ Kꜰᴛ., Budapest, HU.

I went to Budapest, Hungary, to the headquarter of Holografika [6] company. I followed the integration between the surgical simulator developed in Altair Lab (SAFROS European Project) and the 3D Light Field display invented by the company.

Boards of Research

February 2015	**Conference session chair**, *International Conference on Computer Vision Theory and Applications (VISAPP)*, Rome (IT).

Publications

* equal contribution

2020	**Saliency-based approaches for multidimensional explainability of deep networks**, *M. Carletti*, PhD thesis
2019	**Active 3D Classification of Multiple Objects in Cluttered Scenes**, *Y. Wang, M. Carletti, F. Setti, M. Cristani, A. Del Bue*, International Conference on Computer Vision (ICCV Workshop)
2019	**6D Pose Estimation for Industrial Applications**, *F. Cunico, M. Carletti, M. Cristani, F. Masci, D. Conigliaro*, International Conference on Image Analysis and Processing (ICIAP Industrial Session)
2018	**Estimating body fat from depth images: hand-crafted features vs Convolutional Neural Networks**, *M. Carletti, M. Cristani, V. Cavedon, C. Milanese, C. Zancanaro, A. Giachetti*, 3DBODY.TECH Conference & Expo
2018	**Analyzing Body Fat from Depth Images**, *M. Carletti, M. Cristani, V. Cavedon, C. Milanese, C. Zancanaro, A. Giachetti*, International Conference on 3D Vision (3DV)
2018	**Recognition self-awareness for active object recognition on depth images**, *A. Roberti*, M. Carletti*, F. Setti, M. Cristani*, British Machine Vision Conference (BMVC)
2018	**Understanding Deep Architectures by Visual Summaries**, *M. Carletti, M. Godi, M. Aghaei, M. Cristani*, British Machine Vision Conference (BMVC)
2016	**A Robust Particle Filtering Approach with Spatially-Dependent Template Selection for Medical Ultrasound Tracking Applications**, *M. Carletti, D. Dall'Alba, M. Cristani, P. Fiorini*, International Conference on Computer Vision Theory and Applications (VISAPP)
2015	**Robust 3D Pose Estimation of a Laparoscopic Instrument with three Landmarks**, *M. Carletti, D. Zerbato, D. Dall'Alba, A. Calanca, P. Fiorini*, Smart Tools and Apps for Graphics - Eurographics Italian Chapter Conference (STAG-EG)
2013	**Multiscale modelling of surfaces by profilometry based on conoscopic holography**, *C. Daffara, F. Monti, M. Carletti, P. Fiorini, R. Fontana*, Optical Metrology - Optics for Arts, Architecture, and Archaeology IV

Work Experience

Vocational

October 2019 - present
R&D and Visual Software Engineer, eVS embedded Vision Systems srl, IT-VR.
Projects related to assisted docking (finished in 2020) and object detection where my main jobs are the analysis of the current state of the art technologies and software design. Main achievements:
- Agile management
- Progress presentation
- Software architecture (focus on modularity)

November 2015 - September 2016
Visual Software Engineer, eVS embedded Vision Systems srl, IT-VR.
Founded by a research grant from the University of Verona: *Selezione pubblica n. BO19/15, per titoli, per il conferimento di una borsa di ricerca post lauream dal titolo: "Studio e sviluppo di algoritmi di classificazione e tracking di cellule ematiche"*. I have been working in the development of a software (quality control of hollow glass forming machine) as lead programmer and software architect. Main achievements:
- Leading a team of programmers
- Making decisions about what, when, how and why do something
- Customer service and interaction with the project manager
- Software architecture: GUI, multithreading, OOP (C++, Qt, OpenCV)
- R&D

March-April 2015
Collaborator, eVS embedded Vision Systems srl, IT-VR.
Free collaboration. Research project about the improvement of a pedestrian detector and tracker (see Research Experience section for more details).

2012-2015
Research Assistant, Altair Laboratory, *University of Verona*, IT-VR.
Founded by three research grants from the University of Verona:
- *Selezione pubblica n. BO16/14, per titoli, per il conferimento di una Borsa di Ricerca Post Lauream dal titolo: "Realizzazione e collaudo della realtà aumentata per il progetto europeo ISUR"*.
- *Selezione pubblica n. BO11/13, per titoli, per il conferimento di una borsa di ricerca post lauream dal titolo "Elaborazione di immagini per la realtà aumentata"*.
- *Selezione pubblica n. CO23/12 dal titolo: "Attività di codifica e collaudo dell'interfaccia del simulatore chirurgico per il progetto europeo SAFROS"*.

April-June 2012
Research Assistant, OpDaTe Laboratory, *University of Verona*, IT-VR.
Founded by a research grant from the University of Verona: *Selezione pubblica n. CO14/12 dal titolo: "Messa in opera di un sistema di movimento di sensore laser"*.

Miscellaneous

2009-2010
Warehouse worker, Martinelli supermercati, srl, *Bussolengo*, IT-VR.

Summer job 06/07
Waiter and cleaner, Tivigest Hotels & Resorts, Hotelturist spa, *Folgarida*, IT-TN.

Summer job 06/07
Picker, Azienda agricola Villa Medici, *Sommacampagna*, IT-VR.

Computer Skills

Programming	C/C++, Matlab, Python.
Tools	IDE: Visual Studio, VS Code, MATLAB, QtCreator. RCS: Git (GitHub, Bitbucket, SmartGit, Source Tree). Other: Doxygen.
Libraries	DeepLearning [PyTorch], CGI/CV/AR [OpenGL, GLSL, OpenCV], other [Qt].
Operating Systems	All Microsoft OS (Windows), Linux based system (Ubuntu based).
Graphics Tools	2D: Photoshop, The Gimp, Inkscape. 3D: Blender, Sculptris, Meshlab, Google Sketchup.
Miscellaneous	[Microsoft/Open] Office Suite.

Languages

Italian	**Mothertongue**	
English	**Full professional proficiency**	*C2 (CEFR) [7]*

Qualities and Interests

Personal skills	Determinate, ambitious, passionate, desire to prove my technical abilities, good communicator, good organizational abilities, dreamer but practical.
Interpersonal skills	Extrovert, desire to meet people, dynamism.
Experience with	Teamwork, both low and high level programming, software design, software validation and testing, software and hardware integration.
Driving license	Category B (cars).
Sports	Tennis (practiced for 5 years), Tamburello (2003 national competition; 4th place), hiking and alpinism.
Musical intruments	Guitar, ukulele, piano, ocarina, woodwind flutes (recorder, Armenian duduk), Irish tin whistle. I also sang in a choir for 3 years (baritone and bass).
Interests	Cinema, videogames, astronomy, physics.
Volunteering	Elder care, disabled assistance, free tuitions (mathematics, physics, informatics).

Links

[1] http://www.svilupparty.it/

[2] http://www.redbull.com/it/it/games/stories/1331722764830/
svilupparty-i-videogiochi-made-in-italy-del-momento

[3] http://www.wired.it/gadget/videogiochi/2015/05/18/gioco/

[4] https://twitter.com/roboval/status/470196322990305281

[5] eVS embedded Vision Systems s.r.l., Strada Le Grazie, 15, 37134 Verona, Italy. http:
//www.embeddedvisionsystems.it/

[6] Holografika Kft. Pf. 100. Budapest H1704, Hungary. http://www.holografika.com/

[7] English certification released by EF SET, designed to be aligned with CEFR (Common Euro-
pean Framework of Reference for Languages). https://www.efset.org/cert/xQA6cj