



Caroline Pacheco do E. Silva

Research Engineer in Computer Vision & Machine Learning

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OVERVIEW

I am currently working as a Research Engineer in Computer Vision & Machine Learning with the AI Team of ActiveEon, Paris Office. My main responsibility is developing advanced solutions for computer vision applications with a focus on image understanding, object detection and image segmentation. In addition, I have been engaged in the integration and development of Machine Learning algorithms on the [Proactive Machine Learning \(PML\)](#) that helps data scientists and IT operations work together in an MLOps approach allowing them to bring ML models to production. PML platform simplifies machine learning application lifecycle management providing end-to-end orchestration, automation and scalability.

I obtained my PhD in May, 2017 from the University of La Rochelle, and my research activities were focused on visual feature extraction and ensemble feature selection for moving object detection. In summary, the context of my research was to perform incremental learning of streaming video data, and moving object detection under foreground/background separation. Concerning the visual feature extraction, my main focus was on local binary patterns and dynamic texture descriptors. With regard to ensemble learning for feature selection, I focused on One-Class Classifiers, Boosting, Random Subspace, Wagging, among other ensemble learning approaches.

RESEARCH INTERESTS

My main research interests lie at the intersection of [Computer Vision](#), [Feature Extraction](#) & [Machine Learning](#) with a focus on developing intelligent systems. In particular, motion analysis in videos, facial expression recognition, object tracking, among others.

EXPERIENCE

Since 2017 - Machine Learning for Computer Vision.

Since 2013 - Feature Selection & Ensemble Learning.

2010-2012 - Facial Expression Recognition.

2008-2010 - Algorithm for Mapping Indoor Environments using a [Robot RAVE](#)

PROGRAMMING SKILLS

Advanced-level: Python, MATLAB, PHP, HTML, CSS, JavaScript, and AJAX.

Scientific-level: scikit-learn, PyTorch and Keras

LANGUAGE

Portuguese (Native), French (Advanced), English (Advanced).

ACADEMIC PROJECTS

My academic projects can be found in my [Behance](#), [MathWorks](#) and [GitHub](#) profiles. I'm the author of an open source library, called LBPLibrary that provides a collection of visual descriptors based on local binary patterns. This library was designed for the problem of background/foreground separation in videos.

JOURNAL REVIEWER

I peer-review for two journals which are **IEEE Transactions on Industrial Informatics**, and **Journal of Computer Engineering and Information Technology**. For more information, please visit my Publons profile publons.com/author/1216691/caroline-silva.

GOOGLE SCHOLAR

My public citation profile can be found at scholar.google.com/citations?user=sX5nPOcAAAAJ.

EDUCATION

Sep, 2013 - May, 2017 Ph.D. in Computer Vision and Machine Learning, University of La Rochelle, France. **Thesis:** [Feature Extraction and Selection for Background Modeling and Foreground Detection](#).

Jun, 2014 - Aug, 2014 and Jun, 2015 - Aug, 2015 Ph.D. research stage at Computer Vision Center (CVC), Barcelona, Spain. **Research focus:** "3D Joint Color-Texture Descriptor for Dynamic Texture Recognition".

Mar, 2010 - Dec, 2012 M.Sc. in Mechatronics Engineering with focus on Computer Vision and Pattern Recognition, Polytechnic School, Federal University of Bahia, Brazil. **Focus:** Face detection, facial landmarks extraction, facial expression recognition, shape analysis, generalized procrustes analysis, and artificial neural networks. **Dissertation:** [Facial Expression Recognition using Artificial Neural Networks](#).

Jun, 2004 - Jun, 2009 B.Sc. in Computer Engineering with focus on Mobile Robotics at AREA1 Engineering School, Brazil. **Project:** "An Algorithm for Mapping Indoor Environments using a Mobile Robot". **Focus:** Development of an algorithm for mapping indoor environments using a mobile robot named [RAVE](#). I have made experimental evaluations with both a real and a virtual robot.

PROFESSIONAL EXPERIENCE

May, 2017 - Current – Paris, France

Type of contract: CDI (Permanent Employee Contract)

R&D Engineer Machine Learning at [ActiveEon](#).

I am currently working on a collaborative project between [Thales Alenia Space](#), [INRIA](#), and [IRT Saint Exupery](#). The main goal of this project is firstly to design neural architecture networks. After that, the best neural architecture will be embedded in the satellite imaging system for detection and monitoring of forest fires. In this project, the Activeeon team is responsible for automating the design of neural architecture search to find the most efficient and compact neural architecture. In addition, I am responsible for integrating the new breakthroughs in the field of machine learning on the [Proactive Machine Learning \(PML\)](#) platform from ActiveEon.

In short, some of my activities on the PML platform are:

- Development of generic tasks for input/output data, data preprocessing, feature extraction, etc.
- Integration of different deep/machine learning algorithms.
- Model Explainability to explain the output of any deep/machine learning model.
- ONNX models support.
- RAPIDS NVIDIA support.
- Neural Architecture Search (NAS) support.

Some use cases:

- Thales Alenia Space (TAS) : Anomaly Detection using Convolutional Neural Networks (CNNs) on Hybrid Circuit Images from Satellite Hardware.
 - **Goal:** Detection of wires defect on a set of images from production line.
 - **Main challenges:** Occlusion, variation, noise, grayscale, semantic analysis.
- Thales Alenia Space (TAS) : Ship Detection on Satellite Images.
 - **Goal:** Find ships directly on satellite images as quickly as possible by semantic segmentation.
 - **Main challenges:** Semantic segmentation on binary images of ships (objects from the same class with large variability in terms of scale, pose, viewpoint and background).
- Feature engineering and ML model training workflows for the Desjardins Data Cup 2018.
 - **Goal:** Detect fraud in financial payment services using machine learning algorithms.
 - **Main challenges:** Unstructured financial data, parallel data loading and training, a large volume of data.

Main tools:

- scikit-learn, PyTorch, Tensorflow, Keras, SHAP, LIME, OpenCV, NVIDIA RAPIDS, Dask, etc.

Dec, 2010 – Aug, 2013 (2 years 8 month) — Salvador, Bahia, Brazil

Software Consultant at [JCL Tecnologia](#).

JCL Tecnologia is a Brazilian company focused on consulting and auditing in Information Technology and Computer Networks.

- **My main activities were:**

- design and develop intelligent modules for the “e-cidade” project. The e-cidade project was designed to the management of Brazilian municipalities in an integrated way;
- testing software components;

- **Tools and technologies used:**

- HTML, JavaScript, CSS, AJAX, PHP, MySQL and SQL Server.

Apr, 2011 – Mar, 2012 (1 year) — Salvador, Bahia, Brazil

IT Supervisor at [CTAI](#).

CTAI is the abbreviation of “Centro de Capacitação Tecnológica em Automação Industrial”. CTAI is a Brazilian Technology Training Center for Industrial Automation, located at Polytechnique School of Federal University of Bahia, Brazil.

- **My main activities were:**

- software development;
- technical support for CTAI platform;
- management and acquisition of hardware and software licenses;

Oct, 2006 – Mar, 2010 (3 years 6 months) — Salvador, Bahia, Brazil

Systems Analyst and Software Developer at [SEMGE](#).

SEMGE is a municipal secretary of Salvador de Bahia. I worked with analysis, design and development of Web applications and data processing systems.

I collaborated to the development of the following software applications:

- SIATE (PHP);
- Portal for University (Delphi);
- SOE (Sistema de Operações Especiais) (PHP).

Web sites:

- [Portal do Servidor](#) (PHP with Joomla);
- [Site de Concursos](#) (PHP).

Customer support:

- An online platform to register and monitor the internal processes, called e-protocolo.

PUBLICATIONS

JOURNALS

- 2021** Silva, Caroline; De Souza, Jose A. M. Felipe; Vacavant, Antoine; Bouwmans, Thierry; Cordolino Sobral, Andrews. “Automated Mathematical Equation Discovery for Visual Analysis”, ArXiv, 2104.08633, 2021 ([submitted to Machine Learning Research \(JMLR\)](#)) [\[PDF\]](#) [\[CODE\]](#).
- 2018** Bouwmans, Thierry; Silva, Caroline; Marghes, Cristina; Zitouni, Sami; Bhaskar, Harish; Frelicot, Carl. “On the Role and the Importance of Features for Background Modeling and Foreground Detection”, Computer Science Review [\[PDF\]](#).
- 2017** Silva, Caroline; Bouwmans, Thierry; Frelicot, Carl. “Superpixel-based incremental wagging one-class ensemble for feature selection in foreground/background separation”, Pattern Recognition Letters (PRL) [\[PDF\]](#) [\[CODE\]](#).

INTERNATIONAL CONFERENCES AND WORKSHOPS

- 2016** Silva, Caroline; Frelicot, Carl. “Online Weighted One-Class Ensemble for Feature Selection in Background/Foreground Separation”. The International Conference on Pattern Recognition (ICPR), Cancun, Mexico, December, 2016, (*oral presentation*) [\[PDF\]](#) [\[CODE\]](#).
- 2015** Silva, Caroline; Frelicot, Carl. “An eXtended Center-Symmetric Local Binary Pattern for Background Modeling and Subtraction in Videos”. In the Proceedings of the 10th International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications (VISAPP), Berlin, Germany, March, 2015, (*oral presentation*) [\[PDF\]](#) [\[CODE\]](#).

NATIONAL CONFERENCES AND WORKSHOPS

- 2014** Silva, Caroline; Sobral, Andrews; Vieira, Raissa Tavares. “An automatic facial expression recognition system evaluated with different classifiers”. X Workshop de Visão Computacional (WVC’2014), Uberlândia, Minas Gerais, Brazil, October, 2014 [\[PDF\]](#) [\[CODE\]](#).
- 2014** Silva, Caroline; Sobral, Andrews; Vieira, Raissa Tavares. “Facial expression recognition in static images by generalized procrustes analysis”. X Workshop de Visão Computacional (WVC’2014), Uberlândia, Minas Gerais, Brazil, October, 2014 [\[PDF\]](#).
- 2012** Silva, Caroline; Schnitman, Leizer; Oliveira, Luciano. “Detection of Facial Landmarks Using Local-Based Information”. The 19th edition of the Brazilian Conference on Automation - CBA 2012, Campina Grande, PB, Brazil, September, 2012, (*oral presentation*) [\[PDF\]](#) [\[CODE\]](#).
- 2010** Sobral, Andrews; Silva, Caroline; Júnior, Carlos A.V.V.; Oliveira, Fabrício M. “RAVE: A robot platform for research and development in mobile robotics using r/c car”. CONEM 2010 - VI National Congress of Mechanical Engineering, Campina Grande, PB, Brazil, August 21, 2010 [\[PROJECT PAGE\]](#) [\[PDF\]](#).

EDITORIAL ACTIVITIES

I'm currently editorial board member of [Journal of Soft Computing and Artificial Intelligence](#)

ADDITIONAL INFORMATION

INVITED TALKS

2019 "AI and Deep Learning for On-Board Satellite Image Analysis", OW2con'19

2019 "Proactive Machine Learning (PML) ", SophiaConf2019.

2014 "A New Texture Descriptor Based on Local Binary Patterns for Background Subtraction", Lab. Mathématiques, Image et Applications (MIA).

2014 "A New Texture Descriptor Based on Local Binary Patterns for Background Subtraction", Lab. XLIM-SIC, Poitiers, France.

EVENT PARTICIPATION

2015 "Programmation Python pour le calcul scientifique", 27-29 May, La Rochelle, France.

2014 "Traitement et analyse statistique des données massives (BigData)", 19-21 November, Poitiers, France.

2014 "WVC (Workshop de Visão Computacional)", 3-5 June, Rio de Janeiro, Brazil.

HOBBIES AND INTERESTS



Personal development



Meditation



Travel



Neuroscience & Astronomy