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## Curriculum Vitae

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### 1. HIGHLIGHTS OF QUALIFICATION

- Scientific career with the most demanding international standards, being able to develop very strong analytical skills.
- High communication skills as Teacher for more than 16 years.
- Principal Investigator (PI) of several projects funded by the Portuguese Foundation for the Science and Technology and with the Industry (total raised up to 600k€).
- Big Data entrepreneurial experience developing algorithms to deal with big amounts of information and to transform them into business knowledge.
- Entrepreneurial experience developing communication and leadership skills in the area of Online Lead Generation, Web Marketing and Information Systems. Strong connection to management since the beginning (People Router project).
- Teaching of a PhD Course on Computational Techniques on Estimation, Identification and Detection, with strong knowledge on Artificial Intelligence and Machine Learning.
- Strong leadership experience in Non-for-profit associations.

### 2. ACADEMIC DEGREES

- **PhD** degree obtained in the 2<sup>nd</sup> of October of 2008 by the University of Coimbra in the area of **Computer Vision** (Electrical Engineering, field of Informatics), with the highest grade. Thesis under the title “Noncentral Catadioptric Systems With Quadric Mirrors: Geometry and Calibration”. The supervisor was the Prof. Helder Araújo. Principal reviewer of the thesis: Prof. Rahul Swaminathan, Technical University of Berlin and Deutsche Telekom.
- MsC in Systems and Automation by the Science and Technology Faculty of the University of Coimbra. The master thesis title was “Motion estimation in sequences of stereo images: comparison of two methods”. Approved with ‘Very Good’ grade (highest). The supervisor was the Prof. Helder Araújo.
- BsC in Electrical Engineering, branch of Computers by the University of Coimbra. The final grade was 18 (in 20).

### 3. PROFESSIONAL SITUATION

- **Tenured Assistant Professor** at the Department of Electrical and Computers Engineering of the Faculty of Science and Technology of the University of Coimbra.
- **CEO** of People Router, The World on Demand, an entrepreneurship project on Big Data, Web Marketing and Information Systems.
- **Permanent Researcher** of the Institute for Systems and Robotics – University of Coimbra.

#### 4. PROJECTS

- **TrustStamp** – A R&D project with the industry for the development of security products. November-2016 to May-2018.
- **UniqueMark** – A R&D project with the industry for the development of security products. December-2016 to June-2018.
- **Card3DFace** – A R&D project with the industry for the development of security products. January-2017 to December-2018.
- **UniProjection** - Unified Projection Model of Non SVP Systems - Application to Endoscopy and Graphics
  - Geometric calibration of cameras from image of lines in a non-supervised environment, using radial distortion.
  - Projection Model for general Non Single Viewpoint Systems.
  - Computer Aided Surgery based in the processing of inter-operative endoscopic images.
  - Faster accurate reflection in mirror for faster graphics rendering.
  - Augmented reality in real-time.
  - GPU programming for the use of reflections in games (computer graphics).
  - **Collaboration** with Project Vegas at INRIA Nancy Grand Est, at Nancy, France for the computation of the explicit projection model using quadrics intersection (visit in January, 2013).
  - **Link:** <http://scrat.isr.uc.pt/>
- **Webpage classification** – Automatic classification of webpages using visual features.
  - Low level and mid-level visual features to classify webpages according to objective and subjective criteria, such as, area of interest (newspaper, sports, celebrity ...), recency, among others.
  - High level features to improve classification accuracy.
- **Face age estimation** – Automatic estimation of age from faces, using visual features.
  - Low level and mid-level visual features to estimate face aging.
  - High level features to improve classification accuracy.
- **SO (10)** – Automatic computation of the Yukawa interaction terms for SO(N) groups in orthogonal  $2n \times 2n$  matrices of rotations in  $2n$  dimensional real space.
  - Building a C++ class for the computation of the terms, to be publicly available.
  - In collaboration with CFTP (Centre for Theoretical Particle Physics) of the Instituto Superior Técnico, of the Technical University of Lisbon.

#### 5. RESEARCH INTERESTS

- Computer Vision
- Estimation and Classification Techniques
- Medical imaging
- Omnidirectional vision
- Camera Calibration
- Computer Graphics

- Pattern Recognition
- Visual webpage classification
- Face aging
- Geometry in Robot Vision
- Robot navigation by Vision
- Information Systems for Computer Science
- Web Marketing

## 6. ENTREPRENEURSHIP ACTIVITIES

- Since Feb/2010 – **CEO** and Partner of **People Router** Project in Lisbon and Madrid. Specialist in Big Data and Information Systems has developed a technological platform for online lead management that supports the project business model. It is based on a novel **scoring algorithm** for **optimization of conversion rates**. In a leave of absence between September/2010 and February/2012.
  - Funds raised from BA: ~150 k€
  - As CEO of this spin-off start-up, I dedicated 2 years to its management.
  - **Link:** [www.peoplerouter.com](http://www.peoplerouter.com)

## 7. OTHER RESEARCH ACTIVITIES

- Summer School ‘Embedded systems: Trajectory Control for a Mobile Robot’ in the University of Reading, UK. July/August 1998
- Summer Research Grant for the development of an interface for an optical device: OPTO 3D. Summer of 1998. Institute of Systems and Robotics – Coimbra, Portugal.
- Summer School in Solar Astrophysics – EVISS99. Astronomical Observatory of the University of Coimbra. July, 1999.
- Visiting researcher at the University of Tsinghua, Beijing, China, August of 2000.
- Summer School – 1<sup>st</sup> EURON - “Mobile Robot Navigation”, in the École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland – September, 2001.
- NEURO-IT Summer School in Neurotechnology and Neuroengineering, in Venice, June 2005.
- Regular Reviewer of several Scientific Journals:
  - Computer Vision and Image Understanding (CVIU)
  - Pattern Recognition (PR)
  - Image and Vision Computing (IVC)
  - Pattern Recognition Letter (PRL)
  - Transaction on Robotics (TR)
  - Transaction on Image Processing (TIP)
  - Autonomous Robots (AR)
  - Transactions on Computer Vision and Applications (CVA)
  - International Journal of Imaging (IJI)
  - International Journal of Pattern Recognition and Artificial Intelligence (PRAI)
  - ETRI Journal
  - ...
- ... and International Conferences
  - International Conference on Computer Vision (ICCV)
  - Computer Vision and Pattern Recognition (CVPR)
  - International Conference on Robotics and Automation (ICRA)
  - International Conference on Intelligent Robots and Systems (IROS)
  - Workshop on Omnidirectional Vision (OMNIVIS)
  - International Conference on Image Processing (ICIP)
  - American Conference on Information Systems (AMCIS)

- International Conference on Information Systems (ICIS)
- International Conference on Intelligent Transportation Systems (ITSC)
- Intelligent Vehicles (IV)
- ...
- Member of several Masters and a PhD thesis' jury.
- Regular supervision of Master's thesis in the aim of Electrical and Computers Engineering Master degree at the University of Coimbra.
- Session Chair at 10<sup>th</sup> WEBIST, 2014 – Barcelona, Spain.

## 8. PUBLICATIONS

### PhD Thesis

- **Nuno Gonçalves.** *Noncentral Catadioptric Systems with Quadric Mirrors: Geometry and Calibration* 2/October/2008. University of Coimbra. Supervisor: Prof. Helder Araújo. Approved with the highest classification. Principal reviewer of the thesis: Prof. Rahul Swaminathan, Technical University of Berlin and Deutsche Telekom.

### Master Thesis

- **Nuno Gonçalves.** *Estimação de Movimento em Sequências de Imagens Estéreo – Comparação de Dois Métodos.* 19/June/2002. University of Coimbra. Very Good grade.

### Book Chapters

- **Nuno Gonçalves,** António Videira, "Automatic Web Page Classification Using Visual Content for Subjective and Functional Variables", Web Information Systems and Technologies Volume 226 of the series Lecture Notes in Business Information Processing pp 279-294. 2015

### International Journals

- **Nuno Gonçalves,** Ana Catarina Nogueira and André Lages Miguel, "Forward Projection Model of Noncentral Catadioptric Cameras with Spherical Mirrors", ROBOTICA University of Cambridge, Accepted, in press. 2016.
- Nuno Cardoso, David Emmanuel-Costa, **Nuno Gonçalves** and C. Simões, "SoSpin, a C library for Yukawa decomposition in SO(2N) models", Computer Physics Communications, February 2016, ISSN 0010-4655, DOI:10.1016/j.cpc.2016.01.010.
- Tiago Dias, Pedro Miraldo and **Nuno Gonçalves,** "A Framework for Augmented Reality using Non-Central Catadioptric Cameras". Journal of Intelligent and Robotic Systems, January 2016. DOI:10.1007/s10846-016-0349-9.
- Tiago Matias, Francisco Souza, Rui Araújo, **Nuno Gonçalves,** João P. Barreto, "Sequential Extreme Learning Machine Based on Recursive Partial Least Squares", Journal of Process Control, 2015.
- Pedro Miraldo, Helder Araújo and **Nuno Gonçalves.** Pose Estimation for General Cameras using Lines. IEEE Transactions on Systems Man and Cybernetics Part B (Cybernetics). Issue 99. DOI: 10.1109/TCYB.2014.2366378. 2015.

- Nuno Gonçalves, Diogo Roxo, João P Barreto and Pedro Rodrigues. Perspective shape from shading for wide-FOV near-lighting endoscopes. *Neurocomputing* (150) 136-146. 2015.
- Jérôme Mendes, Francisco Souza, Rui Araújo and **Nuno Gonçalves**. Genetic fuzzy system for data-driven soft sensors design. *Applied Soft Computing*, No. 12 (10), p. 3237-3245, Elsevier. 2012.
- Micael Couceiro; David Portugal; **Nuno Gonçalves**; Rui Rocha; Miguel Luz; Carlos Figueiredo and Gonçalo Dias. A Methodology for Detection and Estimation in the Analysis of the Golf Putting. *Pattern Analysis and Applications*, Springer, DOI 10.1007/s10044-012-0276-8, ISSN 1433-755X (Online) / 1433-7541 (Print), 2012.
- **Nuno Gonçalves**. On the reflection point where light reflects to a known destination in quadric surfaces. *Optics Letters* (Optical Society of America) 35(2) p.100-102, 2010.
- **Nuno Gonçalves** and Helder Araújo. Estimating Parameters of Noncentral Catadioptric Systems Using Bundle Adjustment. *CVIU (Computer Vision and Image Understanding)*. CVIU 113(1), January 2009, p. 11-28.
- **Nuno Gonçalves** and Helder Araújo. Low-Cost Method for the Estimation of the Shape of Quadric Mirrors and Calibration of Catadioptric Cameras. **Journal of Optical Engineering**, Society of Photo-Optical Instrumentation Engineers (SPIE). 46(7) p. 1-12, July 2007.
- **Nuno Gonçalves** and Helder Araújo. *Analysis and comparison of two methods for the estimation of 3D motion parameters*. Published in *Robotics and Autonomous Systems*, Elsevier Science. October 2003. 45(2003), pp. 23-49

#### **International Conferences with referreing**

- Rodrigo Ferreira and **Nuno Gonçalves**. Accurate and fast micro lenses depth maps from a 3D point cloud in light field cameras. *International Conference on Pattern Recognition (ICPR'2016)*, December, 2016, Cancun, Mexico.
- Rodrigo Ferreira and **Nuno Gonçalves**. Fast and accurate micro lenses depth maps for multi-focus light field cameras. *German Conference on Pattern Recognition (GCPR'2016)*, September, 2016, Hannover, Germany.
- Rodrigo Ferreira, Joel Cunha and **Nuno Gonçalves**, "Multi-Focus Plenoptic Simulator and Lens Pattern Mixing for Dense Depth Map Estimation". Accepted to 37th Eurographics 2016, Lisbon. 2016
- Tiago Dias, Pedro Miraldo and **Nuno Goncalves**. A Framework for Augmented Reality Using Non-Central Catadioptric Cameras. *IEEE International Conference on Autonomous Robot Systems and Competitions (ICARSC'2015)*, pp.213-220. Vila Real, Portugal. April 2015. doi: 10.1109/ICARSC.2015.31
- Tiago Dias, Pedro Miraldo, **Nuno Gonçalves** and Pedro Lima. Augmented Reality on Robot Navigation using Non-Central Catadioptric Cameras. *IEEE/RSJ Proc. International Conconference on Intelligent Robots and Systems (IROS)*, Hamburg, Germany. 2015.
- António Videira and **Nuno Gonçalves**. "Automatic Web Page Classification using Visual Content". *WEBIST'14 (10th International Conference on Web Information Systems and Technologies)*. April 2014. Barcelona, Spain.

- André Miguel, Ana Catarina Nogueira and **Nuno Gonçalves**. "Real-Time 3D Visualization of Accurate Specular Reflections in Curved Mirrors - A GPU Implementation". GRAPP'14 (9th International Conference on Computer Graphics Theory and Applications). Jan 2014.
- Rui Melo, Michel Antunes, João P. Barreto, Gabriel Falcão and **Nuno Gonçalves**. "Unsupervised intrinsic calibration from a single frame using a "plumb-line" approach". ICCV'13 (International Conference on Computer Vision). Sydney, Australia. Dec 2013.
- Susana Silva, Iulian Otel, Sofia Gouveia, Leonor Gomes, Luís Negrão, Maria João Quadrado, **Nuno Gonçalves**, João Barreto and António Miguel Morgado. Corneal Nerve Morphometry for Diabetic Peripheral Neuropathy Assessment. The International Conference on Health Informatics. IFMBE Proceedings Volume 42, 2014, pp 296-299.
- Diogo Roxo, **Nuno Gonçalves** and João Barreto. Perspective Shape from Shading for Wide-FOV Near-Lighting Endoscopes. Accepted to IbPria 2013 (6th Iberian Conference on Pattern Recognition and Image Analysis). Madeira, Portugal, Jun 2013.
- João Andrade, Gabriel Falcão, Vitor Silva, João Barreto, **Nuno Gonçalves** and Valentin Savin. Near-LSPA Performance at MSA Complexity. Accepted to IEEE ICC'13 (International Conference on Communications) - Communications Theory. Budapest, Hungary, Jun 2013.
- Miguel Lourenço and **Nuno Gonçalves**. Fusing appearance and geometric constrains for estimating the epipolar geometry. WACV 2013 (Workshop on the Applications of Computer Vision) in Clearwater, Florida. Jan 2013.
- **Nuno Gonçalves** and Ana Catarina Nogueira. "Faster accurate reflections through quadric mirrors", SIGGRAPH '10 (ACM SIGGRAPH), Los Angeles, USA, Jul 2010.
- **Nuno Gonçalves** and Ana Catarina Nogueira. Projection through quadric mirrors made faster. Published in the International Conference OMNIVIS'09 – The 9th Workshop on Omnidirectional Vision, Camera Networks and Non-Classical Cameras, in conjunction with the ICCV'09, Kyoto, Japan, 4th of October of 2009.
- **Nuno Gonçalves** and Helder Araújo. *Linear Solution for the Pose Estimation of Noncentral Catadioptric Cameras*. OMNIVIS'07 – The 7th Workshop on Omnidirectional Vision, Camera Networks and Non-Classical Cameras, in conjunction with the ICCV'07, Rio, Brazil, October 2007.
- **Nuno Gonçalves** and Helder Araújo. *Partial Calibration and Mirror Shape Recovery for Non-central Catadioptric Systems*. OMNIVIS'05 – The 6th Workshop on Omnidirectional Vision, Camera Networks and Non-Classical Cameras, in conjunction with the ICCV'05, Beijing, China, October 2005.
- **Nuno Gonçalves** and Helder Araújo. *Estimating Parameters of Non-Central Catadioptric Systems Using Bundle Adjustment*. OMNIVIS'05 – The 6th Workshop on Omnidirectional Vision, Camera Networks and Non-Classical Cameras, in conjunction with the ICCV'05, Beijing, China, October 2005.
- **Nuno Gonçalves** and Helder Araújo. [Projection Model, 3D Reconstruction and Rigid Motion Estimation from Non-central Catadioptric Images](#). 2<sup>nd</sup> International Symposium on 3D Data Processing, Visualization and Transmission, Thessaloniki, Greece, September 2004.
- **Nuno Gonçalves** and Helder Araújo. *Rigid Motion Estimation from Catadioptric Images*. IEEE sponsored international conference ICPR2004. August 2004, Cambridge, UK.

- **Nuno Gonçalves** and Helder Araújo. *Mirror shape recovery from image curves and intrinsic parameters: Rotationally symmetric and conic mirrors*. Published in the OMNIVIS2003 workshop, in conjunction with the CVPR'03. June 2003, Madison, USA.
- **Nuno Gonçalves** and Helder Araújo. *Estimation of 3D Motion from Stereo Images – Uncertainty Analysis and Experimental Results*. Proceedings of the conference IROS2002, Lausanne – Switzerland, October 2002.
- **Nuno Gonçalves** and Helder Araújo. *Uncertainty Propagation in Estimation of Partial 3D Velocity*. Proceedings of the conference MED2002 (10<sup>th</sup> Mediterranean Conference on Control and Automation), Lisbon, Portugal, July 2002.
- **Nuno Gonçalves** and Helder Araújo. *Estimation of 3D Motion from Stereo Images – Differential and Discrete Formulations*. Proceedings of the conference ICPR2002, Quebec – Canada, August 2002.
- **Nuno Gonçalves** and Helder Araújo. *Analysis of Two Methods for Estimation of Partial 3D Velocity*. Proceedings of Symposium on Intelligent Robotic Systems - SIRS2001, Toulouse – France, July 2001.
- Carlos Queiroz; **Nuno Gonçalves** and Paulo Menezes. *A Study on Static Gaits for a Four Legged Robot*. Proceedings of CONTROL'2000, Cambridge - UK, September 2000.

#### **National Conferences with refereeing**

- Tiago Dias, Pedro Miraldo and **Nuno Goncalves**. A GPU Approach to Augmented Reality using Non-Central Catadioptric Cameras. Conferência Ciências e Tecnologias da Interação 2015 - SciTechn15, Coimbra, Portugal. 2015.

## **9. COURSES TAUGHT**

Taught in the Department of Electrical and Computers Engineering of the University of Coimbra the following course of the BsC and MsC degrees:

1. Computers Architectures
2. Industrial Automation
3. Electrical Circuits
4. Design and Computer Graphics
5. Data Structures and Algorithms
6. Afine and Projective Geometry
7. Geometry of Image Formation
8. Control Theory
9. Digital Systems
10. Real-Time Systems
11. Microprocessors Systems
12. Computers Technology
13. Computer Vision

For the Doctoral Programme taught the discipline **Computational Techniques of Estimation, Detection and Identification**.

Lisbon, 30th of November, 2016