

---

# Computer Vision

## MAP-I Curricular Unit

### Context

This document describes a PhD level course, corresponding to a Curriculum Unit credited with 7 ECTS, intended for the MAP-I doctoral program. It is offered jointly by (i) Departamento de Ciência de Computadores, Universidade do Porto, (ii) Departamento de Engenharia Informática, Universidade do Porto, (iii) Departamento de Engenharia Electrotécnica e de Computadores, Universidade do Porto (iv) Departamento de Electrónica, Telecomunicações e Informática, Universidade de Aveiro.

### Course Description

The proposed unit intends to be a specialization in computer vision topics, namely image and video processing, pattern recognition and machine learning.

The impressive technological evolution of signal and image capturing hardware has slowly created a new and demanding problem: How do we handle so much data? There is a clear need for automatic tools that can help us analyse, find and annotate the massive amount of video information captured by modern technology. A *Computer Vision* learning unit is therefore vital for motivating and preparing PhD students with mathematical tools that will help them handle the various real-world problems where computer vision methods might provide robust solutions.

### Teaching Staff

Miguel Tavares Coimbra ( <i>Principal Instructor</i> )	FC, UP	mcoimbra@fc.up.pt
João Paulo Silva Cunha	FE, UP	jcunha@det.ua.pt
António José Ribeiro Neves	DETI, UA	an@ua.pt
Luís Filipe Almeida Teixeira	FE, UP	luisft@fe.up.pt

### Prerequisites

Familiarity with basic signal processing methods, namely frequency domain analysis, is highly desirable. Also, some familiarity with a popular programming language such as C or Java is desirable. None of these are strictly necessary but students who have not previously taken courses in these topics may have to work harder to keep up.

### Textbooks and references

- D. Forsyth, J. Ponce, “Computer Vision: A Modern Approach”, Prentice Hall, 2002.

### Course Objectives

The main objectives of this unit can be summarized in the following topics:

- 
- Present and motivate the student for the various topics of *Computer Vision*.
  - Provide the students with a core-set of mathematical tools, useful for most *Computer Vision* challenges.
  - Introduce the student to national and international institutions and companies where *Computer Vision* is a potential solution to their real-world problems.
  - Help the student develop rigorous research and development methodologies.

## Course Topics

- **Chapter I - Image and Video Processing**
  - **Definitions:** optics and image formation; digital image; colour models; medical imaging; noise.
  - **Low-level feature extraction:** colour; texture; shape.
  - **Image pre-processing:** filtering; enhancement.
- **Chapter II - Image Segmentation**
  - **Basic methods:** thresholding; colour segmentation; region-based segmentation; mathematical morphology.
  - **Segmentation by clustering:** background subtraction; mean-shift; k-means; graph-theoretic clustering; normalised cuts.
  - **Segmentation by fitting:** fitting lines; fitting curves; robust methods.
- **Chapter III – Pattern Recognition**
  - **Fundamentals:** definitions; feature vectors; classes; principal component analysis.
  - **Generic pattern recognition techniques:** statistical pattern recognition, soft-computing machines, neural networks, support vector machines.
  - **Pattern recognition for computer vision:** hypothesize and test; template matching; relations between templates.
- **Chapter IV – Applications**
  - **Applied Computer Vision:** various examples.

## Expected number of students

10

## Teaching Methodology

- Theoretical presentation of *Computer Vision* topics in the form of classes and/or seminars given by lecturers of the learning unit or invited speakers.
- Integration of students into the teaching process, namely the presentation of state-of-the-art reviews on certain *Computer Vision* topics, enabling them to tighten their relationship with the learning unit and stimulating their interest on a set of specific topics.

## Time scheduling

- 7 ECTS (189 hours)
- 3 hours/week for 14 weeks
- 1.5 hours/week guided study

---

## **Evaluation Criteria**

- 50%: Final Exam.
- 40%: Scientific paper submission. This can be either an individual paper with a review on a specific computer vision topic, or a group paper (two students) which describes scientific results obtained by the students.
- 10%: Presentations of selected papers during lectures.

# CURRICULUM VITAE

## PERSONAL DETAILS

Name: Miguel Tavares Coimbra  
Date of Birth: 15/05/1975  
Nationality: Portuguese  
Address: Rua Clube dos Caçadores, 905, 1º DTTZ  
4430-057 Vila Nova de Gaia  
Portugal  
E-mail: mcoimbra@fc.up.pt  
Webpage: www.dcc.fc.up.pt/~mcoimbra

## EDUCATION

- 2004-2006 Post-Doc studies at IEETA, University of Aveiro, Portugal. Work consisted in using computer vision methods for the creation of computer tools for clinical analysis of a variety of video exams. Examples include automatic annotation of endoscopic capsule exams, single particle tracking for low SNR confocal microscopy exams, and numerical quantification of patient 3D motion during epileptic seizures.
- 1999-2004 PhD in Electronic Engineering, Queen Mary, University of London, “Compressed Domain Processing with Applications to Surveillance”. Research consisted in the study of compressed domain information of encoded digital video. This resulted in the development of fast tools that approximate traditional image and video processing methods. The test scenario for these tools was a real underground train CCTV surveillance system.
- 1993-1998 BEng in Electrical and Computer Engineering with specialization in Telecommunications, at Faculdade de Engenharia da Universidade do Porto, Portugal. Final average: 16. Distinction for graduating in the top 5% of students.

## PROFESSIONAL AND ACADEMIC EXPERIENCE

- 2006-... Assistant Professor of the Computer Science Dep., Faculty of Sciences of the University of Porto, Portugal.
- 1998-1999 Researcher at INESC-Porto. Worked in the VIDION project in collaboration with RTP, the Portuguese public television provider. Work consisted in the development of the ‘Search workstation’ for RTP’s multimedia digital archive. It included search, real-time navigation and on-line visualization of results.

## PUBLICATIONS - JOURNAL PAPERS

1. L. Rodrigues, R. Sampaio, M. Coimbra, “Contrast Medium Volume Optimization in Abdominal CT on Basis of Lean Body Weight”, in *American Journal of Biomedical Engineering*, vol.3(6A), Dec 2013, pp.22-26.
2. F. Riaz, F.B. Silva, M. Dinis-Ribeiro, and M. Coimbra, "Impact of Visual Features on The Segmentation of Gastroenterology Images Using Normalized Cuts", accepted for publication in *IEEE Transactions on Biomedical Engineering*.
3. F.B. Silva, M. Dinis-Ribeiro, M. Coimbra, et al., "Endoscopic assessment and grading of Barrett’s esophagus using magnification endoscopy and narrow band imaging: impact of structured learning program and experience on the accuracy of the Amsterdam classification system", in *Scandinavian Journal of Gastroenterology*, Nov 2012.
4. F. Riaz, F.B. Silva, M. Dinis-Ribeiro, and M. Coimbra, "Invariant Gabor Texture Descriptors for Classification of Gastroenterology Images", in *IEEE Transactions on Biomedical Engineering*, vol. 59/10, Oct 2012, pp. 2893-2904.

5. C. Ye, B.V.K. Vijaya Kumar, M. Coimbra, "Heartbeat Classification using Morphological and Dynamic Features of ECG Signals", in *IEEE Transactions on Biomedical Engineering*, vol. 59/10, Oct 2012, pp. 2930-2941.
6. M. Coimbra, M. Mackiewicz, M. Fisher, C. Jamieson, J. Soares, J.P. Silva Cunha, "Computer Vision Tools for Capsule Endoscopy Exam Analysis", invited paper in *Eurasip NewsLetter*, vol. 18/1, March 2007, pp. 1-19.
7. J.P. Silva Cunha, M. Coimbra, P. Campos, J. Soares, "Automated Topographic Segmentation and Transit Time Estimation in Endoscopic Capsule Exams", in *IEEE Transactions in Medical Imaging*, vol. 27/1, Jan. 2008.
8. M. Coimbra, and J.P. Silva Cunha, "MPEG-7 visual descriptors – Contributions for automated feature extraction in capsule endoscopy", in *IEEE Trans. Circuits and Systems for Video Technology*, vol. 16/5, 2006, pp. 628-637.
9. M. Coimbra, and M. Davies, "Approximating optical flow within the MPEG-2 compressed domain" in *IEEE Transactions on Circuits and Systems for Video Technology*, Volume: 15 , Issue: 1 , Jan. 2005, pp. 103-107.

## FINANCED PROJECTS

1. GEMINI – GastroEnterology Made INteractIve; Funding Organization: IT; Role: PI; Total Funding: 39.970€; Own Funding: 31.080€; Duration: 2 years; Finishes in May 2016
2. Future Health - Health Monitoring in Future Cities; Funding Organization: QREN; Role: PI; Funding: 366.879€; Duration: 2.5 years
3. HeartSafe - Assessing Heart Function for Unsupervised Homecare Applications through Multi-Channel Auscultation; Funding Organization: FCT; Role: Co-PI (IT Team Leader); Funding: 199.864€; Duration: 2 years
4. CellNote Touch - Touch-based Interactive Annotation of Cellular Images; Funding Organization: IT; Role: PI; Funding: 46.400€; Duration: 2 years
5. DECA-Bio - Dependent Component Analysis of Biological Signals; Funding Organization: IT; Role: Co-PI (IT Porto Team Leader); Funding: 35.700€; Duration: 2 years
6. CAGE - Computer Assisted Gastroenterology Examination; Funding Organization: FCT; Role: PI; Funding: 145.000€; Duration: 3 years
7. DigiScope - DIGItally enhanced stethosCOPE for clinical usage; Funding Organization: FCT; Role: PI; Funding: 120.000€; Duration: 3 years
8. MovEpi3D - Motion quantification of 3D body motion during epileptic seizures; Funding Organization: FCT; Role: Researcher; Funding: 128.796€; Duration: 3 years
9. GERES-Med - Grid-Enabled REpositorieS for medical applications; Funding Organization: FCT; Role: Researcher; Funding: 199.560€; Duration: 2 years
10. CapView – Automated Tools for Endoscopic Capsule Exam Analysis; Funding Organization: FCT; Role: Researcher; Funding: 87.300€; Duration: 3 years

## OTHER INDICATORS

2	PhD Alumni
18	MSc Alumni
62	Conference Papers
31	Technical Program Committees of International Conferences
6	PhD Academic Committees
3	PhD Steering Committees
1	European Doctorate Committee
18	MSc Academic Committees

## CURRICULUM VITAE

**Name:** António José Ribeiro Neves

**University:** University of Aveiro

**Department:** Electronics, Telecommunications and Informatics

**R&D Unit:** Institute of Electronics and Telematics Engineering of Aveiro

**E-mail:** an@ua.pt

**Telephone:** 927994296

### **Academic degrees:**

- Ph.D. - University of Aveiro , 2007
- Habilitation "Licenciatura" in Electronics and Telecommunications - University of Aveiro, 2002

### **Academic career:**

- Assistant Professor, University of Aveiro, since 2007
- Coordinator of several courses and collaborator in some others on the areas of Informatics, Signal Processing and Robotics in the masters programmes from Department of Electronics, Telecommunications and Informatics.

### **Research interests:**

- Image and video coding (lossless coding, lossy-to-lossless coding and pre-processing techniques)
- Bioinformatics (Microarray images and DNA coding)
- Robotics (computer vision, sensor fusion, learning and multi-agent robotics)

### **Research and post-graduate experience:**

- Member of 13 research projects in robotics and signal processing, with several founding sources, some of them still active. He is currently the team leader of the CAMBADA robotic project.
- Co-author of 5 book chapters and 9 papers in international journals with referee for a total of around 95 papers in journals, book chapters, and conference proceedings.
- Reviewer for several journals in robotics and signal processing.
- Organized 4 conferences and served as member of Scientific/Technical Committees for around 46 conferences/workshops.
- Strong post-graduate teaching experience in robotics and signal processing.
- Supervised 26 MSc students and is supervising 4 PhD students.
- Collaboration with the PhD Programme MAP-i in Portugal.

### **Prizes/Awards:**

- 19 awards as a member of the CAMBADA Middle Size Robotic team CAMBADA in several scientific events (6 national and 13 International).



**João Paulo Silva Cunha** is Associate Professor (with “Agregação”) at the Department of Electrical and Computer Engineering of the Faculty of Engineering of the University of Porto, Portugal and senior researcher at the INESC-TEC: Institute for Systems and Computer Engineering (<http://www.inesctec.pt>) where he created the BRAIN – Biomedical Research And INnovation - research group. He is also co-PI of the recently created *Center for Biomedical Engineering Research* (C-BER) of INESC-TEC that aggregates ~30 researchers. Prof. Cunha is also affiliated with the Institute for Electronics and Telematics Engineering (IEETA) of the University of Aveiro, Portugal and visiting professor at the Neurology Dep., Faculty of Medicine of the University of Munich, Germany. He is faculty member of the Carnegie-Mellon|Portugal (CMU-P) program and was faculty of the Information Networking Institute (INI) of the Carnegie Mellon University between 2007 and 2009 in the framework of the Masters in Information Networking (MSIN) dual degree.

Prof. Cunha earned a degree in Electronics and Telecommunications engineering (1989), a Ph.D. (1996) and an “Agregação” degree (2009) in Electrical Engineering all at the University of Aveiro, Portugal. He was the creator (1997) and leader of the “Healthcare Information and systems” R&D group and head of the “Innovative Biomedical Technologies” transverse activity (involving ~50 researchers / 17 faculty) of IEETA research institute until 2012 (<http://www.ieeta.pt>) when he accepted a new challenge at the University of Porto.

Prof. Cunha is senior member of the IEEE (2004) where he joined the Engineering in Medicine and Biology Society (EMBS) in 1986 as a student member. He co-founded in 2007 a spin-off company called Biodevices SA (<http://www.biodevices.pt>) to bring to the market innovative biomedical technology developed for several years in his lab. He is co-author of more than 200 publications, of which, in the last five years, he has co-authored one book, 13 book chapters and 24 papers in international scientific journals cited on ISI, holding a ‘*h-index*’ of 10.

# Luis F. Teixeira

FEUP – Universidade do Porto  
Rua Dr. Roberto Frias, s/n  
4200-465 Porto  
Portugal

P +351 963953024  
F +351 225574103  
✉ [luisft@fe.up.pt](mailto:luisft@fe.up.pt)  
W <http://luisteixeira.net>

## Current position

*Assistant Professor*, Faculdade de Engenharia, Universidade do Porto

## Areas of specialization

computer vision, image processing, machine learning.

## Education

- 2005–2009 **PhD in Electrical and Computer Engineering, Universidade do Porto**  
*Title:* Contributions for the Automatic Description of Multimodal Scenes  
*Advisor:* Prof. Luis Corte-Real  
Approved by unanimous vote
- 2002–2004 **MSc in Computer Networks and Communication Services, Universidade do Porto**  
*Title:* Editing and Description Framework for Video Objects  
*Advisor:* Prof. Luis Corte-Real  
*Muito Bom* (Very good, top grade) with a first-year classification of 18/20
- 1996–2001 **Licenciatura in Electrical and Computer Engineering, Universidade do Porto**  
5-year degree – Major in Telecommunications  
Final classification of 17/20 (2<sup>nd</sup> among 116 finalists)

## Work experience

- 2013–  
2009–2013 **Assistant Professor at Dep. of Informatics Engineering (DEI) of FEUP**  
**Invited Assistant Professor at Dep. of Informatics Engineering (DEI) of FEUP**  
Coordinates and teaches courses and supervises MSc and PhD students.
- 2008–2013 **Senior Scientist at Fraunhofer AICOS**  
Member of the Scientific Board. Collaborates in industry, European and internal projects with management, and research and development responsibilities. Co-supervises projects by FEUP MSc students.
- 2006 **Visiting Researcher at University of Victoria**  
Collaborated in the Marsyas project with the supervision of Prof. George Tzanetakis.
- 2001–2008 **Researcher at INESC Porto**  
Collaborated in European projects and internal projects with research and development responsibilities. Co-supervised projects by FEUP MSc/Licenciatura students.
- 2004–2006 **Teaching Assistant at Dep. of Electrical and Computer Engineering (DEEC) of FEUP**  
Assisted Programming laboratory classes - Informatics Engineering course.
- 2001 **Junior Researcher at INEB**  
Collaborated in an internal project of the ARSIS group with development responsibilities.



## Grants, honours & awards

- 2014 Pedagogical recognition - top 10% of the teachers, according to the evaluation done by the students, FEUP – Universidade do Porto, 2014
- 2013 Pedagogical recognition - top 10% of the teachers, according to the evaluation done by the students, FEUP – Universidade do Porto, 2013
- 2004–2008 Doctoral scholarship, FCT - Portuguese Foundation for Science and Technology
- 2003–2004 Master's scholarship, FCT - Portuguese Foundation for Science and Technology
- 2001 Top 10% (2<sup>nd</sup> among 116 finalists) of the Licenciatura in ECE course, FEUP

## Publications & talks

### Theses

- 2009 2. Luis F. Teixeira. *Contributions for the Automatic Description of Multimodal Scenes*. PhD thesis, Faculdade de Engenharia da Universidade do Porto, Portugal, 2009.
- 2004 1. Luis F. Teixeira. Editing and description framework for video objects. Master's thesis, Faculdade de Engenharia da Universidade do Porto, Porto, Portugal, July 2004.

### Proceedings

- 2011 1. Jaime S. Cardoso, Luis F. Teixeira, and Pedro Quelhas, editors. *Portuguese Conference on Pattern Recognition*, Porto, Portugal, October 2011. APRP.

### Journal articles

- 2013 5. Pedro Carvalho, Telmo Oliveira, Lucian Ciobanu, Filipe Gaspar, Luis F. Teixeira, Rafael Bastos, Jaime S. Cardoso, Miguel S. Dias, Luís Corte-Real. Analysis of object description methods in a video object tracking environment. *Machine Vision and Applications*, 2013, 24(6):1149–1165, August 2013.
- 2009 4. Jaime S. Cardoso, Pedro Carvalho, Luis F. Teixeira, and Luis Corte-Real. Partition-distance methods for assessing spatial segmentations of images and videos. *Computer Vision and Image Understanding*, 113(7):811–823, July 2009.
- 3. Luis F. Teixeira and Luis Corte-Real. Video object matching across multiple independent views using local descriptors and adaptive learning. *Pattern Recognition Letters*, 30(2):157–167, January 2009.
- 2007 2. Luis F. Teixeira, Jaime S. Cardoso, and Luis Corte-Real. Object segmentation using background modelling and cascaded change detection. *Journal of Multimedia*, 2(5):55–64, September 2007.
- 1. M. J. Cardoso et al. Turning subjective into objective: The BCCT.core software for evaluation of cosmetic results in breast cancer conservative treatment. *The Breast*, 16(5):456–461, October 2007.

### International Conferences

- 2014 15. Samaneh Khoshrou, Jaime S. Cardoso, and Luis F. Teixeira. Active Learning from Video Streams in a Multi-Camera Scenario. In *Proceedings of the International Conference on Pattern Recognition*, Stockholm, Sweden, August 2014. (accepted)
- 2013 14. João Marques, Ana Vasconcelos, and Luis F. Teixeira. Senior-Driven Design and Development of Tablet-Based Cognitive Games. In *Proceedings of the International Conference on Wearable Micro and Nano Technologies for Personalized Health*, pages 133–138, Tallinn, Estonia, June 2013.

- 2012 13. Luis F. Teixeira, Pedro Carvalho, Jaime S. Cardoso, and Luis Corte-Real. Automatic description of object appearances in a wide-area surveillance scenario. In *Proceedings of the IEEE International Conference on Image Processing*, pages 1609–1612, Orlando, FL, September 2012.
12. Ana Vasconcelos, Paula Alexandra Silva, João Caseiro, Francisco Nunes, and Luis F. Teixeira. Designing tablet-based games for seniors: the example of cogniplay, a cognitive gaming platform. In *Proceedings of the International Conference on Fun and Games*, pages 1–10, Toulouse, France, September 2012.
- 2011 11. Pedro Teixeira, Francisco Nunes, Paula Silva and Luis F. Teixeira. Mover – Activity Monitor and Fall Detector for Android. In *Proceedings of the Workshop on Mobile Wellness at Mobile HCI 2011*, September, 2011.
10. Diogo Junior and Luis F. Teixeira. Location Based Services for Everyone. In *Proceedings of the Workshop on Mobile Wellness at Mobile HCI 2011*, September, 2011.
- 2009 9. Jaime S. Cardoso, Ricardo Sousa, Luis. F. Teixeira, and M. J. Cardoso. Breast contour detection with stable paths. *Communications in Computer and Information Science*, 25:439–452, 2009.
- 2008 8. Luis F. Teixeira, Luis G. Martins, Mathieu Lagrange, and George Tzanetakis. ”MarsyasX: multimedia dataflow processing with implicit patching. In *Proceedings of ACM International Conference on Multimedia*, pages 873–876, Vancouver, BC, October 2008.
7. George Tzanetakis, Luis G. Martins, Luis F. Teixeira, Carlos Castillo, Randy Jones, and Mathieu Lagrange. Interoperability and the marsyas 0.2 runtime. In *Proceedings of the International Computer Music Conference*, Belfast, Northern Ireland, August 2008.
6. Jaime S. Cardoso, Luis F. Teixeira, and Maria J. Cardoso. Automatic breast contour detection in digital photographs. In *Proceedings of International Conference on Health Informatics*, pages 91–98, Funchal, Portugal, January 2008.
5. Filipe Coelho, Luis Baptista, Luis F. Teixeira, and Jaime S. Cardoso. Automatic system for the recognition of amounts in handwritten cheques. In *International Conference on Signal Processing and Multimedia Applications*, pages 320–324, Porto, Portugal, July 2008.
4. Daniel Duraes, Luis F. Teixeira, and Luis Corte-Real. Building modular surveillance systems based on multiple sources of information – architecture and requirements. In *International Conference on Signal Processing and Multimedia Applications*, pages 314–319, Porto, Portugal, July 2008.
- 2007 3. Luis F. Teixeira and Luis Corte-Real. Cascaded change detection for foreground segmentation. In *Proceedings of IEEE Winter Vision Meeting - Motion and Video Computing*, Austin, TX, February 2007.
- 2006 2. Mathieu Lagrange, Luis G. Martins, Luis F. Teixeira, and George Tzanetakis. Speaker segmentation of interviews using integrated video and audio change detections. In *Proceedings of International Workshop on Content-Based Multimedia Indexing*, pages 219–226, Bordeaux, France, June 2006.
1. Luis F. Teixeira and Luis Corte-Real. Integrated multimedia authoring and description framework. In *Proceedings of the International Workshop on Image Analysis for Multimedia Interactive Services*, pages 265–268, Incheon, South Korea, April 2006.

### Invited Talks / Seminars

Computer Vision Academy, Enermeter, October 2013

Augmented Reality Seminar, Portuguese Catholic University, School of Arts, July 2011

Computer Vision and Multimodal Interfaces Seminar, Portuguese Catholic University, School of Arts, March 2010

## Projects

- 2011–2014 **ENSURE**  
European project focusing on the long term usability problem of the digital preservation of data that is caused by the huge amounts of data produced or controlled by an organization.  
Tasks: co-principal investigator at FEUP (starting in January 2013).
- 2012–2013 **AROS**  
Small research project sponsored by SAPO Labs that aims to develop a system that can recognize objects using cameras incorporated in smartphones or other mobile devices.  
Tasks: principal investigator.
- 2010 **AICOS-Tablet**  
Industry project for a major Telco company that was looking to develop a concept and create prototypes for validation.  
Tasks: managed task consisting on the development of a prototype application.
- 2009 **AICOS-Box**  
Industry project for a major Telco company that was looking to develop a concept and create prototypes for validation.  
Tasks: managed project (3 partners) and developed software for the system.
- 2007–2010 **DR-Vids**  
Project funded by FCT, with the reference PTDC/EEA-ELC/69394/2006, on reconfigurable systems applied to real time video processing.  
Tasks: managed task consisting on the development of an algorithm for background/segmentation.
- 2004–2009 **IST NoE VISNET I and II**  
European project on audiovisual systems and algorithms.  
Tasks: develop segmentation and tracking algorithm for visual surveillance systems.
- 2003–2004 **IST NUGGETS**  
European project on distributed systems for digital television.  
Tasks: developed MXF SDK support, integrated in a team of 3 elements.
- 2003 **IST ASSET**  
European project on distributed systems for digital television.  
Tasks: developed metadata handling SDK in C++, integrated in a team of 3 elements.
- 2002 **MXF SDK**  
Project with IRT (Institut für Rundfunktechnik) on distribution formats for digital television.  
Tasks: MXF SDK implementation in C++, integrated in a team of 5 elements.
- 2002–2003 **IST METAVISION**  
European project on distributed systems for digital television.  
Tasks: developed distributed audiovisual file management system in C++, integrated in a team of 3 elements.
- 2001–2002 **ORBIT**  
Industry project for BBC R&D Video processing on distributed systems for digital television.  
Tasks: developed CORBA modules in C++ and video annotation GUI in JAVA, integrated in a team of 15 elements.

## Teaching

### Courses

- 2011/2012 – Programming 2, ECE MSc, coordinator  
2013/2014 Programming 1, ECE MSc, coordinator  
Introducion to Programming, Multimedia MSc, coordinator  
Computer Vision, IE MSc, instructor  
Computer Vision, MAP-i Doctoral Programme, instructor

2010/2011	Programming 2, ECE MSc, coordinator Programming 1, ECE MSc, coordinator Computer Laboratory, IE MSc, instructor
2009/2010	Programming 2, ECE MSc, instructor Programming 1, ECE MSc, instructor Database and Web Applications Laboratory, IE MSc, instructor
2005/2006	Programming, IE MSc, teaching assistant
2004/2005	Programming II IE <i>Licenciatura</i> , teaching assistant

ECE - Electrical and Computer Engineering; IE - Informatics Engineering

### Supervision

#### PhD students

1. Samaneh Khoshrou, MAP-tele, “Learning in Evolving Video Streams”, co-supervisor with Professor Jaime Cardoso, 2014 (expected).

#### MSc students

21. João Pedro Fonseca Teixeira, ECE MSc FEUP, “Classification of Lung Function on a Smartphone App”, co-supervised by Professor Miguel Coimbra, 2014 (expected).
20. Ivo Filipe Valente Mota, ECE MSc FEUP, “Olhó-passarinho: uma extensão do TweepProfiles para fotografias”, co-supervised by Professor Carlos Soares, 2014 (expected).
19. André Filipe do Couto Maia, ECE MSc FEUP, “Facial Expressions in Sign Language Videos”, co-supervised by Ricardo Sousa, 2014 (expected).
18. Eduardo Luís Almeida Rodrigues Barbosa, Informatics Engineering MSc FEUP, “Efficient Database Image Search”, co-supervised by Rui Marques, 2014 (expected).
17. Maria Inês Coutinho Vigário Rodrigues, Bioengineering MSc FEUP, “Body and Facial Expressions for Socio-Emotional Behaviour Analysis”, co-supervised by Eduardo Marques, 2014 (expected).
16. Ana Catarina Cardoso Salgueiro Fernandes, Master in Multimedia FEUP, “Optimizing the interpretation of FUSAMI data for usability analysis”, co-supervised by Ana Barros, 2014 (expected).
15. Daniel Gomes Rodrigues, Master in Multimedia FEUP, “Produtividade na Organização e Gestão de Conteúdos Virtuais (Productivity in the organization and management of virtual contents)”, 2014 (expected).
14. Joel Pedro Pereira Fonseca, Master in Multimedia FEUP, “Software Autocrítico no âmbito da Composição e Enquadramento no Ato Fotográfico (Auto-critical Software in the Scope of Composition and Framing in Photography)”, 2014 (expected).
13. Ana Luísa Pires Magalhães Marques, Informatics Engineering MSc FEUP, “Interface com o utilizador para sistema de análise e segregação de eventos sonoros em sinais musicais (User interface for the analysis and segregation of sound events in music signals)”, 2014
12. Ivo Almeida Rodrigues, Informatics Engineering MSc FEUP, “Interface baseada em objectos visuais usando dispositivos móveis - aplicação a serviço de cinema (Interface based on visual objects using smartphones - application to a cinema database service)”, 2014
11. Pedro Boloto Chambino, Informatics Engineering MSc FEUP, “Android-based implementation of Eulerian Video Magnification for vital signs monitoring”, co-supervised by Luis Rosado, 2013.
10. José Pedro da Silva Couto e Sá, ECE MSc FEUP, “Multi Person Tracking in Real-time Video Streams”, co-supervised by Rui Marques, 2013

9. João Carlos Almeida Antunes, Master in Multimedia FEUP, “Visualization of Complex Information - Application to a Mobile Usage Logging Tool (final title to be defined)”, 2013
8. João Pedro de Macedo Marques, Informatics Engineering MSc FEUP, “User-Driven Design, Development and Evaluation of a Tablet-Based Cognitive Gaming Platform for Seniors”, co-supervised by Ana Vasconcelos, 2013.
7. Hugo Filipe Coelho Duarte Teixeira, ECE MSc FEUP, “Recognition of Visual Objects using Mobile Devices”, 2013.
6. João Figueiredo Cevada, Informatics Engineering MSc FEUP, “Analysis, design and evaluation of smartphone applications for Parkinson-affected persons”, co-supervised by Professor Paula Alexandra Silva, 2012.
5. Inês Vale Ferreira, IE MSc FEUP, ‘Real-time Audiovisual and Interactive Applications for Desktop and Mobile Platforms’, co-supervised by Professor Luis Gustavo Martins, 2012.
4. Ana Filipa Ferreira Vasconcelos, IE MSc at FEUP, “The use of tablets as a gaming platform for older adults”, co-supervised by Professor Paula Alexandra Silva, 2011.
3. João Manuel Vieira Caseiro, IE MSc at FEUP, “The Android Tablet as a Game Development Platform”, co-supervised by Professor Paula Alexandra Silva, 2011.
2. Ricardo Jorge Azevedo Moutinho, IE MSc at FEUP, “A mobile phone navigator for older adults”, co-supervised by Diogo Junior, 2011.
1. Ricardo Torgal Dias Duarte, ECE MSc at FEUP, “Harpa Laser para Controle de Síntese Sonora” (Laser Harp for Sound Synthesis Control), co-supervised by Professor Luis Gustavo Martins, 2011.

Undergraduate and MSc students (as supervisor at the R&D institute)

7. Pedro Miguel Correia Teixeira, IE MSc at FEUP, “Image search and navigation of photo collections”, co-supervisor with Professor Jorge Alves, 2010.
6. Diogo Dias Júnior, IE MSc at FEUP, “Mobile-based context aware services framework”, co-supervisor with Professor Jorge Alves, 2010.
5. Luís António Alves Ferreira, IE MSc at FEUP, “Hyperbolic tree visualization on mobile devices”, co-supervisor with Professor Ademar Aguiar, 2009.
4. Daniel Filipe Martins Durães, ECE MSc at FEUP, “Arquitetura de sistema de vigilância integrada” (Integrated surveillance system architecture), co-supervisor with Professor Luís Corte-Real, 2008.
3. Guilherme Artur Conceição Capela, IE MSc at FEUP, “Reconhecimento de símbolos musicais manuscritos na framework Gamera” (Recognition of handwritten musical symbols in the framework Gamera), co-supervisor with Professor Jaime S. Cardoso, 2008.
2. Filipe Emanuel Amaro Coelho, MSc IE at FEUP, “Sistema automático de reconhecimento do montante de um cheque” (Automatic system for the recognition of check amounts), co-supervisor with Professor Jaime S. Cardoso, 2008.
1. Moisés Emanuel Adrega Medeiros, final year project Lic. ECE at FEUP, ‘Descrição e manipulação de objectos para composição de multimédia’ (Description and manipulation of objects for multimedia composition), co-supervisor with Professor Luís Corte-Real, 2005.

#### **Advising – PhD Committee Member**

1. Rui Vítor Pires Fernandes, FEUP, “Knowledge and context-based strategies for 3D video content adaptation decision”, supervised by Professor Teresa Andrade, 2013 (expected).

## Scientific and institutional management

- 2009–2013 Member of the Scientific Board of Fraunhofer Portugal since its creation in the beginning of 2009.
- 2010 President of the Scientific Board of Fraunhofer Portugal during 2010.
- 2010–2011 Member of the Department of Informatics Engineering Council between July 2010 and March 2011.

## Other activities

### Reviewer for scientific publications and conferences

Pattern Recognition Letters  
International Journal of Imaging  
Conferences: ICIAR, ICMC, EUSIPCO

### Organising committees of conferences and other events

IbPRIA 2013 – Iberian Conference on Pattern Recognition and Image Analysis  
AERFAISS 2012 – AERFAI Summer School on Pattern Recognition in Multimodal Human Interaction  
RECPAD 2011 – Portuguese Conference on Pattern Recognition

### Scientific committees of conferences

Chairman of the Scientific Steering Committee of pHealth 2012 – International Conference on Wearable Micro and Nano Technologies for Personalized Health

### Contributions to open-source projects

Marsyas/MarsyasX [<http://marsyas.sf.net>] – Several core contributions to the Marsyas project, an audio processing library; main developer of MarsyasX, an evolution of Marsyas toward multimodal processing.

## Personal skills and competences

### Languages

Portuguese (mother-tongue), English (proficient), French (basic), Finnish (basic)