Ana Maria Silva Rebelo

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Work Position

- **Research & Development** — **INESC TEC**
  Senior Researcher — *September, 2013-ongoing*
  - Develop and implement Image Processing, Computer Vision and Machine Learning algorithms for biometric applications.
  - Team Leader in vCardID project with INCM (Imprensa Nacional Casa da Moeda) for the creation of a national fingerprint identification algorithm.
  - Principal Investigator in AUTOMOTIVE (FCT 030707).
  - Member of the research project OMR (FCOMP-01-0124-FEDER-010159).
  - Research Grants and Funds Raising.
  - Team members supervision and mentoring.
- **Strategize and plan events** — ***INESC TEC***
  Co-Founding and Coordinating — *July, 2012-ongoing*
  - VISion Understanding and Machine intelligence Summer School[1]
  - A non-profit summer school that aims to gather Ph.D. candidates, Post-Doctoral scholars and researchers from academia and industry with research interests in computer vision and machine intelligence.
  - Through the creation of a specialized multicultural environment, it is intended to promote and increase the knowledge of all participants on the state of the art of these topics, provided by internationally renowned experts in data science field.

Professional Experience

- **Project Manager** — ***INESC TEC***
  September, 2013-ongoing
  - Project coordinator: tasks, milestones, head count and talent acquisition.
  - Reporting: problem description, society impact, objectives, proposal solution.
  - Hold regular meetings with all project members.
  - Ensure proper communication concerning changes in established milestones or challenges that may affect the outcome of a project's completion date.
  - Scientific advisor.
- **Solution Design and Implementation** — ***INESC TEC***
  September, 2008-ongoing
  - Fingerprint Matching and Identification.
  - Staff line detection and removal.
  - Music symbols extraction based on musical rules.
  - Music score binarization based on domain knowledge.
  - Metric Learning for Music Symbol Recognition.
  - Dataset creation: Handwritten Score Database to evaluate the algorithms for symbols classification, binarization and staff line detection and removal.
- **Teaching** — **Universidade Portucalense**
  Assistant Professor — *September, 2018-2020*
  - Professor at the Department of Science and Technology.
  - Coordinator of Master's Degree in Data Science
  - Lectures: Fundamentals of Computer Programming, Computer Vision, Fundamental of Database Systems and others.

[1] http://visum.inesctec.pt/

Core Technical Skills

Programming Languages: Python, SQL, Theano, Matlab, LaTeX, C, C++, R.
Software: SQL Server, MariaDB, Trello, Git.

Education

- **Doctoral Studies** ***Faculdade de Engenharia, Universidade do Porto, Portugal***
  Doctoral Program in Electrical and Computer Engineering *2012*

  Title: Robust Optical Recognition of Handwritten Musical Scores Based on Domain Knowledge

  Supervisors: Prof. Doctor Jaime S. Cardoso and Prof. Doctor Andre R. S. Marcal

  Area of Study: Image Processing, Machine Learning

- **Master Studies** ***Faculdade de Ciências, Universidade do Porto, Portugal***
  Mathematical Engineering *2008*

  Title: New Methodologies Torwads an Automatic Optical Recognition of Handwritten Musical Scores

  Supervisors: Prof. Doctor Jaime S. Cardoso and Prof. Doctor Joaquim F. P. da Costa

  Area of Study: Image Processing, Machine Learning

- **Graduate Studies (*Licenciatura*)** ***Faculdade de Ciências, Universidade do Porto, Portugal***
  Mathematics Applied to Technology *2007*

  Title: Automatic Recognition of handwritten musical scores

  Area of Study: Image Processing, Machine Learning

Summer School

- **Future of Computing** ***UPTEC*, Porto, Portugal**
  July 2019

  5 days of theory and hands-on classes on GPU-based, quantum, neuromorphic and biochemical computing.

- **Neural Network** ***Instituto Superior de Engenharia do Porto*, Porto, Portugal**
  July 2012

  Student in the 8th Neural Network (NN) Summer School. The topic of the school was neural network for classification, regression and data mining. The lectures were focused on multilayer perceptrons (MLP), radial basis function networks (RBF) and support vector machines (SVM). Specific topics were also presented, namely Deep Neural Networks, Recurrent Neural Networks, Functional Networks, Multi-Valued and UB Neurons, Entropic Neural Networks Criteria and Data Mining using NN.

- **LxMLS** ***Instituto Superior Técnico*, Lisboa, Portugal**
  July 2011

  Student in the 1st Lisbon Machine Learning School. The topic of the school was Learning for the Web. The lectures were focused on the main areas of machine learning: Classification, Structured Prediction (sequences, trees, graphs), Parsing, Semi-Supervised Learning, and their applications to practical language processing on the Web.

Scientific Advisor

- **Team Leader** **INESC TEC**
  - vCardID project with INCM (Imprensa Nacional Casa da Moeda).
  - AUTOMOTIVE (FCT 030707).

- **PhD Thesis** **INESC TEC**
  - Leonardo Gomes Capozzi, Automatic recognition of criminals, victims, and illegal behaviour in videos, FEUP, 2020-ongoing.
  - Pedro Ferreira, Sign Language Recognition: Integrating Prior Domain Knowledge into Deep Neural Networks, FEUP, 2015-2019.

- **Master Thesis** **INESC TEC**

- Telma Esteves, Sleepy Drivers: Drowsiness Monitoring Using ECG and Face Video, 2021.
- Leonardo Gomes Capozzi, Face Recognition For Forensic Applications - Methods for matching facial sketches to mugshot pictures, 2020.
- João Soares Sousa, "Automation of Waste Sorting with Deep Learning", 2019.
- Margarida João Castro Neves Fernandes, "Driver drowsiness detection combining non-intrusive signal acquisition modalities", 2019.
- Miguel Nunes, Computer-aided learning tool for Portuguese language, 2017.
- Pedro Saleiro, Métodos de optimização para a validação de regras sintáticas e semânticas em partituras musicais, 2015.
- Laura Ângelo, Técnicas Inteligentes de Redimensionamento de Imagens, 2015.
- Marisa Reis, A Comparative Study on Fingerprint Matching Algorithms, 2014.
- Carlos Reconhecimento de Gestos em Videos da Lingua Gestual, 2014.
- André Castro, Reconhecimento de simbolos musicais em imagens cinza de partituras manuscritas, 2014.
- Rui Silva, Mobile framework for recognition of musical characters, 2013.
- Vitor Vidal, Optical Recognition in the Grayscale Domain, 2012.
- Cuihong Wen, Classification of Optical Music Symbols based on Combined Neural Network, 2012.
- Telmo Pinto, *OMRsys - Desenvolvimento e Aplicação de um Módulo de Segmentação de Imagem*, 2010.
- Andreas Seufert, *Investigação e aperfeiçoamento de algoritmos de reconhecimento de símbolos musicais*, 2010.
- Marcia dos Santos Pinheiro, *Sistema Web para o Reconhecimento de Partituras Musicais*, 2009.

Instructional experience

- **Visiting Assistant Professor** ***Universidade Católica Portuguesa*, Porto, Portugal**
  September-February 2014-2018

  Communication and Data Networks classes of the Bsc in Bioengineering.

- **Monitor** ***Faculdade de Engenharia, Universidade Porto*, Porto, Portugal**
  September-December 2009

  Biomedical Imaging Analysis classes of the Bioengineering degree.

- **Monitor** ***Faculdade de Engenharia, Universidade Porto*, Porto, Portugal**
  September-December 2009

  Algebra classes of the Informatics Engineering degree.

Research

- **Scholarship** **INESC TEC**
  Collaborator in Research Projects *Since 2008*

  - Automated Border Control gates: A Contactless Fingerprint Recognition System (FCT - SFRH/BPD/101439/2014).
  - Robust Optical Recognition of Handwritten Musical Scores Based on Domain Knowledge (FCT - SFRH/BD/60359/2009).
  - OMR (Optical Recognition System for Handwritten Music Scores) (FCT - PTDC/EIA/71225/2006).

- **Service to the Scientific Community**
  Strategize and plan events

  - Sponsorship & Industry Liaison Chair: the 8th International Workshop on Biometrics and Forensics[2].
  - Organizing Committee: the 20th Portuguese Association for Information Systems Conference[3].
  - Organizing Committee: the Portuguese Conference on Pattern Recognition[4].

  Reviewer

[2] https://vcmi.inesctec.pt/iwbf_2020/
[3] https://capsi2020.apsi.pt/
[4] http://recpad2019.dcc.fc.up.pt/

- Conferences: *the 2020 International Joint Conference on Biometrics*, *the 8th International Workshop on Biometrics and Forensics*, *International Joint Conferences on Artificial Intelligence*, *the Portuguese Conference on Pattern Recognition*, *Iberian Conference on Pattern Recognition and Image Analysis*, *International Society for Music Information Retrieval*.
- Journals: *International Journal of Pattern Recognition and Artificial Intelligence*, *Journal of Cultural Heritage*, *International Journal on Document Analysis and Recognition*, *Journal of Zhejiang University Science C*, *Journal of Visual Communication and Image Representation*, *Journal of Pattern Recognition*.
- Books: *AIECM: Turing 2012*.

Academic Degrees jury participation

- PhD Degree
  - Pedro Ferreira, "Sign Language Recognition: Integrating Prior Domain Knowledge into Deep Neural Networks", 2020. PhD Thesis (Programa de Doutoramento em Engenharia Electrotécnica e de Computadores) - Universidade do Porto.
- Master Degree
  - Ariana Os'0rio, "Optimização analitica de operações de retenção de clientes num operador integrado de telecomunicações e entretenimento", 2018. Master Thesis (Mestrado em Estatistica) - Universidade do Minho
  - Pedro Silva, "Development of a System for Automatic Plant Species Recognition", 2013. Master Thesis (Mestrado em Engenharia Matemática) - Universidade do Porto.
  - Cláudia Castro, "Estudo do impacto da densidade mamária no cancro da mama", 2012. Master Thesis (Mestrado em Informática Médica) - Universidade do Porto.

Publications

- **List of Publications on**
  Refereed Journals
  - Pedro M. Ferreira, Diogo Pernes, Ana Rebelo, Jaime S. Cardoso, DeSIRe: Deep Signer-Invariant Representations for Sign Language Recognition, In IEEE Transactions on Systems, Man and Cybernetics: Systems, 2020.
  - Pedro M. Ferreira, Diogo Pernes, Ana Rebelo, Jaime S. Cardoso, Signer-Independent Sign Language Recognition with Adversarial Neural Networks, In International Journal of Machine Learning and Computing (IJMLC), 2019.
  - Pedro Ferreira, Jaime S. Cardoso, Ana Rebelo, On the Role of Multimodal Learning in the Recognition of Sign Language, In Multimedia Tools and Applications, 2019.
  - Pedro Ferreira, Filipe Marques, Jaime S. Cardoso, Ana Rebelo, Physiological Inspired Deep Neural Networks for Emotion Recognition, In IEEE Access, 2018.
  - Cuihong Wen, Jing Zhang, Ana Rebelo and Fanyong Cheng, "A Directed Acyclic Graph-Large Margin Distribution Machine Model for Music Symbol Classification", PLOS ONE, 2016.
  - Cuihong Wen, Ana M. S. Rebelo, Jing Zhang, and Jaime S. Cardoso, "A new Optical Music Recognition system based on Combined Neural Network," Pattern Recognition Letters, 2015.
  - A. Rebelo, I. Fujinaga, F. Paszkiewicz, A. R. S. Marcal, C. Guedes, and J. S. Cardoso, "Optical Music Recognition - State-of-the-Art and Open Issues," International Journal of Multimedia Information Retrieval, (IJMIR 2012), 2012.
  - A. Rebelo, G. Capela, and J. S. Cardoso, "Optical recognition of music symbols: A comparative study," in International Journal on Document Analysis and Recognition (IJDAR 2010), 2010.
  - J. S. Cardoso, A. Capela, A. Rebelo, C. Guedes, and J. F. P. da Costa, "Staff detection with stable paths" in IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI 2009), 2009.
- **List of Publications on**
  Refereed International Conferences
  - Pedro Ferreira, Diogo Pernes, Ana Rebelo, Jaime S. Cardoso, Learning Signer-Invariant Representations with Adversarial Training, In Proceedings of the 12th International Conference on Machine Vision (ICMV), 2019.

- Pedro Ferreira, Filipa Sequeira, Diogo Pernes, Ana Rebelo, Jaime S. Cardoso, Adversarial learning for a robust iris presentation attack detection method against unseen attack presentations, In Proceedings of the 18th International Conference of the Biometrics Special Interest Group (BIOSIG), 2019.
- Joao Sousa, Ana Rebelo, Jaime S. Cardoso, Automation of Waste Sorting with Deep Learning, In Proceedings of the XV Workshop on Computational Vision (WVC), 2019.
- Pedro Ferreira, Filipa Sequeira, Jaime S. Cardoso, Ana Rebelo, Robust Clustering-based Segmentation Methods for Fingerprint Recognition, In Proceedings of the 17th International Conference of the Biometrics Special Interest Group (BIOSIG), 2018.
- Ana Rebelo, Tiago Oliveira, Manuel E. Correia, Jaime S. Cardoso, Are Deep Learning Methods Ready for Prime Time in Fingerprints Minutiae Extraction?, In Proceedings of the 23rd Iberoamerican Congress on Pattern Recognition (CIARP), 2018.
- Pedro Ferreira, Jaime S. Cardoso, Ana Rebelo, Multimodal Learning for Sign Language Recognition, In Proceedings of Iberian Conference on Pattern Recognition and Image Analysis (IbPRIA), 2017
- P. Ferreira, A. Sequeira and A. Rebelo, "A Fuzzy C-Means Algorithm for Fingerprint Segmentation", in Iberian Conference on Pattern Recognition and Image Analysis (IbPRIA), (Santiago de Compostela, Spain), 2015.
- C. Wen, A. Rebelo, J. Zhang, and J. S. Cardoso, "Classification of optical music symbols based on combined neural network", in Proceedings of the IEEE International Conference on Mechatronics and Control (ICMC), 2014.
- A. Rebelo and J. S. Cardoso, "Staff line detection and removal in the grayscale domain", in Twelfth International Conference on Document Analysis and Recognition (ICDAR 2013), (Washington, DC, USA), 2013.
- A. Rebelo, A. Marcal, and J. S. Cardoso, "Global constraints for syntactic consistency in omr: an ongoing approach", in International Conference on Image Analysis and Recognition (ICIAR 2013), (Póvoa de Varzim, Portugal), 2013.
- A. Rebelo, J. Tkaczuk, R. Sousa, and J. S. Cardoso, "Metric Learning for Music Symbol Recognition," in 10th International Conference on Machine Learning and Applications (ICMLA 2011), (Honolulu, Hawai), 2011.
- A. Rebelo, F. Paszkiewicz, C. Guedes, A. R. S. Marcal, and J. S. Cardoso, "A method for music symbols extraction based on musical rules," in Bridges: Mathematical Connections in Art, Music, and Science (BRIDGES 2011), (Coimbra, Portugal), 2011.
- T. Pinto, A. Rebelo, G. Giraldi, and J. S. Cardoso, "Music score binarization based on domain knowledge", in Proceedings of 5th Iberian Conference on Pattern Recognition and Image Analysis (IbPRIA 2011), (Las Palmas, Spain) ,2011.
- J. Cardoso and A. Rebelo, "Robust staffline thickness and distance estimation in binary and gray-level music scores," in 20th International Conference on Pattern Recognition (ICPR 2010), (Istanbul, Turkey), 2010.
- J. S. Cardoso, A. Capela, A. Rebelo, and C. Guedes, "A connected path approach for staff detection on a music score," in Proceedings of the International Conference on Image Processing (ICIP 2008), (San Diego, California), 2008.
- A. Capela, J. S. Cardoso, A. Rebelo, and C. Guedes, "Integrated recognition system for music scores," in Proceedings of the International Computer Music Conference (ICMC 2008), (Belfast, Irland), 2008.
- A. Capela, A. Rebelo, J. S. Cardoso, and C. Guedes, "Staff line detection and removal with stable paths," in Proceedings of the International Conference on Signal Processing and Multimedia Applications (SIGMAP 2008), (Porto, Portugal), 2008.
- A. Rebelo, A. Capela, J. F. P. da Costa, C. Guedes, E. Carrapatoso, and J. S. Cardoso, "A shortest path approach for staff line detection," in Third International Conference on Automated Production of Cross Media Content for Multi-Channel Distribution (AxMEDIS 2007), (Barcelona, Spain) 2007.