Ricardo Cruz, PhD

- Machine learning specialist
- Computer vision specialist
- Programmer

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I am a post-doc at the THEIA project – a parternship between the University of Porto and Bosch Portugal in order to advance autonomous driving. My expertise is mainly in artificial intelligence and computer vision, working on TensorFlow, PyTorch, OpenCV, and a wide variety of other frameworks and languages. I completed my Ph.D. in Computer Science in mid-2021.

Skills: Python · C · C++ · Java · R · MATLAB · TensorFlow · PyTorch · OpenCV · SQL · Git

Career

- Oct. 2021–currently | **Post-Doc Deep Learning Specialist**
  Faculty of Engineering, University of Porto
  Object detection, point-cloud LiDAR parsing
- Sept. 2015–Jul. 2021 | **INESC TEC (Porto)**
  Machine Learning and Computer Vision Researcher
  INESC TEC is an R&D institute
- Mar.–Jul. 2015 | **Flykt Startup**
  I was involved in a non-successful startup whose goal was to search for travel destinations. I was involved in the NLP part.
- Sept. 2014–Feb. 2015 | **Research Grant**
  Mathematics Center of the University of Porto
  Research on epidemiological models: from differential equations to stochastic simulations and cellular automata.

Teaching

- Sept. 2021–Aug. 2022 | **Faculty of Engineering, University of Porto**
  Invited Auxiliary Professor (∼3h/week)
  Practical tutorials on Python, C++ and data structures to first-year students.
- Sept. 2018–Aug. 2020 | **Faculty of Engineering, University of Porto**
  Invited Teacher Assistant (∼3h/week)
  Practical tutorials on Python and C++ to first-year students.

Education

- 2016–2021 | **Ph.D. in Computer Science**
  University of Porto, Minho and Aveiro (joint degree)
  Thesis: Re-thinking a Deep Learning Pipeline for Images
- 2013–2015 | **MSc in Mathematical Engineering**
  Faculty of Sciences, University of Porto
  18 out of 20 points
- 2009–2012 | **BSc in Computer Science**
  Faculty of Sciences, University of Porto
  16 out of 20 points

Selected Open-Source Portfolio

- **objdetect package**
  Light-weight and versatile one-stage object detection framework
  I developed this one-stage object detection framework because existing frameworks, such as detectron2, are either for two-stage models or are not versatile and simple enough to adapt for new models. At the very least, I hope this package is educational for someone learning object detection.

- **Apoo (virtual machine) GTK+ interface**
  
  I helped with the development of the GTK+ interface for Apoo (together with Profs Rogério Reis and Nelma Moreira), a virtual machine that is currently being used to teach Assembly. Apoo is written in Python and GTK+.

- **EatFeed**
  
  RSS/Atom reader written in C++ and GTK+

- **Google Summer of Code**
  I was awarded twice a Google grant to work on open-source projects. LibreOffice dynamic layouts (2007) and YaST port from GTK+ to Qt (2006).

- **J2ME and Android games**
  Games written in Java Mobile Edition; more recently, I ported a couple of them to Android.

- **SuperTux, co-author**
  
  While in high-school, I was part of the initial team developing this game. It is written in C++, SDL, and OpenGL.

▶ Find more of my open-source code at https://github.com/rpmcruz.

Publications

These are my indexed publications with some publications in **highlight** for emphasis. You may find the papers in my Google Scholar: https://scholar.google.pt/citations?user=pSFY_gQAAAAJ

- 2023 | **Two-Stage Framework for Faster Semantic Segmentation.** R. Cruz, D. Silva, T. Gonçalves, D. Carneiro, J. Cardoso.
- 2023 | **Rethinking Low-Cost Microscopy Workflow: Image Enhancement using Deep Based Extended Depth of Field Methods.** T. Albuquerque, L. Rosado, R. Cruz, M. Vasconcelos, T. Oliveira, J. Cardoso. Intelligent Systems with Applications.
- 2022 | **Two-stage Semantic Segmentation in Neural Networks.** R. Cruz, D. Silva, T. Gonçalves, D. Carneiro.
- 2022 | **Quasi-Unimodal Distributions for Ordinal Classification.** T. Albuquerque, R. Cruz, J. Cardoso. MDPI Mathematics.
- 2021 | **Ordinal Losses for Classification of Cervical Cancer Risk.** T. Albuquerque, R. Cruz, J. Cardoso. PeerJ Computer Science.
- 2021 | **Background Invariance by Adversarial Learning.** R. Cruz, R. Prates, E. Filho, J. Costa, J. Cardoso. 25th International Conference on Pattern Recognition (ICPR), IEEE.
- 2019 | **Automatic Augmentation by Hill Climbing.** R. Cruz, J. Costa, J. Cardoso. 28th International Conference on Artificial Neural Networks (ICANN), Springer.
- 2019 | **Averse Deep Semantic Segmentation.** R. Cruz, J. Costa, J. Cardoso. 41st Engineering in Medicine and Biology Conference (EMBC), IEEE.
- 2019 | **Insulator visual non-conformity detection in overhead power distribution lines using deep learning.** R. Prates, R. Cruz, A. Marotta, R. Ramos, E. Filho, J. Cardoso. Journal Computers & Electrical Engineering, Springer.

- 2018 | **A Class Imbalance Ordinal Method for Alzheimer's Disease Classification.** R. Cruz, M. Silveira, J. Cardoso. 2018 International Workshop on Pattern Recognition in Neuroimaging (PRNI), IEEE.
- 2018 | **Binary ranking for ordinal class imbalance.** R. Cruz, K. Fernandes, J. Costa, M. Pérez Ortiz, J. Cardoso. Journal Pattern Analysis and Applications, Springer.
- 2018 | **Deep image segmentation by quality inference.** K. Fernandes, R. Cruz, J. Cardoso. International Joint Conference on Neural Networks (IJCNN), IEEE.
- 2017 | **Constraining type II error: building intentionally biased classifiers.** R. Cruz, K. Fernandes, J. Costa, J. Cardoso. International Work-conference on Artificial Neural Networks (IWANN), Springer.
- 2017 | **Fine-to-coarse ranking in ordinal and imbalanced domains: an application to liver transplantation.** M. Pérez-Ortiz, K. Fernandes, R. Cruz, J. Cardoso. International Work-conference on Artificial Neural Networks (IWANN), Springer.
- 2017 | **Combining ranking with traditional methods for ordinal class imbalance.** R. Cruz, K. Fernandes, J. Costa, M. Pérez-Ortiz, J. Cardoso. International Work-conference on Artificial Neural Networks (IWANN), Springer.
- 2017 | **Ordinal class imbalance with ranking.** R. Cruz, K. Fernandes, J. Costa, M. Pérez-Ortiz, J. Cardoso. Iberian conference on pattern recognition and image analysis (Ibpria), Springer.
- 2016 | **Tackling class imbalance with ranking.** R. Cruz, K. Fernandes, J. Costa, J. Cardoso. International Joint Conference on Neural Networks (IJCNN), IEEE.

Supervisions

Master's Theses

- on-going | **Introducing Domain Knowledge to Autonomous Driving** Rafael Valente Cristino
- on-going | **Iterative Inference for Point-Clouds** Alankrita Asthana (University of Munich)
- on-going | **Academic Internship in Out of Distribution Detection – Autonomous Driving (Internship at Bosch Car Multimedia)** José António Barbosa da Fonseca Guerra
- 2022 | **Human Feedback during Neural Networks Training** Pedro João Cruz Serrano e Silva (co-supervisor: Tiago Filipe Sousa Gonçalves)
- 2022 | **Environment Detection for Railway Applications based on Automotive Technology (Internship at Continental)** João Malheiro Baptista Marcos da Silva
- 2022 | **Phishing Detection with a Machine Learning Net (Internship at E-goi)** Ana Luís Carvalho Matos Bezerra (main supervisor: Prof Joaquim Pinto da Costa)

Bachelor's Projects

- 2022 | **Semantic Segmentation in Neural Networks using Iterative Visual Attention** Diana Raquel Teixeira e Silva (co-supervisor: Tiago Filipe Sousa Gonçalves)
- 2022 | **Mobile App using Object Detection for Car Driving** Filipe Pinto Campos, Francisco Gonçalves Cerqueira, Vasco Marinho Rodrigues Gomes Alves
- 2022 | **Internship at ANO** Bruno Campos Gomes
- 2022 | **Internship at ANO** Rafael Fernando Ribeiro Camelo

Awards

- 2022 | **Bosch for Mobility**
  My students won Best New Participating Team on an autonomous driving competition
- 2021 | **INESC TEC**
  Outstanding recognition award
- 2021 | **FEUP**
  Pedagogic award, voted by students
- 2021 | **RECPAD conference**
  Best paper and presentation
- 2018 | **INESC TEC**
  Outstanding recognition award
- 2017 | **Kaggle**
  Bronze medal for NLP competition and silver for engagement