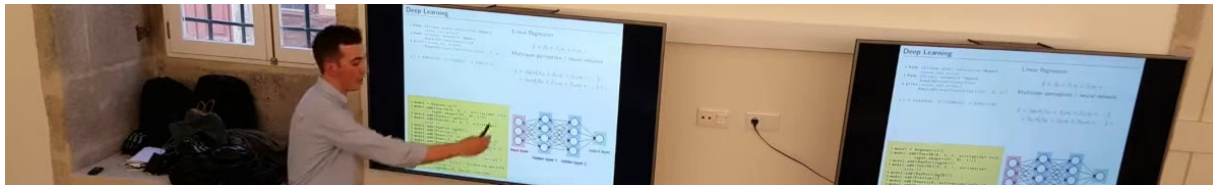


Ricardo Cruz, PhD

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I enjoy a good challenge. From mathematics to computer science, from research to engineering, from health applications to autonomous driving, I have been applying, proposing and teaching data science and artificial intelligence.

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



EDUCATION

- | | |
|-----------|---|
| 2016–2021 | Ph.D. in Computer Science
Joint Degree: University of Porto, Minho and Aveiro |
| 2013–2015 | MSc in Mathematical Engineering
University of Porto (FCUP) |
| 2009–2012 | BSc in Computer Science
University of Porto (FCUP) |



EMPLOYMENT

- | | |
|-----------------------------|--|
| 2021–ongoing | Autonomous Driving Post-Doc Researcher
University of Porto (FEUP) <ul style="list-style-type: none">• Collaboration between the University of Porto and Bosch Car Multimedia to improve autonomous driving perception• Frameworks developed for object detection using camera and LiDAR (2D discretization and raw point-clouds)• Published new methods for efficient semantic segmentation and ordinal regression• Supervised six master's theses, four bachelor's projects, and other team members• Responsible for the HPC infrastructure (using Slurm) |
| 2015–2021
<i>6 years</i> | Machine Learning and Computer Vision Researcher
INESC TEC <ul style="list-style-type: none">• Research focus: re-thinking fundamentals about image classification and semantic segmentation (8+ publications)• Some highlights: (1) a method for background invariance using adversarial training, (2) new losses that minimize absolute trade-offs between Type 1 and 2 errors instead of relative trade-offs, (3) using backpropagation also for inference to refine existing outputs, (4) deploying learning-to-rank methods for class imbalance• Contributed to workshops, Summer School on Computer Vision (VISUM), and other events• Twice awarded "outstanding recognition" for organizing workshops and helping with the HPC infrastructure |
| 2014
<i>6 months</i> | Mathematical Modelling Research
Mathematics Center of the University of Porto (CMUP) <ul style="list-style-type: none">• Epidemiological models for HIV. A little of everything: from differential equations to stochastic simulations to cellular automata. |



PUBLICATIONS

- 2023 **Two-Stage Framework for Faster Semantic Segmentation** [↗](#)
R. Cruz, D. Silva, T. Gonçalves, D. Carneiro, J. Cardoso. MDPI Sensors.
- 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. Elsevier Intelligent Systems with Applications.
- 2022 **Two-stage Semantic Segmentation in Neural Networks** [↗](#)
R. Cruz, D. Silva, T. Gonçalves, D. Carneiro. Proceedings of the Fifteenth International Conference on Machine Vision (ICMV 2022).
- 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. IEEE 25th International Conference on Pattern Recognition (ICPR).
- 2019 **Automatic Augmentation by Hill Climbing** [↗](#)
R. Cruz, J. Costa, J. Cardoso. Springer 28th International Conference on Artificial Neural Networks (ICANN).
- 2019 **Averse Deep Semantic Segmentation** [↗](#)
R. Cruz, J. Costa, J. Cardoso. IEEE 41st Engineering in Medicine and Biology Conference (EMBC).
- 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. Springer Journal Computers & Electrical Engineering.
- 2018 **A Class Imbalance Ordinal Method for Alzheimer's Disease Classification** [↗](#)
R. Cruz, M. Silveira, J. Cardoso. IEEE International Workshop on Pattern Recognition in Neuroimaging (PRNI)
- 2018 **Binary ranking for ordinal class imbalance** [↗](#)
R. Cruz, K. Fernandes, J. Costa, M. Pérez Ortiz, J. Cardoso. Springer Journal Pattern Analysis and Applications.
- 2018 **Deep image segmentation by quality inference** [↗](#)
K. Fernandes, R. Cruz, J. Cardoso. IEEE International Joint Conference on Neural Networks (IJCNN)
- 2017 **Constraining type II error: building intentionally biased classifiers** [↗](#)
R. Cruz, K. Fernandes, J. Costa, J. Cardoso. Springer International Work-conference on Artificial Neural Networks (IWANN)
- 2017 **Fine-to-coarse ranking in ordinal and imbalanced domains: an application to liver transplantation** [↗](#)
M. Pérez-Ortiz, K. Fernandes, R. Cruz, J. Cardoso. Springer International Work-conference on Artificial Neural Networks (IWANN).

- 2017 **Combining ranking with traditional methods for ordinal class imbalance** [↗](#)
R. Cruz, K. Fernandes, J. Costa, M. Pérez-Ortiz, J. Cardoso. Springer International Work-conference on Artificial Neural Networks (IWANN)
- 2017 **Ordinal class imbalance with ranking** [↗](#)
R. Cruz, K. Fernandes, J. Costa, M. Pérez-Ortiz, J. Cardoso. Springer Iberian conference on pattern recognition and image analysis (Ibpria).
- 2016 **Tackling class imbalance with ranking** [↗](#)
R. Cruz, K. Fernandes, J. Costa, J. Cardoso. IEEE International Joint Conference on Neural Networks (IJCNN).

My favorite publications are in **highlight**. See my Google Scholar for more information: scholar.google.com/citations?user=pSFY_gQAAAAJ



PROJECTS

Uber Pixor implementation [↗](#)

Implementation of a popular bird's eye view LiDAR object detection model.

objdetect package [↗](#)

Light-weight and versatile one-stage object detection framework

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).

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.

See my github for more projects: github.com/rpmcruz



SUPERVISIONS

- on-going **Introducing Domain Knowledge to Autonomous Driving**
Rafael Valente Cristino
- Iterative Inference for Point-Clouds**
Alankrita Asthana (University of Munich)
- Academic Internship in Out of Distribution Detection – Autonomous Driving (Internship at Bosch Car Multimedia)**
José António Barbosa da Fonseca Guerra (co-supervisor: Prof Luís Teixeira)

- 2022 **Human Feedback during Neural Networks Training** [↗](#)
 Pedro João Cruz Serrano e Silva (co-supervisor: Tiago Filipe Sousa Gonçalves)
- Environment Detection for Railway Applications based on Automotive Technology (Internship at Continental)** [↗](#)
 João Malheiro Baptista Marcos da Silva
- Phishing Detection with a Machine Learning Net (Internship at E-goi)** [↗](#)
 Ana Luís Carvalho Matos Bezerra (co-supervisor: Prof Joaquim Pinto da Costa)



AWARDS

- 2022 **Bosch for Mobility** [↗](#)
 My students won Best New Participating Team in an autonomous driving competition
- 2021 **INESC TEC Outstanding Recognition Award** [↗](#)
 Monthly award for INESC TEC collaborators, for maintenance of the HPC infrastructure
- 2021 **Pedagogic award (voted by students)**
 University of Porto (FEUP)
- 2021 **Best paper and presentation** [↗](#)
 RECPAD conference
- 2018 **INESC TEC Outstanding Recognition Award** [↗](#)
 Monthly award for INESC TEC collaborators, for organizing workshops
- 2017 **Kaggle Bronze Medal (competition) and Silver (engagement)**