Sandro Augusto Costa Magalhães | PhD candidate

sandro1995@gmail.com +351 912 054 696
http://web.fe.up.pt/~up201304932 sandromagalhaes
0000-0002-3095-197X 3F11-D058-571D 9_xVRdwAAAAJ

Professional Profile

Sandro Augusto Costa Magalhães is a Ph.D. candidate at the University of Porto, Faculty of Engineering in the Doctoral Program in Electrical and Computers Engineering. He finished his master's (integrated) in Electrical and Computers Engineering in 2018 at the same institution. He is performing his Ph.D. research at the INESC TEC – CRIIS in the robotics team for agriculture and forestry. His Ph.D. research aims to find solutions for grasping and manipulation in open-field environments using active perceptions strategies. Besides that, he is enthusiastic about robotics and belongs to the 5DPO MSL Robotics Soccer Team from FEUP/INESC TEC. On its personal time is a Scoutmaster from CNE – Corpo Nacional de Escutas.

Education

2020 – Now **Ph.D., University of Porto, Faculty of Engineering** Doctoral Program in Electrical and Computers Engineering
Thesis title: *Fruit's Harvesting with Active Perception*
FCT PhD Grant agreement ID: **SFRH/BD/147117/2019**

2016 – 2018 **M.Sc., University of Porto, Faculty of Engineering** in Electrical and Computers Engineering.
Thesis title: *Trajectory control for High Performance Robots*.

2013 – 2016 **B.Sc., University of Porto, Faculty of Engineering** in Computer Science – Electrical and Computers Engineering.

Teaching Experience

02/2022 – Now **Invited Assistant Professor.** Instituto Superior de Engenharia, Instituto Politécnico do Porto.
Lecturing laboratory classes of Circuits Theory and Electrical Systems

02/2020 – 06/2020 **Module Leader.** University of Porto, Faculty of Engineering.
EEC0093: Industrial Robotics Delivered one theoretical lesson about programming frameworks and simulators for robotics and two laboratory assignments in the Visual Components simulator (Process Modelling of a manufacturing cell, Programming of an industrial anthropomorphic manipulator). Responsible for presenting the theoretical lesson and supporting the students in performing the laboratory assignments and evaluating them.
This teaching experience was performed for the first year of the PhD, PDEEC0054: Special Topics

10/2016 – 01/2017 **Laboratory Tutor.** University of Porto, Faculty of Engineering.
EEC0005: Programming I Supporting the responsible Professor lecturing the classes Laboratory tutor at the University of Porto, Faculty of Engineering for the Department of Electrical and Electronics Engineering. As a lab tutor, he has supported students in performing laboratory assignments in C programming languages. Programming I focuses on the specificities of the C language, such as variables, loops and conditions, pointers and dynamic memory.

Teaching Experience (continued)

02/2018 – 07/2018 **Laboratory Tutor.** University of Porto, Faculty of Engineering.
EEC0006: Programming II Supporting the responsible Professor lecturing the classes
Laboratory tutor at the University of Porto, Faculty of Engineering for the Department of Electrical and Electronics Engineering. As a Lab tutor, he has supported students in performing laboratory assignments in C programming languages. Programming II uses the C language and focuses on computational algorithms, such as sorting, vector, lists, stacks, graphs and hash tables.

Research Experience

10/2023 – Now **Researcher.** INESC TEC, CRIIS.
Researcher in the Centre for Robotics in Industry and Intelligent Systems(CRIIS), integrated into the team of robotics and IoT for agriculture and forestry (TRIBE).

09/2018 – 10/2023 **Assistant Researcher.** INESC TEC, CRIIS.
Researcher in the Centre for Robotics in Industry and Intelligent Systems(CRIIS), integrated into the team of robotics and IoT for agriculture and forestry (TRIBE).

06/2021 – 10/2021 **ERASMUS+ Internship,** Nottingham Trent University, School of Sciences and Technology.
Deploy Deep Neural Networks in Xilinx FPGAs ZCU104 using Vitis AI, PYNQ and FINN.

05/2017 – 09/2022 **Researcher.** 5DPO MSL Robotics Soccer Team, FEUP/INESC TEC.
Develop a trajectory control strategy for high-performance robots. Design and assembly of the new generation of omnidirectional robots.

Projects

Participation in Projects

METBOTS **Robots for metabolomics using self-learning artificial intelligence for precision agriculture**
Grant agreement ID: **02/SAICT2017**
Develop a spectroscopy sensor to measure and analyse the properties of the grapes in the vineyards on the go. Active perception of grapes in the vineyards and control of a robotic manipulator to touch them with the implemented sensor.

DRONETOOL **Service to develop a prototype of a end-effector for leaf harvesting**
Development of a lightweight and low-cost tool for a drone to collect samples of branches from trees.

SMARTFERTILIZERS **Smart sensing of slurry and soil nutrients for intelligent spraying**
Grant agreement ID: **01/SI/2018**
Development of a spectroscopy sensor and conductivity meter calibration to measure soil and slurry properties.

ROBOCARE **Robotic Platforms for protected cultures of smart precision**
Collection of data images of tomatoes in greenhouses for dataset creation. Data curation. Design and deploy a deep learning model for fruit detection in greenhouses.

Projects (continued)

INCAFO — **Identification of vine varieties through the leaves**
Grant agreement: **POCI-01-0247-FEDER-068922**
Vineyard leaves dataset collection and digitalisation for dataset building. Dataset curation. Designing and deploying deep learning models for vines' varieties identification.

PhenoBot-LA8 — **Smart Photonics for Phenotyping of Agri-food Crops**
Grant agreement: **PRR-C05-i03-I-000134-LA8**
The PhenoBot project aims to materialize precision agriculture based on plant physiology, using non-invasive in-situ and in-vivo metabolic monitoring through intelligent photonics in autonomous robot systems. The technology enables integrated molecular diagnosis with artificial intelligence and digital twins of the plant at the genomic scale. This new approach allows for the development of precision production management strategies tailored to the plant's physiological response, representing a significant scientific and technological advancement in integrating information between plant biotechnology and agriculture.

Miscellaneous Experience

Volunteering

09/2001 – Now — **Scout**
03/2016 – 05/2017 Coordinator of Scouting Conference Cenáculo
Team leader for several years

09/2018 – Now — **Scoutmaster**

09/2011 – 06/2021 — **Cathequist**

Certification

2018 — **CPP. Certificate of Pedagogical Competences**. Awarded by IEFP.

2021 — **Aliance Partner**. Awarded by AMD - Xilinx

Embedded Academy. Awarded by AMD - Xilinx

2022 — **Fundamentals of Deep Learning**. Awarded by NVIDIA.

Skills

Languages — Portuguese (mother tongue), English

Coding — C++, Python, SQL, MatLab.

Databases — PostgreSQL, SQLite.

Web Dev — HTML, CSS, JavaScript, NodeRed, Hugo.

Machine Learning — Deep Learning, TensorFlow, Pytorch, Vitis AI, FINN, Brevitas, SciKit.

Misc. — Academic research, teaching, thesis supervising, and Markdown and LaTeX typesetting.

Research Publications

Journal Articles

1. **Magalhães, S. A.**, Castro, L., Rodrigues, L., Padilha, T. C., de Carvalho, F., dos Santos, F. N., … Moreira, A. P. (2023). Toward Grapevine Digital Ampelometry Through Vision Deep Learning Models. *IEEE Sensors Journal*, *23*(9), 10132–10139. doi:10.1109/jsen.2023.3261544

2. Pinheiro, I., Moreira, G., da Silva, D. Q., **Magalhães**, **S. A.**, Valente, A., Oliveira, P. M., … Santos, F. (2023). Deep Learning YOLO-Based Solution for Grape Bunch Detection and Assessment of Biophysical Lesions. *Agronomy*, *13*(4), 1120. doi:10.3390/agronomy13041120

3. Rodrigues, L., **Magalhães**, **S. A.**, da Silva, D. Q., dos Santos, F. N., & Cunha, M. (2023). Computer Vision and Deep Learning as Tools for Leveraging Dynamic Phenological Classification in Vegetable Crops. *Agronomy*, *13*(2), 463. doi:10.3390/agronomy13020463

4. **Magalhães**, **S. A.**, dos Santos, F. N., Machado, P., Moreira, A. P., & Dias, J. (2023). Benchmarking edge computing devices for grape bunches and trunks detection using accelerated object detection single shot multibox deep learning models. *Engineering Applications of Artificial Intelligence*, *117*, 105604. doi:10.1016/j.engappai.2022.105604

5. Marques, M. N., **Magalhães**, **S. A.**, Dos Santos, F. N., & Mendonça, H. S. (2023). Tethered Unmanned Aerial Vehicles — A Systematic Review. *Robotics*, *12*(4). doi:10.3390/robotics12040117

6. Moreira, G., **Magalhães**, **S. A.**, Pinho, T., dos Santos, F. N., & Cunha, M. (2022). Benchmark of Deep Learning and a Proposed HSV Colour Space Models for the Detection and Classification of Greenhouse Tomato. *Agronomy*, *12*(2), 356. doi:10.3390/agronomy12020356

7. Aguiar, A. S., **Magalhães**, **S. A.**, dos Santos, F. N., Castro, L., Pinho, T., Valente, J., … Boaventura-Cunha, J. (2021). Grape Bunch Detection at Different Growth Stages Using Deep Learning Quantized Models. *Agronomy*, *11*(9), 1890. doi:10.3390/agronomy11091890

8. **Magalhães**, **S. A.**, Castro, L., Moreira, G., dos Santos, F. N., Cunha, M., Dias, J., & Moreira, A. P. (2021). Evaluating the Single-Shot MultiBox Detector and YOLO Deep Learning Models for the Detection of Tomatoes in a Greenhouse. *Sensors*, *21*(10), 3569. doi:10.3390/s21103569

9. Tinoco, V., Silva, M. F., Santos, F. N., Valente, A., Rocha, L. F., **Magalhães**, **S. A.**, & Santos, L. C. (2021). An overview of pruning and harvesting manipulators. *Industrial Robot: the international journal of robotics research and application*, *49*(4), 688–695. doi:10.1108/ir-07-2021-0139

Conference Proceedings

1. Moreira, G., **Magalhães**, **S. A.**, dos Santos, F. N., & Cunha, M. (2023). Automated Infield Grapevine Inflorescence Segmentation Based on Deep Learning Models. In *Iecag 2023*. doi:10.3390/iecag2023-15387

2. Tinoco, V., Silva, M. F., Santos, F. N., **Magalhães**, **S. A.**, & Morais, R. (2023). Design and Control Architecture of a Triple 3 DoF SCARA Manipulator for Tomato Harvesting. In *2023 IEEE International Conference on Autonomous Robot Systems and Competitions (ICARSC)*. doi:10.1109/icarsc58346.2023.10129554

3. Oliveira, F., Tinoco, V., **Magalhães**, **S. A.**, Santos, F. N., & Silva, M. F. (2022). End-Effectors for Harvesting Manipulators - State Of The Art Review. In *2022 IEEE International Conference on Autonomous Robot Systems and Competitions (ICARSC)*. doi:10.1109/icarsc55462.2022.9784809

4. Terra, F., Rodrigues, L., **Magalhães**, **S. A.**, Santos, F., Moura, P., & Cunha, M. (2021). PixelCropRobot, a cartesian multitask platform for microfarms automation. In *2021 International Symposium of Asian Control Association on Intelligent Robotics and Industrial Automation (IRIA)*. doi:10.1109/iria53009.2021.9588786

5. Tinoco, V., Silva, M. F., Santos, F. N., Rocha, L. F., **Magalhães**, **S. A.**, & Santos, L. C. (2021). A Review of Pruning and Harvesting Manipulators. In *2021 IEEE International Conference on Autonomous Robot Systems and Competitions (ICARSC)* (pp. 155–160). doi:10.1109/icarsc52212.2021.9429806

6. **Magalhães**, **S. A.**, Moreira, A. P., dos Santos, F. N., Dias, J., & Santos, L. (2021). Cost-Effective 4DoF Manipulator for General Applications. In *Lecture Notes in Networks and Systems* (pp. 251–267). doi:10.1007/978-3-030-82199-9_15

7. Padilha, T. C., Moreira, G., **Magalhães**, **S. A.**, dos Santos, F. N., Cunha, M., & Oliveira, M. (2021). Tomato Detection Using Deep Learning for Robotics Application. In *Progress in Artificial Intelligence* (pp. 27–38). doi:10.1007/978-3-030-86230-5_3

8. **Magalhães**, **S. A.**, Moreira, A. P., & Costa, P. (2020). Omnidirectional robot modeling and simulation. In *2020 IEEE International Conference on Autonomous Robot Systems and Competitions (ICARSC)* (pp. 251–256). doi:10.1109/icarsc49921.2020.9096069

9. Santos, L. C., Santos, F. N., Solteiro Pires, E. J., Valente, A., Costa, P., & **Magalhães**, **S. A.** (2020). Path Planning for ground robots in agriculture: a short review. In *2020 IEEE International Conference on Autonomous Robot Systems and Competitions (ICARSC)* (pp. 61–66). doi:10.1109/icarsc49921.2020.9096177

10. Santos, L., Santos, F. N., **Magalhães**, **S. A.**, Costa, P., & Reis, R. (2019). Path Planning approach with the extraction of Topological Maps from Occupancy Grid Maps in steep slope vineyards. In *2019 IEEE International Conference on Autonomous Robot Systems and Competitions (ICARSC)*. doi:10.1109/icarsc.2019.8733630

11. **Magalhães**, **S. A.**, dos Santos, F. N., Martins, R. C., Rocha, L. F., & Brito, J. (2019). Path Planning Algorithms Benchmarking for Grapevines Pruning and Monitoring. In *Lecture Notes in Artificial Intelligence* (pp. 295–306). doi:10.1007/978-3-030-30244-3_25

12. Martins, R. C., **Magalhães**, **S. A.**, Jorge, P., Barroso, T., & Santos, F. (2019). Metbots: Metabolomics Robots for Precision Viticulture. In *Lecture Notes in Artificial Intelligence* (pp. 156–166). doi:10.1007/978-3-030-30241-2_14

Dissertations and Thesis

1. **Magalhães**, **S. A.** (2018). *Controlo das trajetórias de um robô móvel de alto desempenho* (Master's thesis, Faculty of Engineering, University of Porto). Retrieved from http://hdl.handle.net/10216/113380

Patents

1. Martins, R., dos Santos, F. N., Cunha, M., Silva, A. F., Tosin, R., **Magalhães**, **S. A.**, & Pereira, M. (2023). *Method and device for non-invasive tomographic characterisation of a sample comprising a plurality of differentiated tissues*. PCT/EP2022/088102.

Projects, Dissertations and Thesis Supervisions

Bachelor Projects

1. de Almeida, M. A. T. (2023, September 14). *Real-time classification of bunches of grapes using FPGA* (Bachelor Report No. 8192). Instituto Superior de Engenharia do Porto, Instituto Politécnico do Porto. Retrieved from https://portal.isep.ipp.pt/intranet/provaslicenciatura/download.aspx?id=8192&ver=2

2. Pinto, B. B. (2023, September 14). *Development and validation of an agricultural and forestry dataset: Tribe agroset* (tech. rep. No. 8181). Instituto Superior de Engenharia do Porto, Instituto Politécnico do Porto. Retrieved from https://portal.isep.ipp.pt/intranet/provaslicenciatura/download.aspx?id=8181

3. Dias, B. M. (2023, July 19). *Geração de novos dados com generative adversarial network (gan)* (Bachelor Report No. 7964). Instituto Superior de Engenharia do Porto, Instituto Politécnico do Porto. Retrieved from https://portal.isep.ipp.pt/intranet/provaslicenciatura/download.aspx?id=7964

4. Nogueira, J. P. F. (2023, July 6). *Development of a RP2040 driver for a low-cost LiDAR and an Android application to map the environment* (Bachelor Report No. 7692). Instituto Superior de Engenharia do Porto, Instituto Politécnico do Porto. Retrieved from https://portal.isep.ipp.pt/intranet/provaslicenciatura/download.aspx?id=7692