CURRICULUM VITAE

Pedro Miguel Salgueiro dos Santos

June 29, 2021

Contents

Personal Information

Full name	Pedro Miguel Salgueiro dos Santos
Name in bibliography	Pedro Miguel Santos
Date of birth	February 13, 1986
Place of birth	Porto, Portugal
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Habilitations	Ph.D in Electrical and Computer Engineering, University of Porto, May 2017 B.Sc./M.Sc. in Electrical and Computer Engineering, University of Porto, July 2009
Professional Activity	Assistant Researcher, Research Centre in Real-Time and Embedded Computing Systems (CISTER), Instituto Superior de Engenharia do Instituto Politécnico do Porto (ISEP/IPP) Invited Assistant Lecturer (28.6% of full time) Departamento de Engenharia Electrotécnica e de Computadores (DEEC), Faculdade de Engenharia da Universidade do Porto (FEUP).
Affiliation	Research Centre in Real-Time and Embedded Computing Systems (CISTER) *(Web: https://www.cister.isep.ipp.pt/people/pedro_miguel_santos/)* Faculdade de Engenharia da Universidade do Porto, Portugal *(Web: https://sigarra.up.pt/feup/pt/func_geral.formview?p_codigo=510443)* Previously: Instituto de Telecomunicações, Portugal
Online Presence	
ORCID	orcid.org/0000-0002-7162-0560
Scopus	https://www.scopus.com/authid/detail.uri?authorId=57195194993
Google Scholar	https://scholar.google.pt/citations?user=PWGti5IAAAAJ
Web of Science ResearcherID	AAJ-7540-2020 - https://publons.com/researcher/3062034/pedro-m-santos/
Ciencia Vitae	9F14-3CD7-F5DE - https://www.cienciavitae.pt//pt/9F14-3CD7-F5DE
Research Gate	https://www.researchgate.net/profile/Pedro_Santos70

Introduction

This document serves as a curriculum vitae of the competences, activities and achievements of scientific, pedagogic and of other nature of Pedro Miguel Salgueiro dos Santos, Ph.D. in Electrical and Computer Engineering by the Universidade do Porto, Portugal, assistant researcher at the Research Centre in Embedded and Real-Time Computing Systems of the Instituto Superior de Engenharia do Porto (CISTER/ISEP), Portugal, and invited assistant lecturer at the Faculdade de Engenharia da Universidade do Porto (FEUP), Portugal.

This document is organized as follows. Chapter 1 reviews the educational and professional path of Pedro. In Chapter 2, an overview of the scientific activity and community engagement of Pedro, including his scientific publications and participation in national and international projects, is presented. Pedagogical activities are described in Chapter 3. In Chapter 4, activities relevant to the institutional mission are presented.

All documents mentioned are available online via hyperlinks.

The following table maps the evaluation criteria of the call notice (*Edital*) into sections of this document.

Table 1: Mapping table between evaluation criteria and document sections.

Evaluation Criteria	Document Section
CMC1	Sec.2.1
CMC2	Sec.2.2
CMC3	Sec.2.3
CMC4	Sec.2.4
CMP1	Sec.3.1
CMP2	Sec.3.2
CMP3	Sec.3.3
CMC1	N/A
CMC2	N/A
CMC3	Sec.4.1
10 most representative works (point 5.2.c of *Edital*)	Sec.2.1.8

Chapter 1

Education and Experience

1.1 Education and Academic Degrees

Concluded the *Ciclo Secundário* (10th to 12th public school years) at the **Escola Secundária Aurélia de Sousa**, in Porto, Portugal, in the field of Sciences, with a final grade of 19 out of 20.

Concluded the **B.Sc./M.Sc. Program in Electrical and Computer Engineering**, offered by the **Faculty of Engineering of the University of Porto** (FEUP), between September 2004 and July 2009, with the final grade of 17 out of 20. In 2009, he successfully defended his Master thesis entitled **Stereoscopic Hand-Detection System based on FPGA** under supervision of Professor Doctor João Canas Ferreira, with a final grade of 18 out of 20.

Concluded the **Doctoral Program in Electrical and Computer Engineering**, offered by the **University of Porto**, Portugal, between October 2009 and May 2017, under supervision of Professor Doctor João Barros and Professor Doctor Ana Aguiar, and with the **Instituto de Telecomunicações** (Porto branch) as hosting institution. In the class year of 2009/2010, Pedro concluded the mandatory courses of the program with the final grade of 15 out of 20. In May 2017, Pedro successfully defended the thesis **Wireless Protocols and Channel Estimation for Data Gathering with Mobile Nodes**.

Professional Experience

This section is meant to provide an overview of Pedro's professional path. More in-depth information can be found in Section 2.2 ("Coordination and Participation in Academic Projects").

Pedro is currently an **assistant Ph.D. researcher** at the **Research Centre for Embedded and Real-Time Computing Systems (CISTER)** of the **Instituto Superior de Engenharia do Porto**, Portugal, since February 2019.

He also holds a position as **invited assistant lecturer** (*professor auxiliar convidado*) at the **Faculty of Engineering of the University of Porto**, Portugal, since September 2017.

Pedro is a **Ph.D. researcher and institutional coordinator** of the project **FLOYD** (call AAC no. 04/SI/2019, Grant 045912), funded by the CMU|Portugal Program, since January 2021.

Pedro is a **Ph.D. researcher and institutional coordinator** of the project **MIRAI** (Eureka Cluster ITEA3, Call 6, Grant no. 19034; Portuguese reference: call AAC nº 16/SI/2019, Grant no. 69522), funded by ANI, since December 2020.

Pedro is a **Ph.D. researcher and institutional coordinator** of the project **RETINA** (call NORTE-45-2020-75 *Structured R&D&I Projects – Horizon Europe*; operation no. NORTE-01-0145-FEDER-000062), funded by NORTE 2020, since January 2021.

He is a **Ph.D. Researcher** in the project **InSecTT** (ECSEL/0002/2019, Grant no. 876038, call H2020-ECSEL-2019-1-IA), funded by the H2020 and FCT in the scope of the ECSEL Joint Undertaking.

Pedro is a **Ph.D. researcher** in the project **AQUAMON** (PTDC/CCI-COM/30142/2017), funded by the Fundação para Ciência e Tecnologia, since April 2018.

In the past, Pedro participated in several national and international academic projects as:

- **Ph.D. researcher** in the project **S2MovingCity** (CMUP-ERI/TIC/0010/2014), funded by the CMU|-Portugal Program, from November 2018 to January 2019.
- **Ph.D. researcher** in the project **Generation.Mobi** (POCI-01-0247-FEDER-017369), a Co-Promotion project funded by the European Union - ERDF/FEDER, Compete2020 and Portugal 2020 programs, from June 2017 to November 2018.
- **Ph.D. student researcher** in the project **SmartCityMules** (PTDC/EEI-TEL/2008/2014), funded by the Fundação para Ciência e Tecnologia, from October 2016 to December 2016.
- **Ph.D. student researcher** in the project **VR2Market** (CMUP-ERI/FIA/0031/2013), funded by the CMU|Portugal Program, from October 2015 to April 2016.
- **Ph.D. student researcher** in the project **Vital Responder 2.0** (PTDC/EEI-ELC/2760/2012), funded by Fundação para Ciência e Tecnologia, from July 2015 to October 2015.
- **Ph.D. student researcher** in the project **Future Cities** (FP7-REGPOT-2012-2013-1, 316296), funded by the 7th Framework Program (FP7) of the European Union, between May 2014 and May 2015.
- **Ph.D. student researcher** in the project **Vital Responder** (CMU-PT/CPS/0046/2008), funded by the CMU|Portugal Program, from September 2009 to September 2012.

International

For the period between September 2007 and February 2008, Pedro attended the **Technische Universiteit Eindhoven** as an interchange student under EU's Erasmus Program.

Pedro visited the **Carnegie Mellon University**, for a three-month period (February to May 2012), on invitation by Professor Anthony Rowe, to carry out collaboration work on in the scope of the CMU|Portugal Program project *Vital Responder*. *Note: Pedro travelled under the Visa Waiver program (regular travel visa) and not under J-1 (Visiting Scholar) visa.*

Affiliations

Pedro is currently a member of the **Research Center on Real-Time and Embedded Computing Systems** (CISTER), a research unit within the **Instituto Superior de Engenharia do Porto** (ISEP), in Portugal, since February 2019.

Pedro is affiliated with the **Department of Electrical and Computer Engineering** at FEUP since October 2009.

He was member of the **Instituto de Telecomunicações** (IT) between October 2009 and May 2017 in the context of his Ph.D. studies, as IT was his hosting institution.

Scholarships

Pedro received a scholarship from the Fundação para a Ciência e Tecnologia (Portuguese scientific funding agency; scholarship reference: SFRH/BD/67178/2009) to carry out Ph.D. studies over the period of four years, in January 2010.

Other Training

Attended a course of complementary skills on **Presentation and Assertive Communication Techniques**, offered by the Faculty of Engineering of the University of Porto, Portugal, and worth 1,5 ECTS, in November 2013.

Attended a course of complementary skills on **Pedagogical Training**, offered by the Faculty of Engineering of the University of Porto, Portugal, totaling 1,5 ECTS, in November 2016.

Chapter 2

Scientific Activity

The scientific output and engagement of Pedro in the Portuguese and international academic community are described in the following sections.

2.1 Scientific Production

As per criterium CMC1 of the evaluation criteria - Produção científica
(Back to mapping table)

The impact of Pedro's production is characterized in the following subsection. The remainder of the section lists the publications of Pedro under various categories. The last subsection lists the ten most representative publications of the candidate.

2.1.1 Impact in Scientific and Academic Communities

The quality of the scientific output of Pedro can be evaluated by the following elements:

1. Citation count: The following Table 2.1 shows the citations of the applicant's work excluding self-citations. The procedures to obtain these values are explained in Appendix A, *Citation Count Procedure*.

Table 2.1: Citation count

Scholar	Scopus	ISI Web of Knowledge
138	95	71

2. Impact factor & Exposure: two of the journals in which Pedro has published have an impact factor higher than 5.0 – IEEE TWC and IEEE IoT-J (see Section 2.1.3). Having published mostly in IEEE and ACM fora, most publications of Sections 2.1.3 and 2.1.4 are indexed in the international repositories IEEEXplore and/or ACM Digital Library.

2.1.2 Theses

San2017a: P. M. Santos. *Wireless Protocols and Channel Estimation for Data Gathering with Mobile Nodes.* Ph.D. thesis, University of Porto, May 2017.

San2009: P. M. Santos. *Stereoscopic Hand-Detection System based on FPGA.* Master thesis, University of Porto, July 2009.

Video of system in operation: https://www.youtube.com/watch?v=2fsh8o-3cpQ.

2.1.3 Articles in International Journals with Peer-Review

1. **[San2019a]** A. Aslam, P. M. Santos, F. Santos, L. Almeida: *Empirical Performance Models of MAC Protocols for Cooperative Platooning Applications.* MDPI Electronics, Open Access, 2019, Vol. 8, n.11, pp.1334, 12 November 2019.

   SCIMAGO *Quartile* 2020 = 2nd (Computer Networks and Communications)

   ISI *Journal Citation Report* 2019 Impact Factor = 2.412

2. **[San2018a]** P. M. Santos, L. Kholkine, A. Cardote, A. Aguiar: *Context Classifier for Position-based User Access Control to Vehicular Hotspots.* Elsevier Computer Communications, March 2018.

   SCIMAGO *Quartile* 2020 = 1st (Computer Networks and Communications)

   ISI *Journal Citation Report* 2019 Impact Factor = 2.816

3. **[San2018b]** P. M. Santos, J. G. P. Rodrigues, S. B. Cruz, T. Lourenço, P. M. d'Orey, Y. Luis, C.Rocha, S.Sousa, S.Crisóstomo, C.Queirós, S. Sargento, A. Aguiar, J. Barros. *PortoLivingLab: an IoT-based Sensing Platform for Smart Cities.* IEEE Internet-of-Things Journal, January 2018.

   SCIMAGO *Quartile* 2020 = 1st (Computer Science Applications)

   ISI *Journal Citation Report* 2019 Impact Factor = 9.936

4. **[San2014]** P.M. Santos, T.E. Abrudan, A. Aguiar, J. Barros. *Impact of Position Errors on Path Loss Model Estimation for Device-to-Device Channels.* IEEE Transactions on Wireless Communications, Vol.13, No.5, pp.2353-2361, May 2014.

   SCIMAGO *Quartile* 2020 = 1st (Computer Science Applications)

   ISI *Journal Citation Report* 2019 Impact Factor = 6.779

5. **[San2013a]** P.M. Santos, J.C. Ferreira, J.S. Matos. *Scalable Hardware Architecture for Disparity Map Computation and Object Location in Real-Time.* Journal of Real-Time Image Processing, Vol. 11, n.3, pp.473-485, Springer, March 2016 (first online on June 2013).

   SCIMAGO *Quartile* 2020 = 3rd (Information Systems)

   ISI *Journal Citation Report* 2019 Impact Factor = 1.968

2.1.4 Articles in International Conferences with Peer-Review

1. **[San2021a]** P. M. Santos, J. C. Sousa, R. Morla, N. Martins, J. Tagaio, J. Serra, C. Silva, M. Sousa, P. Souto, L. L. Ferreira, J. Ferreira, L. Almeida. *Towards a Distributed Learning Architecture for Securing ISP Home Customers*. In Proceedings of the 1st Workshop on Distributed AI on Resource-Constrained Platforms (DARE) (co-located with AIAI 2021), 28 May 2021, online.

2. **[San2021b]** R. Reddy, L. Almeida, M. G. Gaitán, P.M. Santos, E. Tovar. *Synchronous Framework Extended for Complex Intersections*. Accepted at the 24th Euro Working Group on Transportation Meeting (EWGT 2021), 16-18 September 2021, Aveiro, Portugal.

3. **[San2020a]** M. G. Gaitán, L. Almeida, P. M. Santos, P. M. Yomsi. *EDF scheduling and minimal-overlap shortest-path routing for real-time TSCH networks*. In Proceedings of the 2nd Workshop on Next Generation Real-Time Embedded Systems (NG-RES) (co-located with HiPEAC 2021), 20 January 2021, online.

4. **[San2020b]** P. M. Santos, M. Rosa, L. M. Pinto, L. Almeida. *Cooperative Bicycle Localization System via Ad Hoc Bluetooth Networks*. In Proceedings of the IEEE VNC 2020, 16-18 December 2020, online.

5. **[San2020c]** D. Martins, B. Parreira, P. M. Santos, S. Figueiredo. *NetButler:Voice-Based Edge/Cloud Virtual Assistant for Home Network Management*. In Proceedings of the EAI Edge-IoT 2020, 4 December 2020, online.

6. **[San2020d]** M. G. Gaitán, P. M. Santos, L. M. Pinto, L. Almeida. *Optimal antenna-height design for improved capacity on over-water radio links affected by tides*. In Proceedings of the IEEE OCEANS 2020: Singapore – U.S. Gulf Coast (OCEANS 2020), 5-14 October 2020, online.

7. **[San2020e]** R. Reddy, L. Almeida, P. M. Santos, E. M. Tovar. *Comparing the Ecological Footprint of Intersection Management Protocols for Human/Autonomous Scenarios*. In Proceedings of the 23rd IEEE International Conference on Intelligent Transportation Systems (ITSC 2020), 20-23 September 2020, online.

8. **[San2020f]** R. Reddy, L. Almeida, P. M. Santos, Samia Bouzefrane, E. M. Tovar. *Synchronous Intersection Management to reduce Time Loss*. In Proceedings of the 23rd EURO Working Group on Transportation Meeting (EWGT 2020), 16-18 September 2020, online.

9. **[San2020g]** M. G. Gaitán, P. M. Santos, L. M. Pinto, L. Almeida. *Experimental Evaluation of the Two-Ray Model for Near-Shore WiFi-based Network Systems Design*. In Proceedings of the IEEE 91st Vehicular Technology Conference (VTC2020-Spring), 25-27 May 2020, online.

10. **[San2020h]** M. G. Gáitan, P. M. Yomsi, P. M. Santos, L. Almeida. *Work-in-Progress: Assessing supply/demand-bound based schedulability tests for wireless sensor-actuator networks*. In Proceedings of the 2020 IEEE 16th International Conference on Factory Communication Systems (WFCS 2020), online (planned for Porto, Portugal), 27-29 April 2020.

11. **[San2019b]** P. M. Santos, L. M. Sousa, A. Aguiar: *Experimental Evaluation of Urban Points-of-Interest as Predictors of I2V 802.11 Data Transfers*. In Proceedings of the 2019 IEEE Smart Cities Conference, October 14-17 2019, Casablanca, Morocco.

12. **[San2019c]** P. M. d'Orey, P. M. Santos, J. Pintor, A. Aguiar: *Opportunistic Use of In-Vehicle Wireless Networks for Vulnerable Road User Interaction.* In Proceedings of the 2019 IEEE Intelligent Vehicles Symposium, June 9-12 2019, Paris, France.

13. **[San2018c]** P. M. Santos, L. Pinto, L. Almeida, A. Aguiar: *Characterization and Modeling of the Bicycle-Antenna System for the 2.4GHz ISM Band.* In Proceedings of the 2018 IEEE Vehicular Networking Conference, December 5-7 2018, Taipei, Taiwan.

14. **[San2018d]** E. Soares, P. M. Santos, L. Pinto, A. Aguiar, P. Brandão, R. Prior: Poster. *Poster: VoIP System for Bicycle Platoons.* In Proceedings of the 2018 IEEE Vehicular Networking Conference, December 5-7 2018, Taipei, Taiwan.

15. **[San2018e]** L. M. Sousa, P. M. Santos, A. Aguiar: *An Exploratory Study of Relations between Site Features and I2V Link Performance.* In Proceedings of the 2018 EAI Urb-IoT Conference, November 21-23 2018, Guimarães, Portugal.

16. **[San2018f]** A. Nguyen, P. M. Santos, M. Rosa, A. Aguiar: Poster. *Study on Solar-powered IoT Node Autonomy.* In Proceedings of the 4th IEEE International Smart Cities Conference, September 16-19 2018, Kansas City, MO, USA.

17. **[San2018g]** P.M. Santos, L. Pinto, A. Aguiar, L. Almeida. *A Glimpse at Bicycle-to-Bicycle Link Performance in the 2.4GHz ISM Band.* In Proceedings of 29th IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC 2018), September 9-12 2018, Bologna, Italy.

18. **[San2016a]** L. Kholkine, P.M. Santos, A. Cardote, A. Aguiar. *Detecting Relative Position of User Devices and Mobile Access Points.* In Proceedings of the XXth IEEE Vehicular Networking Conference (VNC 2016), December 8-10 2016, Columbus, OH, USA, pp.1-8.

    Invited for extended version submission to Elsevier Computer Communications.

19. **[San2016b]** Y. Luis, P.M. Santos, T. Lourenço, C. Pérez-Penichet, T. Calçada, A. Aguiar. *UrbanSense: An Urban-scale Sensing Platform for the Internet of Things.* In Proceedings of the 2nd IEEE International Smart Cities Conference (ISC2 2016), September 12-15, 2016, Trento, Italy, pp.1-6.

    Recipient of the **Best Student Paper Award**.

20. **[San2015a]** P.M. Santos, T. Calçada, S. Sargento, A. Aguiar, João Barros. *Experimental Characterization of I2V Wi-Fi Connections in an Urban Testbed.* In Proceedings of the 10th ACM MobiCom Workshop on Challenged Networks (CHANTS '15), September 7-11, 2015, Paris, France. ACM, New York, NY, USA, pp.5-8.

21. **[San2015b]** P. M. Santos, T. Calcada, D. Guimarães, T. Condeixa, S. Sargento, A. Aguiar, J. Barros. *Demo: Platform for Collecting Data From Urban Sensors Using Vehicular Networking.* In Proceedings of the 21st Annual International Conference on Mobile Computing and Networking (MobiCom). 2015. September 7-11, 2015, Paris, France. ACM, New York, NY, USA, pp.167-169.

    Descriptive video: youtube.com/watch?v=Hqjx28hpuT8

22. **[San2015c]** P. M. Santos, T. Calcada, A. Sá, D. Guimarães, T. Condeixa, C. Pérez-Penichet, S. Sargento, A. Aguiar, J. Barros. *Experiments On Using Vehicles As Data Mules For Data Collection From Urban Sensors (Demo)*. In Proceedings of the 21st European Wireless Sensor Network Conference (EWSN), 2015, Porto, Portugal. ACM, New York, NY, USA, pp.167-169.
    ⋆ *Not made available in high-profile repository (ACM DL).*

23. **[San2013b]** L. Pinto, P.M. Santos, S. Crisóstomo, T. Abrudan, J. Barros. *On-the-Fly Deployment of Wireless Sensor Networks for Indoor Assisted Guidance.* In Proceedings of the 1th IEEE International Conference on Cyber-Physical Systems, Networks and Applications (CPSNA), August 19-20 2013, Taipei, Taiwan.
    ⋆ *Not made available in high-profile repository (IEEEXplore).*

    Video at national TV channel *SIC*: youtube.com/watch?v=QkvygFzJyLs&t=121.

24. **[San2010a]** P.M. Santos, J.C. Ferreira: Poster. *FPGA-based real-time disparity computation and object location.* In Proceedings of the 28th Norchip Conference. November 15-16 2010, Tampere, Finland.

Submitted:

25. Miguel G. Gaitán, Luís Almeida, Pedro M. Santos, Luís Pinto, Pedro M. d'Orey, Manuel Ribeiro and J. Borges de Sousa. *Wireless radio link design for reliable near-shore communication with surface nodes on tidal waters.* Submitted to OCEANS 2021.

2.1.5 Articles in National Conferences with Peer-Review

26. **[San2021c]** R. Reddy, L.Almeida, M.G.Gáitan, P.M.Santos, E. Tovar. *Sustainability Analysis of Complex Multi-Lane Intelligent Signalized Intersections.* Accepted at the Doctoral Congress in Engineering *DCE 2019*. Faculdade de Engenharia da Universidade do Porto, June 2020.

27. **[San2019d]** M.G.Gáitan, L.M.Pinto, P.M.Santos, L.Almeida. *On the Two-Ray Model Analysis for Overwater Links with Tidal Variations.* Poster presented at the Simpósio de Informática *Inforum 2019*, track CRC (Comunicações e Redes de Computadores). Universidade do Minho, Guimarães, September 2019.

28. **[San2019e]** M.G.Gáitan, L.M.Pinto, P.M.Santos, L.Almeida. *An Analysis of the Two-Ray Propagation Model to Support Near-Surface Overwater Wireless Sensor Networks Design.* Presented at the Doctoral Congress in Engineering *DCE 2019*. Faculdade de Engenharia da Universidade do Porto, June 2019.

2.1.6 Talks, Posters and Demonstrations

1. **[San2021c]** M.G.Gáitan, P.M.Santos, L.Almeida. Improving short to medium range communication over water tides: Why does height matters?. Talk at the 29th RTCM Seminar. February 4, 2021. Online.

2. **[San2020i]** M.G.Gáitan, P.M.Santos, L.Almeida. Real-Time Communication Support for Overwater Wireless Multi-hop Networks. Presented at 7th Barcelona Supercomputing Center Severo Ochoa Doctoral Symposium (BSC SO Doctoral Symposium 2020), 5 May 2020, pp. 51-52. Online.

3. **[San2018g]** P.Santos, L.Pinto, M.Rosa, J.Pintor, J.Mesquita, E.Soares, L. Almeida, A. Aguiar. *Connected Bicycles for Smart Mobility*. Poster presented at the national academic event *Ciência 2018*. Centro de Congressos de Lisboa, July 2018.

4. **[San2018h]** L. R. Pinto, P. M. Santos, J.Pintor, M. Rosa, J. Mesquita, L. Almeida, A. Aguiar. *Extensive characterization and modeling of bicycle-to-bicycle link quality.* Poster presented at the 25th RTCM Seminar. June 22, 2018. Faculdade de Ciências, Universidade do Porto, Porto, Portugal.

5. **[San2018i]** M. Rosa, P. M. Santos, L. Pinto, A. Aguiar. *Stolen Bicycles Detection using Bluetooth Low-Energy Technology.* Poster presented at the 25th RTCM Seminar. June 22, 2018. Faculdade de Ciências, Universidade do Porto, Porto, Portugal.

6. **[San2018j]** M. Rosa, P. M. Santos, L. Pinto, A. Aguiar. *Stolen Bicycles Detection using Bluetooth Low-Energy Technology.* Demonstration setup of a stolen bicycle detection system using Bluetooth Low Energy communication. Presented at the P2020 *Generation.Mobi* project Workshop. February 23, 2018. Faculdade de Engenharia, Universidade do Porto, Porto, Portugal.

   Descriptive video: youtube.com/watch?v=zc8JpLaUkHA.

7. **[San2017b]** Pedro M. Santos, Tânia Calçada, Ana Aguiar, Susana Sargento, João Barros. *Communication Hub Placement Driven by I2V Service Estimation*. Poster presented at the national academic event *Ciência 2017*. July 2017. Centro de Congressos de Lisboa.

8. **[San2016c]** Poster: Yunior Luis, Pedro M. Santos, Tania Calçada, Susana Sargento, Ana Aguiar, João Barros. *Collecting Data from the UrbanSense Platform Using Vehicular Networking*. Poster presented at the national academic event *Ciência 2016*. July 2016. Centro de Congressos de Lisboa.

9. **[San2013c]** P. M. Santos, T. E. Abrudan, A. Aguiar, J. Barros. *Impact of Position Errors on Device-to-Device Wireless Channel Estimation.* Talk at the 17th RTCM Seminar. July 19, 2013. Faculdade de Ciências, Universidade do Porto, Porto, Portugal.

10. **[San2013d]** L. Pinto, P. M. Santos, S. Crisóstomo, T. E. Abrudan, J. Barros. *A Cyber-Physical System for Dynamic Building Evacuation.* Talk at the 16th RTCM Seminar. February 15, 2013. Faculdade de Ciências da Saúde, Universidade da Beira Interior, Covilhã, Portugal.

11. **[San2013e]** L. Pinto, P.M. Santos, S. Crisóstomo, T. Abrudan, J. Barros. *On-the-Fly Deployment of Wireless Sensor Networks for Indoor Assisted Guidance.* Demonstration setup for a fast and practical deployment method of a dynamic building evacuation system. Published in [**San2013b**].

    Descriptive video: youtube.com/watch?v=sC_kk_P_lOY

    Presented at:

    - Annual Conference of the FP7 *Future Cities* project. Mosteiro de São Bento da Vitória, Porto, January 2014.

- 3rd Annual Conference of the CMU-Portugal Program. Reitoria da Universidade Nova de Lisboa, Lisboa, October 2013.
- Celebrations of the 20th anniversary of the Instituto de Telecomunicações (IT) and 5th anniversary of the Porto branch. Departamento de Ciência dos Computadores, Faculdade de Ciências da Universidade do Porto, October 2012.

12. **[San2010b]** P.M. Santos, F. Vieira, J. Barros. *Building Evacuation System based on Wireless Sensor Networks.* Demonstration setup of a dynamic building evacuation system, that changes routes according to the evolution of the fire vectors.

    Descriptive video: youtube.com/watch?v=PJSqnq6ZfOE.

    Presented at:
    - Meeting of the External Review Committee of the CMU-Portugal projects. Centro Cultural e Científico de Macau, Lisboa, January 2012.
    - 2nd Annual Conference of the CMU-Portugal Program. Fundação Calouste Gulbenkian, Lisboa, June 2010.
    - Opening Ceremony of the School Year 2010/2011. PT, Fórum Picoas, Lisboa, January 2010. Demonstration presented to Science Minister Prof. Dr. José Mariano Gago.

2.1.7 Technical Project Reports

1. P.M. Santos: *Technical Report for Task 1.1: Elicitation for Framework Requirements*. Report produced for the Eureka ITEA3 **MIRAI** project, May 2021.

2. P.M. Santos, Luís M. Pinto, José Pintor, Miguel Rosa, João Mesquita, Eduardo Soares, Luís Almeida, Ana Aguiar: *Technical Report for Task 5.3: Laboratory Evaluation of the Communication System*. Report produced for the P2020 **Generation.Mobi** project.

3. P.M. Santos, Luís M. Pinto, José Pintor, Miguel Rosa, João Mesquita, Eduardo Soares, Luís Almeida, Ana Aguiar: *Technical Report for Task 1.2: Study on Network Architectures for Vehicular Communications*. Report produced for the P2020 **Generation.Mobi** project.

4. P.M. Santos, Emanuel Lima, Ana Aguiar: *Technical Report: Analysis of Wireless Communication Technologies*. Report produced for the CMU|Portugal **Vital Responder 2.0** project.

2.1.8 Selected Publications

As per point 5.2.c) of the Edital - 10 most representative works
(Back to mapping table)

For convenience, the 10 publications were grouped under thematic categories.

Large-scale Smart Cities Platforms

1. **[San2018b]** P. M. Santos, J. G. P. Rodrigues, S. B. Cruz, T. Lourenço, P. M. D'Orey, Y. Luis, C. Rocha, S. Sousa, S. Crisóstomo, C. Queirós, S. Sargento, A. Aguiar, J. Barros. **PortoLivingLab: an IoT-based Sensing Platform for Smart Cities**. IEEE Internet-of-Things Journal, July 2017.

   This article describes the architecture and operation of three IoT platforms installed in Porto, Portugal – a vehicular network, a weather monitoring platform, and a mobile crowdsensing application –, alongside the mechanisms for collecting data from such heterogenous sources at a central repository. Opportunities and challenges in the design and maintenance of the IoT platforms, and a example set of data analyses, are reported. **This publication has been cited 79 times, as it describes one of the largest (at the time of publication) research deployments of IoT, Smart City-enabling platforms worldwide.**

2. **[San2016b]** Y. Luis, P.M. Santos, T. Lourenço, C. Pérez-Penichet, T. Calçada, A. Aguiar. **UrbanSense: An Urban-scale Sensing Platform for the Internet of Things.** In Proceedings of the 2nd IEEE International Smart Cities Conference (ISC2 2016), September 12-15, 2016, Trento, Italy.

   This article describes the architecture and operation of a distributed monitoring platform named *UrbanSense*, composed of 22 weather and air quality sensing units installed in Porto, Portugal. The applicant and co-authors provided performance metrics of the system (KPIs - *key performance indicators*), thus contributing to the definition of those in the context of the community. **This article received the Best Student Paper award at the *IEEE Smart Cities Conference*, the IEEE flagship conference on Smart Cities.**

Wireless Link and Network Modelling

3. **[San2014]** P.M. Santos, T.E. Abrudan, A. Aguiar, J. Barros. **Impact of Position Errors on Path Loss Model Estimation for Device-to-Device Channels.** IEEE Transactions on Wireless Communications, Vol.13, No.5, pp. 2353-2361, May 2014.

   The candidate and co-authors evaluated how the error in GPS position estimates affects computed distances and ultimately the parameter estimation of empirical channel models. The applicant provided guidelines to avoid it and proposed a system based on Monte-Carlo methods to estimate the channel true parameters when the distances are erroneous. This study is particularly relevant given that GNSS systems are used almost universally to acquire the distances between transmitters and receivers used in the measurement pairs of received signal strength and distance. **Due to its innovative nature, this work has been cited 14 times.**

4. **[San2018c]** P. M. Santos, L. Pinto, L. Almeida, A. Aguiar: **Characterization and Modeling of the Bicycle-Antenna System for the 2.4GHz ISM Band.** In Proceedings of the 2018 IEEE Vehicular Networking Conference, December 5-7 2018, Taipei, Taiwan.

   This article describes an extensive measurement campaign to characterize the radiation of IEEE 802.11 transceivers installed in bicycles. We measured the radiation patterns of commodity 2.4 GHz WiFi modules mounted on six distinct positions on the body of six archetypal bicycles in

an anechoic chamber. This study represents one of the most comprehensive empirical studies on bicycle-to-bicycle propagation at the time of its publication.

5. **[San2015a]** P.M. Santos, T. Calçada, S. Sargento, A. Aguiar, J. Barros. **Experimental Characterization of I2V Wi-Fi Connections in an Urban Testbed.** In Proceedings of the 10th ACM MobiCom Workshop on Challenged Networks (CHANTS '15), September 7-11, 2015, Paris.

   This article presents a month-long campaign to measure wireless data transfer rates and volumes between a road-side WiFi-enabled sensor node and WiFi-equipped on-board units installed in a bus fleet. Up to 5+ GBytes of daily transfered volumes were measured in that particular location. A regression study identified the number of connections as the best predictor for the daily transfered data volume.

Smart Networking Applications

6. **[San2021a]** P. M. Santos, J. C. Sousa, R. Morla, N. Martins, J. Tagaio, J. Serra, C. Silva, M. Sousa, P. Souto, L. L. Ferreira, J. Ferreira, L. Almeida. **Towards a Distributed Learning Architecture for Securing ISP Home Customers**. Presented at the 1st Workshop on Distributed AI on Resource-Constrained Platforms (DARE) (co-located with AIAI 2021), 28 May 2021, online.

   This article presents a preliminary discussion into the architecture and Machine Learning mechanisms of a security service offered by an Internet Service Provider (ISP) to detect Distributed Denial-of-Service (DDoS) attacks involving IoT devices of the ISP customers. Particularly, we analyse the trade-offs of distributing the learning components of the service between the Customer-Premises Equipment (CPE) and the cloud.

7. **[San2015b]** P. M. Santos, T. Calcada, D. Guimarães, T. Condeixa, S. Sargento, A. Aguiar, J. Barros. **Demo: Platform for Collecting Data From Urban Sensors Using Vehicular Networking.** In Proceedings of the 21st Annual International Conference on Mobile Computing and Networking (MobiCom). 2015. September 7-11, 2015, Paris, France. ACM, New York, NY, USA, pp.167-169.

   This article demonstrates an operational system to collect data from infrastructural nodes – specifically, weather monitoring stations – to vehicular nodes over opportunistic IEEE 802.11 links. **The demonstration was presented at a prestigious conference (ACM MobiCom 2015); a descriptive video can be found here: youtube.com/watch?v=Hqjx28hpuT8**

8. **[San2018a]** P. M. Santos, L. Kholkine, A. Cardote, A. Aguiar: **Context Classifier for Position-based User Access Control to Vehicular Hotspots**. Elsevier Computer Communications, March 2018.

   This article presents and explores a novel urban problem in the context of mobile computing: the unwanted association of road-side mobile devices to on-board hotspots (such as those available at buses and other public transports). The applicant and co-authors developed a classifier for the on-board WLAN access point to identify whether the devices requesting association are inside or outside the bus. This work represents an application of machine learning algorithms to propagation information for the purpose of improving service to passenger WiFi service.

9. **[San2020b]** P. M. Santos, M. Rosa, L. M. Pinto, L. Almeida. **Cooperative Bicycle Localization System via Ad Hoc Bluetooth Networks**. In Proceedings of the IEEE VNC 2020, 16-18 December 2020, online.

   This article describes an information architecture for collecting and storing data from bicycles. Bicycles are becoming equipped with electric batteries and connectivity modules, e.g., GPS tracking device, cellular module for fleet management, and Bluetooth-controlled lock. We present a system which, in the event that a bicycle gets stolen or lost, and its GPS and cellular modules are tampered with but Bluetooth remains operational and sending beacons, allows other legitimate bicycles can identify the whereabouts of stolen and report them to the service provider.

10. **[San2020c]** D. Martins, B. Parreira, P. M. Santos, S. Figueiredo. **NetButler:Voice-Based Edge/ Cloud Virtual Assistant for Home Network Management**. In Proceedings of the EAI Edge-IoT 2020, 4 December 2020, online.

    This article describes a voice-based assistant to support debugging or feature activation in home gateways served by Internet-service providers. The work integrates Amazon Alexa with a cloud-based application manager and an agent at the customer-premises equipment (CPE) to carry out the necessary routines. This publication represents the integration of commercially-available natural language processing (NLP) tools in the concrete application of management of home networks.

2.2 Coordination and Participation in Academic Projects

As per criterium CMC2 of the evaluation criteria - Coordenação e realização de projetos científicos (Back to mapping table)

2.2.1 Coordination of Academic Projects

Pedro is directly involved in the proposal and management of the following R&D projects:

1. **MIRAI - Machine Intelligence for smart and sustainable planning and operation of IoT and Edge**

Summary: This international project will develop MIRAI Framework Building Blocks (MFBB) based on AI techniques in order to enable the smart and sustainable planning and operation of IoT and edge computing applications. At Portugal, the industrial partner is NOS Inovação and the use-case addresses secure Internet provision to end-users. Pedro was involved in contacting the international consortium and the national industrial partner, writing the project proposal, and is currently in charge of coordination at the CISTER/ISEP partner.

Description:

Call/Program	Eureka Cluster ITEA3, Call 6, Project n. 19034
Duration & Start	36 months, from December 2020
Site	https://itea3.org/project/mirai.html
Funding source	ANI
Funding granted	EUR 280k (CISTER/ISEP)

Scope	International (BE, PT, TR, SE)
Partners	NOS Inovação (PT), FEUP (PT), CISTER/ISEP (PT), SIRRIS (BE), Macq (BE), 3E (BE), BTH (SE), Eliar (TR), Enforma (TR)
Pedro's Role	**Coordinator at CISTER/ISEP**

2. **FLOYD - 5G/SDN Intelligent Systems For LOw latencY V2X communications in cross-Domain mobility applications**

Summary: FLOYD aims at building such a technological stack for offering high-performance network/ computation services to autonomous vehicles. Pedro was involved in the writing of the project proposal, and is the institutional coordinator on the CISTER/ISEP side.

Description:

Call/Program	CMU-PT Large-Scale Collaborative Research Projects – AAC nº 04/SI/2019, Grant 045912
Duration & Start	30 months, starting on January 2021
Site	https://www.cmuportugal.org/large-scale-collaborative-research-projects/floyd/
Funding source	ANI, FCT
Funding granted	EUR 132k (CISTER/ISEP)
Scope	International (PT, US)
Partners	Altran, Altice Labs, Instituto de Telecomunicações, VORTEX CoLab, CISTER/ISEP, Carnegie Mellon University (US)
Pedro's Role	**Coordinator at CISTER/ISEP**

3. **RETINA - REal-Time support Infrastructure and Energy management for Intelligent carbon-Neutral smArt cities**

Summary: This line of funding for ongoing research will support the development of ICT solutions to enable neutrality on climate impact, particularly by enabling energy trading between the grid and new energy market players such as micro-producers and electrical vehicles. Pedro was involved in the writing of the project proposal, and is one of the institutional coordinators (P.I.) on the CISTER/ISEP side.

Description:

Call/Program	NORTE-45-2020-75 *Structured R&D&I Projects – Horizon Europe*, operation no. NORTE-01-0145-FEDER-000062
Duration & Start	24 months, starting on January 2021
Funding source	NORTE 2020 Regional Operational Program
Funding granted	EUR 243k (CISTER/ISEP)
Scope	National
Partners	CISTER, GECAD research centers (ISEP)
Pedro's Role	**Coordinator at CISTER/ISEP**

Pedro currently has the following proposals under evaluation:

1. **VENETSIA** - *wireless-driVEn Networking and Edge computing Time-aware Software-defined architecture for cooperative Intelligent Applications*. Submitted to FCT 2021 Call for Projects in All Scientific Domains (IC&DT).

2.2.2 Participation in Academic Projects

Besides coordinating the aforementioned projects, Pedro also participates in the following projects:

1. Ph.D. Researcher in the project **InSecTT** - **Intelligent Secure Trustable Things** (reference: ECSEL/0002/2019, Grant 876038, call H2020-ECSEL-2019-1-IA), funded by the H2020 and FCT through the ECSEL Joint Undertaking.
2. Ph.D. Researcher in the project **AQUAMON** (Portuguese reference: PTDC/CCI-COM/30142/2017), funded by Fundação para a Ciência e Tecnologia, since April 2019.

Pedro has participated previously in the following projects:

3. Ph.D. Researcher in the project **S2MovingCity** (CMUP-ERI/TIC/0010/2014), funded by Programa CMU|Portugal program, from November 2018 to January 2019.
4. Ph.D. Researcher in the project **Generation.Mobi** (POCI-01-0247-FEDER-017369), funded by the *Portugal 2020*, *Compete 2020* and *EU ERDF* programs. The goal of the project is to deploy innovative functionalities in electric and non-electric bicycles, such as ad hoc communication and vital sign monitoring. It features as partners the Centro para a Excelência e Inovação na Indústria Automóvel (CEiiA), an interface institute of the Portuguese R&D ecosystem; the University of Porto; and the companies Ibérica (bicycles manufacturer) and CardioID (develops vital signs monitoring solutions).
5. Ph.D. Student Researcher in the project **SmartCityMules** (PTDC/EEI-TEL/2008/2014), funded by Fundação para Ciência e Tecnologia, from October 2016 to December 2016. The goal of the project was to develop solutions to gather delay-tolerant data by means of vehicular networking in urban environment, as a follow-up to the work carried out in the **Future Cities** project (see below). The main partners were the Instituto de Telecomunicações (IT) and the VENIAM startup (a spin-off of the Universities of Porto and Aveiro).
6. Ph.D. Student Researcher in the project **VR2Market** (CMUP-ERI/FIA/0031/2013), funded by Programa CMU|Portugal program, from October 2015 to April 2016. The goal of the project was to create a commercial product from several prototype technologies to support firefighting activities. The main partners were the Universidade do Porto, the Instituto Nacional de Engenharia de Sistemas e Computadores (INESC), the Instituto de Engenharia Electrónica e Telemática de Aveiro (IEETA) and the company Biodevices (develops solutions to monitor vital signs).
7. Ph.D. Student Researcher in the project **Vital Responder 2.0** (PTDC/EEI-ELC/2760/2012), funded by Fundação para Ciência e Tecnologia, from July 2015 to October 2015. The goal of the project was to continue the development of the technologies created in the scope of the **Vital Responder** project. The main partners were IT and IEETA.

8. Ph.D. Student Researcher in the project **Future Cities** (FP7-REGPOT-2012-2013-1, 316296), funded by the 7th Framework Program (FP7), from May 2014 to May 2015. The goal of the project was to implement intelligent smart city management systems, and involved the deployment of large-scale IoT platforms in Porto, Portugal (e.g., a vehicular network of 600+ on-board units in fleet vehicles). The main partners were the Municipality of Porto (CMP) and the University of Porto, and spinned off the the start-up *VENIAM* (commercializes vehicular networking technology).

9. Ph.D. Student Researcher in the project **Vital Responder** (reference: CMU-P/CPS/0046/2008), funded by the Carnegie Mellon University and Portugal Partnership Program, from September 2009 to September 2012. The partners were the University of Porto, the Instituto de Engenharia Electrónica e Telemática (IEETA; a public research institute) of the University of Aveiro, and the company Biodevices (develops vital signs monitoring solutions).

2.3 Formation of Scientific Teams

As per criterium CMC3 of the evaluation criteria - Constituição de equipas científicas
(Back to mapping table)

2.3.1 Collaboration with Ph.D. Students

Pedro is currently closely engaged in the work and/or supervision of the following Ph.D. students:

1. **Miguel Gáitan**, Ph.D. on Electrical and Computer Engineering (PDEEC), University of Porto. Current thesis title: *Supporting Real-Time Communications in Overwater Multi-hop Networks*. Pedro is registerd as co-advisor to Miguel in the application to the 2020 call for FCT Ph.D. scholarships, that was granted.

2. **Radha Reddy**, Ph.D. on Electrical and Computer Engineering (PDEEC), University of Porto. Current thesis titled: *Self-Organized Consensus as a Key to drive Pervasive Internet-of-Things*.

2.3.2 Supervision of M.Sc. Theses

Pedro has carried out the following supervision work:

1. Advisor to **André Cipriano Sousa** - M.Sc. on Electrical and Computer Engineering offered by the Faculty of Engineering of the University of Porto, carrying out the thesis entitled *Simulation-based Evaluation of Edge Computing-Assisted Applications*, successfully defended on July 2020.

2. Co-advisor to **Diogo Leite Martins** - M.Sc. on Electrical and Computer Engineering offered by the Faculty of Engineering of the University of Porto. Thesis carried out in an industrial setting (Altran Portugal) and co-advised by Engineer Bruno Parreira, entitled *Rede doméstica gerida por voz*, successfully defended on July 2020.

3. Co-advisor to **Pedro de Castro Albergaria** - M.Sc. on Electrical and Computer Engineering offered by the Faculty of Engineering of the University of Porto. Thesis co-advised by Professor Luís

Almeida, entitled *Remote biometrical monitoring system via IoT*, successfully defended on July 2020.

4. Advisor to student **José Bastos Pintor** - M.Sc. on Electrical and Computer Engineering of the Faculty of Engineering of the University of Porto. Thesis co-advised by Doctor Pedro Miranda d'Orey, entitled *Performance Evaluation of Bicycle-to-X Communication Networks*, successfully defended on February 2019.

5. Advisor to student **José Pedro Fonseca** - M.Sc. on Electrical and Computer Engineering of the Faculty of Engineering of the University of Porto. Thesis carried out in an industrial setting (FollowInspiration) and co-advised by Eng. Joana Santos, entitled *Estimação Stereo usando técnicas de deep learning*, successfully defended on July 2019.

6. Co-advisor to **Luís Miguel Ramos Bárbara Cunha Pinto** - M.Sc. on Electrical and Computer Engineering offered by the Faculty of Engineering of the University of Porto. Thesis advised by Professor Doctor João Barros and Doctor Fausto Vieira, entitled *A Cyber-Physical System for Dynamic Building Evacuation*, successfully defended on July 2011.

Pedro currently advises the following students:

7. Advisor to **Ana Rita de Almeida Martinho** - M.Sc. on Electrical and Computer Engineering offered by the Faculty of Engineering of the University of Porto. Thesis co-advised by Professor Luís Almeida, entitled *Dynamic Quality-of-Service Management Under Software-Defined Networking Architectures*.

8. Advisor to **Rui Miguel Santos Carvalho** - M.Sc. on Electrical and Computer Engineering, Faculty of Engineering of the University of Porto. Thesis being carried out in Altran Portugal under co-supervision by Engineer Ricardo Faria, entitled *ROS2-based Architecture for MAV Data Sensing*.

9. Advisor to **Nuno de Assis Miranda Schumacher** - M.Sc. on Electrical and Computer Engineering, Faculty of Engineering of the University of Porto. Thesis entitled *Cloud/Edge Machine Learning for Privacy-Preserving Network Trace Profiling*.

10. Co-Advisor to **João Francisco Vaz Brandão Gomes** - M.Sc. on Electrical and Computer Engineering, Faculty of Engineering of the University of Porto. Thesis entitled *Evaluating the Performance of the AES70/AES 67-based Network Architectures for Audio Streaming*.

2.3.3 Supervision of B.Sc. Projects

Pedro has carried out the following supervision work:

1. **Diogo José Guedes Marta** - B.Sc. on Electrical and Computer Engineering of the Instituto of Engineering of the Polytechnic Institute of Porto. Final project co-advised by Professor Doctor Ricardo Severino and Ênio Filho, entitled *Hybrid Evaluation Framework for Vehicle Edge Computing*, successfully defended on September 2020.

Pedro currently co-advises the following students:

2. Co-advisor to **Filipe Miguel da Costa Ferreira** - B.Sc. on Electrical and Computer Engineering of the Instituto of Engineering of the Polytechnic Institute of Porto. Final project addressing integration, in the networking and mobility simulation ecossystem OMNeT++ / SUMO / VEINS, of cellular communication libraries (SimuLTE) for evaluation of vehicular safety scenarios (definitive title to be defined).
3. Co-advisor to **João Filipe Mateus Pereira** - B.Sc. on Electrical and Computer Engineering of the Instituto of Engineering of the Polytechnic Institute of Porto. Project title: *Evaluating 802.11p Communications Performance for a Safety-Critical Vehicular Application*

2.3.4 Other Collaborations with M.Sc./B.Sc. Students

Pedro provided technical and/or logistic support to the following students carrying out their M.Sc. thesis:

1. **André da Silva e Sá**, student of the Master in Electrical and Computer Engineering of the Faculty of Engineering of the University of Porto. Thesis advised by Doctor Tânia Calçada and Professor Doctor Susana Sargento (Universidade de Aveiro), entitled *Fixed Sensors Integration for Future Cities Using M2M*, successfully defended at October 2014.

   Pedro supported the student in designing and developing the software modules, and in experimental activities in the field.
2. **Diogo Manuel Castro Guimarães**, student of the Master in Electrical and Computer Engineering of the Faculty of Engineering of the University of Porto. Thesis advised by Doctor Tânia Calçada and Professor Doctor Susana Sargento (Universidade de Aveiro), entitled *Comunicações Oportunisticas para Aquisição de Dados de Sensores Ambientais Usando uma Rede Veicular*, successfully defended at July 2015.

   Pedro supported the student in designing the software modules, and in experimental activities in the field. From this collaboration the following articles resulted: [**San2015b**] and [**San2015a**].
3. **Leonid Andreevitch Kholkine**, student of the Master in Electrical and Computer Engineering of the Faculty of Engineering of the University of Porto, advised by Professor Doctor Ana Aguiar and Doctor André Cardote (VENIAM), with a thesis entitled *Are you on the bus? Detecting Relative Position of Devices versus Mobile Hotspots*, successfully defended at July 2016.

   Pedro collaborated with the M.Sc. student after he successfully defended his thesis, to complete and publish his thesis work.
4. **Fábio Cunha**, student of the Master in Electrical and Computer Engineering of the Faculty of Engineering of the University of Porto, advised by Professor Doctor Ana Aguiar and Doctor André Cardote (VENIAM), with a thesis entitled *Buses as Urban Sensing Data Couriers*. Pedro also supported the work of the following student, that did not defend his thesis for reasons unrelated to Pedro.

Pedro has supervised the work of the following students carrying out research work:

5. **Alex Nguyen**, student working towards the Diplôme d'ingénieur in Energies et environment at ESIEE Paris, visiting under the Erasmus+ program, from May 2018 to July 2018. From this collaboration resulted publication [**San2018f**].

6. **Miguel Rosa**, student of the M.Sc. in Electrical and Computer Engineering of the Faculty of Engineering of the University of Porto, since December 2017.
7. **Luís Miguel Sousa**, student of the B.Sc. in Electrical and Computer Engineering of the Faculty of Engineering of the University of Porto, since October 2017.
8. **Filipa Barros**, student of the B.Sc. in Electrical and Computer Engineering of the Faculty of Engineering of the University of Porto, since October 2017.
9. **Hugo Cruz**, student of the B.Sc. in Electrical and Computer Engineering of the Faculty of Engineering of the University of Porto, between 2012 and 2013.
10. **João Granja**, student of the B.Sc. in Electrical and Computer Engineering of the Faculty of Engineering of the University of Porto, between 2012 and 2013.

2.4 Contribution to the Scientific Community

As per criterium CMC4 of the evaluation criteria - Intervenção nas comunidades científica e profissional (Back to mapping table)

2.4.1 Organization of Scientific Events

Pedro is or was involved in the organization of the following academic events:

1. General Co-Chair of the 2nd EAI International Conference on Intelligent Edge Processing in the IoT Era (Edge-IoT 2021).
2. Member of Program Committee of the 1st Distributed AI for REsource-Constrained Platforms (DARE) Workshop, part of the 17th International Conference on Artificial Intelligence Applications and Innovations (AIAI 2021).
3. Publicity Chair of the 1st EAI International Conference on Intelligent Edge Processing in the IoT Era (Edge-IoT 2020).
4. Publication Chair of 2020 16th IEEE International Conference on Factory Communication Systems (WFCS).
5. Member of the Organizing Committee of the 25th Seminar of the **Rede Temática de Comunicações Móveis (RTCM)**, an important academic national forum on mobile communications, that took place in the Faculdade de Ciências da University of Porto, on June 22, 2018. Pedro was responsible for:
    - Obtaining funding from industrial partners (Rohde&Schwarz) in a value up to 800 Euros;
    - Updating the event website and registration forms, and promoting the event through mailing lists and social networks;
    - Managing submissions and providing support to speakers/participants;

- Producing identification/courtesy material (e.g., nametags, programs).

6. Member of the Organizing Committee of the First Conference of Ph.D. Students on Electrical and Computer Engineering, that took place at the Faculty of Engineering of the University of Porto, Portugal, in June 2012, on invitation by lecturers of the Faculty.

2.4.2 Member of the Technical Program Committee

1. IEEE Vehicular Networking Conference 2021, 2020, 2018
2. International Conference on Ambient Systems, Networks and Technologies (ANT) 2020
3. IEEE International Conference on Factory Communication Systems 2020
4. EAI Future 5V conference 2018

2.4.3 Reviewer of Scientific Articles

Pedro has been or is a reviewer for the following international conferences and journals:

1. IEEE International Conference on Intelligent Transportation Systems 2021, 2020, 2017
2. IEEE Vehicular Networking Conference 2020, 2019, 2018, 2017
3. IEEE Transactions on Wireless Communications 2020, 2019, 2016
4. IEEE Access 2020, 2019
5. IEEE Internet-of-Things Journal 2019
6. IEEE Vehicular Technology Conference 2018
7. MPDI Electronics 2020
8. IEEE/IFIP International Conference on Dependable Systems and Networks, SSIV Workshop 2021
9. IEEE International Conference on Communications, FINP Workshop 2021
10. IEEE MELECON 2020
11. ROBOT'2019 2019
12. ACM/IEEE International Conference on Cyber-Physical Systems 2019
13. EAI Future5V conference 2018
14. International Symposium on Wireless Communication Systems 2018
15. Wireless Days 2018

2.4.4 Participation in Panels and Other Outreach Activities

Pedro was invited to participate in a **debate panel on cyber-physical systems** (CPS) at the CPS Student Forum Portugal, as part of the **CPS Week**, at the Palácio da Bolsa, Porto, Portugal, on April 13, 2018.

Pedro participated in the **2nd Visions for Future Communications Summit: Technologies and Services Towards 6G**, organized by **NetWorld2020**, that took place at ISCTE - University Institute of Lisbon, Lisbon, on November 27-28, 2019, to reach out to academic and industrial partners working in 5G.

2.4.5 Jury in M.Sc. Theses Defenses

Pedro was the external jury member in the following M.Sc. thesis defenses:

1. **Ricardo João dos Santos Pina Cabral**, a student of the M.Sc. in Engineering and Management of Information Systems of the Department of Computer Science of the Escola de Engenharia of the Universidade do Minho, that took place in July 24, 2020. The advisor was Professor Doutor Rui João Peixoto José and the session chair was Professor Doutor Miguel António Sousa Abrunhosa Brito; the thesis was entitled *A Reference Design for Sensible Bicycles*.

2. **Filipe Emanuel de Sá Rocha**, a student of the M.Sc. in Computer Engineering and Telematics of the Department of Electrical, Telecommunications and Informatics of the Universidade de Aveiro, that took place in December 19, 2019. The advisor was Professor Doutor Miguel Luís and the session chair was Professor Doutor Paulo Monteiro; the thesis was entitled *Complementing vehicular connectivity coverage through cellular networks*.

3. **João Bernardo Castanheira Patrício**, a student of the M.Sc. in Computer Engineering and Telematics of the Department of Electrical, Telecommunications and Informatics of the Universidade de Aveiro, that took place in December 19, 2019. The advisor was Professor Doutor Miguel Luís and the session chair was Professor Doutor Paulo Monteiro; the thesis was entitled *Network Mechanisms for Swarms of Drones in Aquatic Sensing Environments*.

4. **Brian Cavagna Rodrigues**, a student of the M.Sc. in Computer Science of the Department of Computer Science of the Faculdade de Ciências da Universidade do Porto, that took place in December 15, 2018. The advisor was Professor Doutor Sérgio Crisóstomo and the session chair was Professora Doutora Inês Dutra; the thesis was entitled *GNSS and Barometric Sensor Fusion for Altimetry Applications*.

2.4.6 Management Positions

Starting from February 2021, Pedro has been appointed **Vice-President of the Scientific Council** of the CISTER Research Centre.

Chapter 3

Pedagogical Activity

3.1 Pedagogical Projects

As per criterium CMP1 of the evaluation criteria — Coordenação de projetos pedagógicos
(Back to mapping table)

Pedro was involved in the following pedagogical projects:

1. Prepared a semester-long course on the topic *Designing Vehicular Applications as Networked Multi-Agent Systems* for Ph.D. student Saeid Sabamoniri (PDEEC/FEUP), in the scope of the *Special Topics* course (described in the following slides: SpecialTopics_SaeidSabamoniri.pdf).
2. Introduced the topic of **long-range communication technologies (e.g., SigFox, LoRa, NB-IoT)** in the syllabus of the course **Industrial Computation Architectures** (ICA), of the 4th year of the Integrated M.Sc. program in Electrical and Computer Engineering of the Faculty of Engineering of the University of Porto (MIEEC/FEUP), and produced the associated pedagogical material (ACI_wireless_long_range.pdf).
3. Produced and revised the **experimental script for a practical assignment** on the temporal response of WLAN and Ethernet networks, also for the aforementioned course (*Industrial Computation Architectures*) and motivated by the reconfiguration of the practical assignments for remote execution (Script_Assign3_Wlan_EN.pdf).

3.2 Pedagogical Resources

As per criterium CMP2 of the evaluation criteria — Produção de material pedagógico
(Back to mapping table)

The following pedagogical materials were produced by Pedro:

1. **Support slides for a semester-long course** on the topic *Designing Vehicular Applications as Networked Multi-Agent Systems*, as part of the Ph.D. course *Special Topics* (PDEEC/FEUP) taught to student Saeid Sabamoniri: SpecialTopics_SaeidSabamoniri.pdf.
2. **Slides for a 2-hour lecture** on long-range communication technologies (e.g., SigFox, LoRa, NB-IoT), for a theoretical class of the course *Industrial Computation Architectures* (MIEEC/FEUP): ACI_wireless_long_range.pdf.
3. **Experimental guide for practical assignment** on the temporal response of WLAN and Ethernet networks, for the course *Industrial Computation Architectures*: Script_Assign3_Wlan_EN.pdf.
4. **Slides on the Internet and TCP/IP stack operation (e.g., DHCP, ARP)**, for a laboratory class of the course *Industrial Computation Architectures*, adapted from pre-existing slides: ACI_trabalho3_20_21.pdf
5. **Slides to introduce the practical implementation component** of the course *Industrial Informatics* (MIEEC/FEUP): II_Aula_Implementacao.pdf.
6. Examination material for the course *Industrial Computation Architectures* – **around 60+ True-or-False questions per year**, created from scratch or adapted from examinations of previous years.

Material under preparation:

7. **Slides for an introduction to Machine Learning**: IntroML_PedroSantos.pdf.

3.3 Teaching Activity

As per criterium CMP3 of the evaluation criteria — Atividade letiva
(Back to mapping table)

Pedro has been an **invited assistant lecturer** (Professor Auxiliar Convidado) at the Faculdade de Engenharia da Universidade do Porto with uninterrupted service since September 2017, on partial time (26.8% of full time).

3.3.1 Lectured Courses

Pedro teaches or has taught the following courses:

1. Laboratory classes of the course **Industrial Computation Architectures** (ICA), of the 4th year of the Integrated M.Sc. program in Electrical and Computer Engineering offered by the Faculty of Engineering of the University of Porto (MIEEC/FEUP), during the first semester (Fall) of school years **2017/2018, 2018/2019, 2019/2020** and **2020/2021**, and being responsible for two classes.
2. Laboratory classes of the course **Industrial Informatics** (II), of the 4th year of the Integrated M.Sc. program in Electrical and Computer Engineering offered by the Faculty of Engineering of the University of Porto, during the second semester (Spring) of school year **2019/2020 and 2020/2021**, and being responsible for two classes.

3. Laboratory classes of the course **Operating Systems** (OS), of the 3rd year of the Integrated M.Sc. program in Electrical and Computer Engineering offered by the Faculty of Engineering of the University of Porto, during the second semester (Spring) of school year **2018/2019**, and being responsible for two classes.

4. Laboratory classes of the course **Digital Signal Processing** (DSP), of the 3rd year of the Integrated M.Sc. program in Electrical and Computer Engineering offered by the Faculty of Engineering of the University of Porto, during the second semester (Spring) of school year **2017/2018**, and being responsible for two classes.

Evaluation by Students

Pedro was evaluated by the students in anonymous questionnaires for his performance in teaching. The students were asked to grade Pedro in the scope of *Support to Autonomy*, *Consistency and Help*, *Structure* and *Relationship*, in a scale of 1 to 7. Table 3.1 presents the results.

Table 3.1: Evaluation of the applicant by the students (averaged).

Year	Course	# Replies	Support to autonomy	Consistency and help	Structure	Relationship
2017/18	ICA	12	5.50	6.04	5.08	6.25
	DSP	10	5.7	5.85	5.17	5.9
2018/19	ICA	12	4.96	5.50	5.06	5.50
	SO	9	5.89	5.61	5.74	5.89
2019/20	ICA	12	4.67	5.58	4.75	5.58
	II	10	6.0	6.2	5.43	6.7
2020/21	ICA	10	2.85	3.70	2.83	3.20

Tailored Courses

I prepared a tailored course to Ph.D. student Saeid Sabamoniri (PDEEC/FEUP), within the scope of the *Special Topics* course, on the topic *Designing Vehicular Applications as Networked Multi-Agent Systems*.

Chapter 4

Outreach Actitivies and Knowledge Exploitation

4.1 Dissemination Activities to the General Public

As per point CTC 3 of the evaluation criteria - Divulgação de ciência e tecnologia
(Back to mapping table)

Pedro presented and promoted the work carried out in the *Generation.Mobi* project (see Section 2.2) within the context of the *Volta ao Conhecimento* initiative, organized by the Ministry of Science, Technology and Higher Education, and that aims to disseminate the scientific research carried out in Portugal in partnership with the *Volta a Portugal* event, Portugal's most important cycling competition. Pedro did:

1. An interview about the project in the RTP show *'Há Volta!'*, a general-audience show themed about the *Volta a Portugal*, on occasion of the 12th and last stage of the 2018 edition, at Fafe, Portugal, on August 12, 2018.

   Video: youtube.com/watch?v=u8yp05SIB8w

2. Dissemination in a dedicated stand in the public area of the event, at the same date and stage.

Presented and promoted the work carried out at the Instituto de Telecomunicações, Porto branch, at:

3. Pedro M. Santos, Leonid Kholkine, Tania Calçada, Diogo Guimarães, Tiago Condeixa, Daniel Moura, Susana Sargento, Ana Aguiar, João Barros. *Poster: Network Solutions for Smart Cities*. Presented at *TechDays 2016*, a dissemination event of the scientific and industrial activities of the municipality of Aveiro, Portugal. Centro de Exposições, Aveiro, Portugal, September 2016.

4. *Mostra UP 2015*, a dissemination event of the course offering and scientific work of the organic entities of the University of Porto, Portugal. Edifício da Alfândega, Porto, Portugal, 2015.

5. *Mostra UP 2014*, a dissemination event of the course offering and scientific work of the organic entities of the University of Porto, Portugal. Pavilhão Rosa Mota, Porto, Portugal, 2014.

4.2 Audiovisual Dissemination Material

Pedro has produced the following audiovisual material to support the dissemination of scientific and academic results in mass media platforms.

1. Pedro M. Santos, L. Pinto, M. Rosa. Video: *Demo: Stolen Bicycle Detection using Bluetooth Ad Hoc Communication*.
   URL: youtube.com/watch?v=zc8JpLaUkHA.
   Video to disseminate results of the P2020 project *Generation.Mobi*.

2. Pedro M. Santos, Diogo Guimarães. Video: *Platform for Collecting Data From Urban Sensor Using Vehicular Networking*.
   URL: youtube.com/watch?v=Hqjx28hpuT8.
   Support video to demonstration submission to the ACM MobiCom 2015 conference.

3. Pedro M. Santos. Video: *Fire sensors and escape routes*.
   URL: youtube.com/watch?v=PJSqnq6ZfOE.
   Dissemination video for the CMU|Portugal project *Vital Responder*.

4.3 Management of University Resources

Pedro was member of the team responsible for the city-scale monitoring platform *UrbanSense*, developed in the context of the *Future Cities* and propriety of the University of Porto, and composed of sensing devices installed at multiple locations in the city of Porto, Portugal. This work involved:

1. Provided platform equipment to the students of the course **Communication Services**, of the fourth year of the B.Sc./M.Sc. program in Electrical and Computer Engineering of the Faculty of Engineering of the University of Porto, to carry out a course project.

2. Kept track of inventory and performed three maintenance rounds to the equipments.

Appendix A

Citation Count Procedure

Instructions to reproduce the publication citation count of the candidate Pedro M. Santos.

Elsevier SCOPUS

1. Login to SCOPUS. Institutional login is recommended.
2. Head to the candidate's SCOPUS profile webpage:

   https://www.scopus.com/authid/detail.uri?authorId=57195194993

3. Select "Cited by X Documents" (see Figure A.1).
4. Select "Export All"; I recommend CSV as the output format.

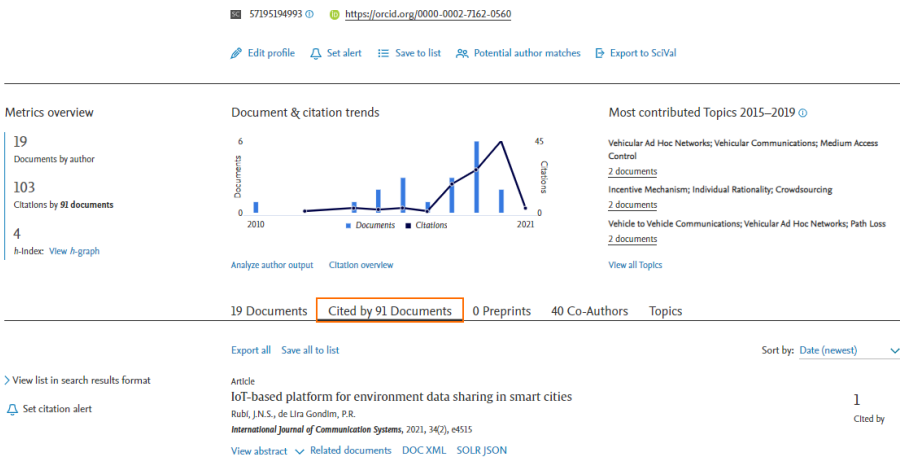

Figure A.1: Scopus profile

5. Open the file; I suggest Notepad++ or Word. Search for the candidate's SCOPUS ID (57195194993); in both programs, the number of occurrences will be provided. To the total number of entries, subtract the number of self-citation occurrences to obtain the number of citations except self-citations.

Google Scholar

1. Head to the candidate's Google Scholar profile:

   https://scholar.google.pt/citations?user=PWGti5IAAAAJ

2. Select 'CITED BY'.

3. Click on the number of citations of the first search result (see Figure A.2).

4. Within the results, select the tick box "Search within citing papers".

5. In the search form, remove citations from the candidate with the following string:

   -author:"Pedro M. Santos" -author:"PM Santos" -author:"PMS dos Santos"

6. Repeat for the remaining entries with citations.

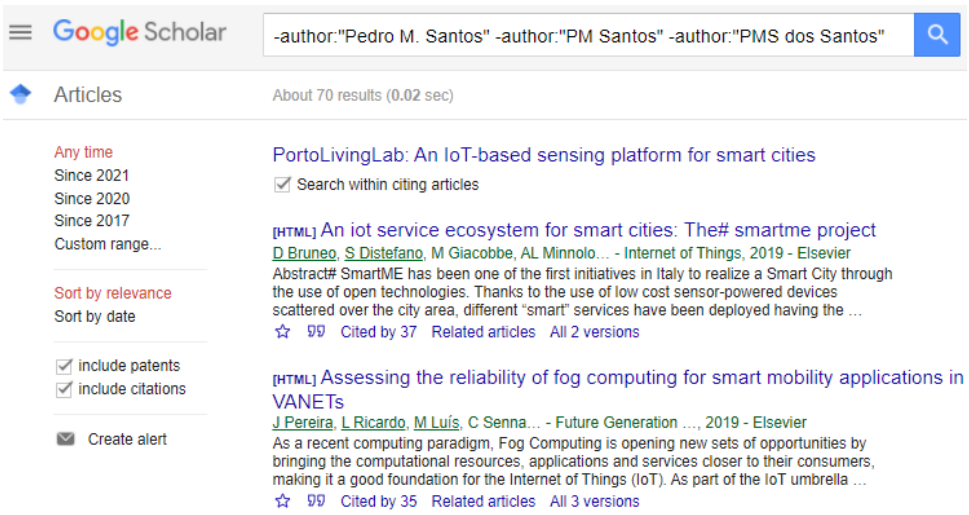

Figure A.2: Google Scholar profile

ISI Web of Knowledge

1. Head to the candidate's Web of Science profile. Institutional login is recommended.

   https://app.webofknowledge.com/author/record/27721443

2. Go to "View full Citation Report".

3. In the presented statistics, find the value for "Sum of Times Cited/Without self citations" (see Figure A.3).

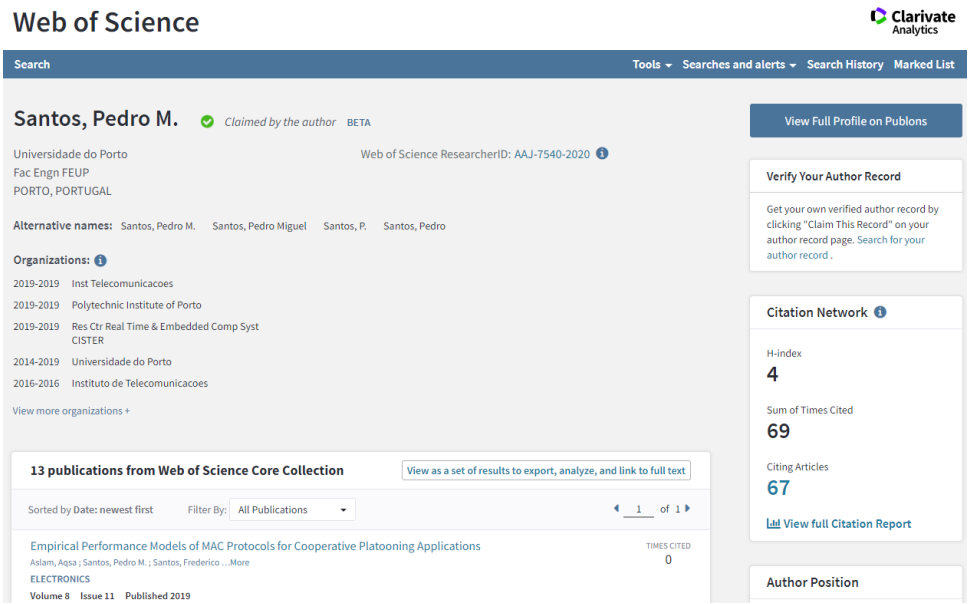

Figure A.3: ISI Web of Knowledge profile