Curriculum Vitae – José Miguel Paiva Proença

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NATIONALITY
Portuguese

RESEARCH INTERESTS
Software engineering, Concurrency, Coordination models, Wireless sensor networks, Product line engineering, Formal methods, Functional programming languages.

SHORT BIO
I graduated from the University of Minho as the best student in Math & Computer Science (2005), and continued to do my PhD in CWI, Amsterdam – a research institute in the top 28 of Europe and top 83 worldwide (`http://research.webometrics.info`). I worked on coordination models: models that describe how runtime components can interact with each other under the supervision of Prof. Farhad Arbab. In 2010 I moved to KU Leuven University, in Belgium – a university in the top 11 of Europe and top 77 worldwide (same source as above). I continued to work in the coordination field and investigated variability within the HATS european (FP7) project, collaborating mainly with Prof. Dave Clarke. In 2014 I started to collaborate within the Wireless Sensor Group, mainly with Prof. Danny Hughes, where I modelled and experimented with communication models in resource-constraint devices. In 2015 I returned to U.Minho, working as a post-doctoral researcher collaborating with Prof. Luis Barbosa, and taught as an invited assistant professor at U.Minho (2016-1019). I now work at CISTER/ISEP since February 2019, investigating coordination aspects in the context of Cyber-Physical Systems, and teaching as an invited assistant professor at ISEP. Currently I am involved in the Lightkone european project (H2020) since January 2017, and I am leading the FCT project DaVinci since July 2018.

EDUCATION

– *PhD* **January 2006 – December 2009**
  - Organisation: Research work at Centrum Wiskunde & Informatica (CWI), degree awarded by Leiden University (LIACS), Leiden, The Netherlands
  - Supervisors: Farhad Arbab (CWI and LIACS), Dave Clarke (KUL), and Erik de Vink (Eindhoven University of Technology – TUE)
  - Topic: Deployment of Distributed Component Based Systems
  - Core subjects: Coordination, concurrency, component-based systems, formal methods

– *Integrated MSc* **September 2000 – October 2005**
  - Organisation: University of Minho (UM), Braga, Portugal
  - Degree: Licenciatura on Math & Computer Science (5-year degree) in 2005
  - ERASMUS mobility: 1 full semester of courses at University of Bristol, UK, in 2004
  - Internship: 1 month at University of Kent, in Canterbury, UK, working with Prof. Simon Thompson, during the final year project in 2005
  - Final grade: 18/20 (best for that year & degree)

– *Summer schools*
  - *2nd International Summer School on Deep Learning*, in Genova, Italy, 2018;
    Summer school on the recent advances of deep learning, covering theory and practice.
  - *School on Formal Models for Objects and Components*, in Bertinoro, Italy, 2012;
    Summer school covering areas such as type theory, programming languages, formal methods, concurrency and software engineering.
  - *Trends in Concurrency*, held in Prague, Czech Republic, 2008;
    Summer school on current research and future trends in concurrent systems design and implementation, including well-known speakers such as Martin Odersky and Byron Cook, among others.
  - *Summer School on Language-Based Techniques for Integrating with the External World*, in the University of Oregon, Eugene, USA, 2007;
    Summer school on programming languages, sponsored by ACM and Microsoft.

- *Marktoberdorf Summer School*, in Marktoberdorf, Germany, organised by NATO, 2006; Summer school on dependable software systems engineering, including the turing-awarded organisers and speakers Amir Pnueli and Tonny Hoare.
- *IPA Spring and Fall Schools* – I attended a school every spring and fall from 2006 until 2009, in different cities in the Netherlands, over a range of topics in computer science for PhD students and organised by IPA – Institute for Programming research and Algorithmics (http://www.win.tue.nl/ipa/).
- *Midland Graduate School*, in the University of Birmingham, UK, 2005;
  Summer school on Foundations of Computing Science, including the topics: category theory, typed lambda-calculus, denotational semantics, and functional programming.

– *Secondary School* **September 1997 – June 2000**

- Organisation: Escola Secundária Carlos Amarante, Braga, Portugal
- Core subjects: Mathematics, Physics and Chemistry
- Final grade: 19/20

Work Experience

– *Invited Assistant Professor ("Professor Auxiliar")* **Sep 2019 – present**

- Organisation: ISEP, Porto, Portugal
- In charge of lab classes of courses:
  - "Algorithms and Programming" (APROG), for 1st year students (2019/20);
  - "Primitive Concurrency Control Mechanisms" (SCOMP), for 2nd year students (2019/20);

– *Invited Assistant Professor ("Professor Auxiliar")* **Fev 2016 – Fev 2019**

- Organisation: University of Minho (UM), Braga, Portugal
- Prepared and taught the course: "Software Architecture and Design Calculi", at a MSc degree (2016-http://ac1516.proenca.org, 2017-http://ac1617.proenca.org, and 2018-http://arca.di.uminho.pt/ac-1718)
- Planned and lectured the course: "Mathematics for Computer Science", under the program Qualifica-IT for the requalification of software scientists (2017-http://mi1718.proenca.org).
- In charge of lab classes of the courses:
  - "Functional Programming", for 1st year students (2016/17 and 2017/18);
  - "Laboratory of Informatics I", for 1st year students (2016/17, 2017/18, 2018/19);
  - "Laboratory of Informatics II", for 1st year students (2017/18);
  - "Program Calculation", for 3rd year students (2016/17).

– *Senior Researcher* **Feb 2019 – present**

- Organisation: CISTER (ISEP), Porto, Portugal
- Topic: Coordination and monitoring of components in Cyber-Physical Systems

– *Post-doctoral Researcher* **Feb 2018 – Jan 2019**

- Organisation: University of Minho (UM), Braga, Portugal
- Project leaders: Luís Barbosa (UM)
- Context: Chair PT-FLAD on Smart Cities & Smart Governance
- Topic: Coordination of concurrently evolving software components

– *Post-doctoral Researcher (FCT grant)* **Mar 2013 – Jan 2014, Feb 2015 – Jan 2018**

- Organisation: University of Minho (UM), Braga, Portugal *and* KU Leuven University (KUL), Leuven, Belgium
- Project leaders: Luís Barbosa (UM) and Dave Clarke (KUL)
- Topic: Adaptable coordination
- Core business: Hybrid modelling of variability for synchronous coordination systems

– *Post-doctoral Researcher* **February 2010 – January 2016**

- Organisation: KU Leuven, Belgium
- Project leaders: Dave Clarke (KUL) and Danny Hughes (KUL)

- Topic: Highly Adaptable and Trustworthy Software using Formal Models
- Core business: Specification and analysis of both variability in a concurrent language and component models for embedded devices.

– *PhD Researcher (FCT grant)* **January 2006 – December 2009**

- Organisation: Centrum Wiskunde & Informatica (CWI), Amsterdam, The Netherlands
- Research interests: Coordination, Distributed systems, Formal methods.

– *Software engineer (work contract)* **November 2005 – December 2005**

- Organisation: MULTICERT – Serviços de Certificação Electrónica SA, Porto
- Type of business or sector: Company on software certification
- Main activities and responsibilities: Programming, documenting and validating the implementation of certification standards.

– *Researcher (BIC grant)* **April 2005 – October 2005**

- Organisation: PURE Project, Dep. Informática, Universidade do Minho;
- Type of business or sector: Scientific research in Computer Science.
- Main activities and responsibilities: Study and development of automatic program transformations;

– *Demonstrator* **February 2004 to September 2004**

- Organisation: Dep. Informática, Universidade do Minho;
- Type of business or sector: Higher Education.
- Main activities and responsibilities: Teaching, tutorial guidance and project marking in a Computer Science subject;

Prizes & Awards

- Post-doctoral Fellowship by the Portugues foundation FCT (SFRH/BPD/91908, 2012);
- PhD Studenship by the Portugues foundation FCT (SFRH/BD/22485, 2005);
- Best graduated student in Computer Science at U.Minho, awarded by the Minister of Science, Technology and Higher Education, 2005;
- Best project in Cryptography at U.Minho, awarded by the company MultiCert, 2005;
- Best student in Computer Science at U.Minho in 2002, 2003, 2004, and 2005: awarded 4 Scholarship Merits;
- Best student that applied for the Computer Science degree, U.Minho, 2001, awarded a Scholarship of Excelence ("Prémio Conselho Académico").

Scientific merit

Scientific publications

Selection of 5 publications in the last 5 years.

- **SCP – Q2 in 2016 [4].** A Procedure for Splitting Data-Aware Processes and its Application to Coordination, Sung-Shik T.Q. Jongmans, Dave Clarke, José Proença, Science of Computer Programming, volumes 115-116, pages 47-78
- **JISA 2016 – Q2 in 2016 [3].** Hitch Hiker 2.0: a binding model with flexible data aggregation for the Internet-of-Things, Gowri Sankar Ramachandran, José Proença, Wilfried Daniels, Mario Pickavet, Dimitri Staessens, Christophe Huygens, Wouter Joosen, Danny Hughes, Journal of Internet Services and Applications, volume 7, pages 1-15
- **SCP 2017 – Q3 in 2017, but Q2 in 2016, when it was submitted [2].** Typed Connector Families and their semantics, José Proença, Dave Clarke, Science of Computer Programming, Volume 146, Pages 28–49

- **COORDINATION 2019 – B in CORE2018, but A in CORE2017 and before [18].** Coordination of tasks on a Real-Time OS, Guillermina Cledou, José Proença, Bernhard H.C. Sputh, and Eric Verhulst, COORDINATION, Lecture Notes in Computer Science, Volume 11533, Pages 250–266.
- **ICTAC 2020 – B in CORE, Q2 proccedings [15].** Implementing Hybrid Semantics: From Functional to Imperative, Sergey Goncharov, Renato Neves, José Proença, ICTAC, Lecture Notes in Computer Science, Volume 12545, Pages 262–282.

It is also worth mentioning:

- I published in 2018 a paper on a teaching experience report in ICFP - a CORE A* conference, also included in this application, that is focused on the educational aspect and therefore described in Section E, but also contains some scientific results, regarding the feedback engine proposed for short runs of feedback and evaluation.
- DBLP's website counts 18 publications in the last 5 years, out of which 3 are edited proceedings, 9 are international peer-reviewed conferences/workshops, and 5 are journal publications, not including a published Q2 journal in 2020. Disregarding the proceedings, there is an average of 3.4 authors per paper, and 8 out of 12 have 2 or 3 authors, which reflects the large involvement in each of my publications.
- Beside writing scientific articles I also edited 3 proceedings of workshops and conferences, 1 journal special edition (for LMCS, a Q1 journal in the year of publication, in the special issue for COORDINATION 2015), and I am currently editing a proceeding volume and a journal special issue.
- I have other CORE A publications (2012 and 2013) that fall out of the 5-year period of relevance, and have in total 43 records appearing in DBLP.

Coordination and participation in Scientific Projects

- **DaVinci** (Jul. 2018-present – **Principal Investigator**)—*Distributed Architectures: Variability and Interaction for Cyber-Physical Systems*—is an FCT project to analyse interactions among software components considering aspects such as real time and variability.
  It currently produced 4 conference publications, 1 master thesis, 5 talks, it was involved in the organisation of a workshop and an invited tutorial, and produced several tools available online in `http://arcatools.org`.
  `http://davinci.di.uminho.pt`
- **VALU3S** (May 2020-present)—*Verification and Validation of Automated Systems Safety and Security*—is an H2020 ECSEL JU project that aims to evaluate the state-of-the-art V&V methods and tools, and design a multi-domain framework to create a clear structure around the components and elements needed to conduct the V&V process.
  `https://valu3s.eu/`
- **Reassure** (Jul. 2018-present)—*Running Secure Runtime Verification for Reliable Real-Time Embedded Software*—is an FCT project that proposes a novel framework for Runtime Verification of Real-Time Embedded Systems.
  `https://www.cister.isep.ipp.pt/projects/reassure/`
- **KLEE** (Jun. 2018-present)—*Coalgebraic Modeling and Analysis for Computational Synthetic Biology*—is an FCT project that aims at the design of biological systems in a systematic way, using the theory of coalgebras.
  `http://klee.di.uminho.pt`
- **LightKone** (Dec. 2016-present)—*Lightweight computation for networks at the edge*—is a **H2020 european project** aiming at investigating models for programming edge networks. An edge network is a large set of heterogeneous, loosely coupled computing nodes situated at the logical extreme of a network, including networks of Internet of Things and mobile devices. It currently produced 44 publications, 21 invited talks, and 4 events.
  `https://www.lightkone.eu/`

- **TRUST** (Sep. 2016-present)—*Trustworthy Software Design with Alloy*—is an FCT project that proposes to investigate lightweight approaches to verify software systems via the Alloy toolset, considering aspects such as variability of systems.
  http://trust.di.uminho.pt

- **EMD** (2015-2016)—*Elastic Media Distribution for Online Collaboration*—is an **ICON project**, Funded by iMinds and IWT (Belgium), and investigates how professional A/V systems can be integrated into corporate and public networks;
  https://www.imec-int.com/nl/imec-icon/research-portfolio/emd

- **TRANSITION** (2014-2015)—*From Ad-Hoc Code Development To Code Reuse Through Middleware For Networked Embedded Control Systems*—is an **IOF (Industrial Research Fund) project** funded by KU Leuven, targeting the collaborations between the PMA and the Distrinet groups aiming at technology transfer;
  https://distrinet.cs.kuleuven.be/research/projects/TRANSITION

Integration in the scientific community

Below I emphasise the key scientific events and proceedings I was involved in as a researcher, in the past 5 years.

- **Edited proceedings and journal special issues**
  - *5th Workshop on Formal Integrated Development Environment (F-IDE)*, Rosemary Monahan, Virgile Prevosto, José Proença (Editors), F-IDE 2019, volume 310 of Electronic Proceedings in Theoretical Computer Science, 2019. http://eptcs.web.cse.unsw.edu.au/content.cgi?FIDE2019
  - *Special Issue of FACS 2017 (Journal)*, Science of Computer Programming, Elsevier, Volume 196, 2020. https://www.sciencedirect.com/journal/science-of-computer-programming/special-issue/10166TH86XL
  - *Special Issue of COORDINATION and FORTE 2016 (Journal)*, Logical Methods in Computer Science, Episciences, Volume 13, 2017. (Q1 in 2016 under Computer Science) https://lmcs.episciences.org/volume/view/id/293
  - *International Conference on Formal Aspects of Component Software (FACS)* , José Proença, Markus Lumpe (Editors), FACS 2017, Lecture Notes in Computer Science, Volume 9686, 2016. http://dx.doi.org/10.1007/978-3-319-39519-7
  - *IFIP conference: Coordination Models and Languages* , Alberto Lluch Lafuente, José Proença (Editors), COORDINATION 2016, Lecture Notes in Computer Science, Volume 10487, 2017. https://link.springer.com/book/10.1007/978-3-319-68034-7
  - *International Workshop on Foundations of Coordination Languages and Self-Adaptive Systems (FOCLASA)* , José Proença, Massimo Tivoli (Editors), FOCLASA 2015, Electronic Proceedings in Theoretical Computer Science, Volume 201, 2015. http://dx.doi.org/10.4204/EPTCS.201
  - *International Workshop on Foundations of Coordination Languages and Self-Adaptive Systems (FOCLASA)* , Javier Cámara, José Proença (Editors), FOCLASA 2014, Electronic Proceedings in Theoretical Computer Science, Volume 175, 2015. http://dx.doi.org/10.4204/EPTCS.175

- **Member of Steering-Committees**
  - **COORDINATION** – IFIP International Conference on Coordination Models and Languages (CORE A conference until 2017, Core B from 2018), for the years **2017**, **2018**, **2019**, **2020**, and **2021**.
  - **FACS** – International Conference on Formal Aspects of Component Software, for the years **2018** and **2019**.

- **Chair of Program-Committees**
  - **F-IDE 2021**, 6th Workshop on Formal Integrated Development Environment, co-located with NASA Formal Methods 2021 conference, to be held online; co-chaired with Andrei Paskevich, from LRI and the University of Paris-Saclay; Edited proceedings will be available in Electronic Proceedings in Theoretical Computer Science (EPTCS).

  - **F-IDE 2019**, 5th Workshop on Formal Integrated Development Environment, co-located with the Formal Methods 2019 conference, to be held in Porto, Portugal; co-chaired with Rosemary Monahan, from Maynooth University, and Virgile Prevosto from the University of Paris-Saclay; Edited proceedings available in Electronic Proceedings in Theoretical Computer Science (EPTCS).
  - **FACS 2017**, 14th International Conference on Formal Aspects of Component Software, held in Braga, Portugal; co-chaired with Markus Lumpe, from the Swinburne University of Technology, Australia; Edited proceedings available in Lecture Notes in Computer Science (LNCS), and a special issue is being organised for Science in Computer Programming (Elsevier Journal).
  - **COORDINATION 2016**, IFIP International Conference on Coordination Models and Languages (CORE A conference), part of the 3 DisCoTec conferences, held in Heraklion, Greece; Co-chaired with Alberto Lluch Lafuente, from the Technical University of Denmark; Edited proceedings available in Lecture Notes in Computer Science (LNCS), and a special issue is being organised for Logical Methods in Computer Science (LMCS).
  - **FOCLASA 2015**, International Workshop on Foundations of Coordination Languages and Self-Adaptive Systems, held in Madrid, Spain; co-chaired with Massimo Tivoli, from the University of L'Aquila, Italy; Edited proceedings available in Electronic Proceedings in Theoretical Computer Science (EPTCS).
  - **FOCLASA 2014**, International Workshop on Foundations of Coordination Languages and Self-Adaptive Systems, held in Rome, Italy; co-chaired with Javier Cámara, from Carnegie Mellon University, USA; Edited proceedings available in Electronic Proceedings in Theoretical Computer Science (EPTCS).

- Creation and management of a **research cluster Arca** (`http://arca.di.uminho.pt`) within HASLab, about Software Architecture & Design Calculi, including the organisation of periodic seminars and maintaining an up-to-date website with current research activities and outcomes.

- **Member of Program-Committees**
  - **TACAS** – International Conference on Tools and Algorithms for the Construction and Analysis of Systems (Artifact evaluation committee member) for **2021**
  - **F-IDE** – Workshop on Formal Integrated Development Environment, for **2019** and **2021**.
  - **FSEN** – IPM International Conference on Fundamentals of Software Engineering, for the years **2015**, **2017**, **2019**, and **2021**.
  - **FACS** – International Conference on Formal Aspects of Component Software, for **2014**, **2017**, **2018**, and **2019**.
  - **FOCLASA** – International Workshop on Foundations of Coordination Languages and Self-Adaptive Systems, for the years **2014**, **2015**, and **2018**, and **2019**.
  - **REBLS** – International Workshop on Reactive and Event-Based Languages & Systems, for **2018**.
  - **PhD-iFM** – International Conference on integrated Formal Methods – PhD Symposium on Formal Methods: Algorithms, Tools and Applications, for **2018**.
  - **AlgoSensors** – International Symposium on Algorithms and Experiments for Wireless Networks, for **2018**.
  - **COORDINATION** – IFIP International Conference on Coordination Models and Languages, for **2016** (as PC-Chair).

- **Juri in PhD defences** of the following PhD researchers:
  - Fan Yan (KU Leuven, private defence on Jan 2019);
  - Guillermina Cledou (not officially in the juri due to university rules), *A Virtual Factory for Smart City Service Integration* (U.Minho, 12 Nov 2018);

- **Juri in MSc thesis** of the following MSc projects:
  - Sven Akkermans, *Supporting the Internet of Things: IPv6 multicase in publish/subscribe middleware* (KU Leuven, 2015);
  - Vincent Goossens, *Reification of monads for parser combinators* (Monadreïficatie voor Parsercombinatoren) (KU Leuven, 2015);

- **Reviewer** in the last 5 years (since 2016) for the following 38 submissions, including 13 journal submissions and 25 publications on international peer-reviewed conferences and workshops: JLAMP (Elsevier journal)'17,20; TACAS'20; FSEN'17,19,20; STTT (Springer journal)'19,20; SCP (Elsevier journal)'18,19,20; Conc.& Comp. (Wiley journal)'19,20; EBL'20; iFM'19; FACS'18,19; FOCLASA',18,19; F-IDE'19; FORTE'17,18; SoSyM (Springer journal)'18,19; FM'16,18; REBLS'18; VORTEX'18; AlgoSensors'18; Inf. and Comp. (Elsevier journal)'18; PhD-iFM '18; JSS (Elsevier journal)'17; SEFM'17; FASE'17; COORDINATION'16; SBCAR'16; SBLP'16; ESOP'16;

Teaching experience and merit

Producing teaching content

The most relevant teaching material produced is listed below.

- **Functional programming** (2016–2019). This is a programming introductory course for first year university students. I was involved in the development of:
  - the student assignments; and
  - an engine to provide instant feedback regarding students assignments and to evaluate automatically several aspects of these assignments, available on `https://github.com/haslab/HAAP`;
  - A hall-of-fame for the best projects since 2013, including playable links to the student's Haskell code compiled into JavaScript, available on `https://haslab.github.io/Teaching/LI1`;
  - A publication on ICFP (CORE A*) on an experience report presenting our approach and tools.
- **Software Architecture and Design Calculi** (2015-2018). This is a MSc level course on formal methods for always-running components, covering topics such as model checking, bisimulations, timed automata, and coordination models. I developed several artifacts, most available online on `http://ac1516.proenca.org`, `http://ac1617.proenca.org`, and `http://arca.di.uminho.pt/ac-1718`:
  - slides;
  - tutorials;
  - assignments; and
  - exams.
- **Cyber-Physical Computation** (ongoing – 2019/20). This is a PhD level course under the MAPi program on formal analysis of cyber-physical systems, focusing on timed and hybrid (continuous/discrete) systems. I am responsible for a module of this course covering timed-automata, where I prepared slides available online on `http://alfa.di.uminho.pt/~nevrenato/CPC.html`.
- **Mathematics for Computer Science - Qualifica IT** (17/18). This is an introductory course on logic for a requalification program from the U.Minho. I developed slides, available on `http://arca.di.uminho.pt/qit1718-mi`, and exams.

Teaching activities

The list below enumerates the different teaching activities where I was involved in since 2011, including supervision of students.

- **Invited Assistant Professor** to deliver part of an ongoing course on Cyber-Physical Computation for PhD students, on formal analysis of time and behavioural properties of cyber-physical systems, involving the preparation of slides and evaluation of students based on a report about a research article (`http://alfa.di.uminho.pt/~nevrenato/CPC.html`).
- **Invited Assistant Professor** in charge of lab classes of the courses:
  - *Computer Systems (SCOMP)* in ISEP (19/20);
  - *Algorithms and Programming (APROG)* in ISEP (19/20);

  - *Functional Programming* in U.Minho (16/17 and 17/18);
  - *Laboratory of Informatics for functional programming* in U.Minho (16/17, 17/18, and 18/19);
  - *Laboratory of Informatics for imperative programming* in U.Minho (17/18);
  - *Program Calculation* in U.Minho (16/17).

- **Invited Assistant Professor** to deliver the MSc course *Arquitectura e Cálculo* (Software Architecture and Design Calculi) in U.Minho (15/16, 16/17, and 17/18), including the preparation of slides, tutorials, assignments, and exams (`http://ac1516.proenca.org`, `http://ac1617.proenca.org`, and `http://arca.di.uminho.pt/ac-1718`).

- **Invited Assistant Professor** to deliver a course for a requalification program (*Qualifica IT*) on Mathematics for Computer Science in U.Minho (17/18), including the preparation of slides, exercises, and exams (`http://arca.di.uminho.pt/qit1718-mi`)

- **Teaching Assistant** at KU Leuven; undergraduate courses:
  - Practical project with constrained devices (P&O, 13/14, 14/15).
  - Software design in object-oriented languages (SWOP, 11/12, 12/13, 13/14),
  - Comparative Programming Languages (CPL, 12/13),
  - Operating Systems (BS, 12/13),
  - Introduction to the object-oriented paradigm (OGO, 11/12),

- **Invited lectures**:
  - 2 lectures on the Comparative Programming Languages course (KU Leuven, 12/13),
  - introductory lecture on Functional Programming (Petrozavodsk State University, Russia, Nov. 2012),
  - lecture on the Reo coordination language (U.Minho, Braga, Apr. 2013).

- **Supervisor** of the following MSc theses:
  - Rúben Cruz, *Web-based analysis of families of Reo connectors* (Univ. Minho, 2017/18);
  - Sam Gielis, *A reactive, extensible & modular Dashboard Factory for WSN monitoring* (KU Leuven, 2015);
  - Jonas Flament, *Encoding Scala with Logic* (KU Leuven, 2014);
  - Wouter Seyen, *Delta Modelling Evaluation using ABS Language* (KU Leuven, 2012);

- **Involved in the supervision** of the work carried in the PhD theses:
  - Guillermina Cledou (U.Minho, defended in 2018)
  - Wilfried Daniëls (KU Leuven, defended in 2018)
  - Gowri Sankar Rang (KU Leuven, defended in 2017)
  - Radu Muschevici (KU Leuven, defended in 2013)

Coordination of Teaching projects

I was involved in an internal teaching project on how to introduce fresh university students to programming, more specifically, to functional programming. This has been mentioned in the section over *"producing teaching content"*.Several consecutive years of experimentation with different ways to stimulate students and provide quicker and better feedback on their project assignments culminated in:

- A tool—HAAP (`https://github.com/haslab/HAAP`)—to compile student assignments, test them, and produce intuitive reports;

- A publication reporting on our findings:
  - **ICFP 2018 (A* in CORE)** – *Teaching how to program using automated assessment and functional glossy games (experience report)*, José Bacelar Almeida, Alcino Cunha, Nuno Macedo, Hugo Pacheco, José Proença, Proceedings of the ACM on Programming Languages volume 2, ICFP, article 82, 2018.

I was also actively involved in the writing of a **proposal for a 2-year MSc** on Critical Systems to be offered by ISEP, Porto, together with other senior researchers at CISTER/ISEP. This proposal includes modules on formal verification of critical systems and advanced programming paradigms that, in case of approval, will be lectured by me. This proposal was approved, but the edition of 2019/20 failed to start.

In all the teaching content mentioned above (8 course units), and in 9 other teaching activities I was actively involved in restructuring content and planning projects for students.

I also organised a reading club on reactive programming, where all content can be found online: https://jose.proenca.org/post/reactive-programming.

Dissemination and Technology Transfer

Organization of scientific volumes and events

I was the **general chair** and **local organizer** of the following international conference:

- **FACS 2017**, 14th International Conference on Formal Aspects of Component Software, held in Braga, Portugal.

I was the **editor** of the following proceedings and journal special issues, already mentioned in the section over my *"integration in the scientific community"*.

- *5th Workshop on Formal Integrated Development Environment (F-IDE)*, Rosemary Monahan, Virgile Prevosto, José Proença (Editors), F-IDE 2019, Electronic Proceedings in Theoretical Computer Science, to appear.
- *Special Issue of FACS 2017 (Journal)*, Science of Computer Programming, Elsevier, not yet complete. https://www.sciencedirect.com/journal/science-of-computer-programming/special-issue/10166TH86XL
- *Special Issue of COORDINATION and FORTE 2016 (Journal)*, Logical Methods in Computer Science, Episciences, Volume 13, 2017. (Q1 in 2016 under Computer Science) https://lmcs.episciences.org/volume/view/id/293
- *International Conference on Formal Aspects of Component Software (FACS)* , José Proença, Markus Lumpe (Editors), FACS 2017, Lecture Notes in Computer Science, Volume 9686, 2016. http://dx.doi.org/10.1007/978-3-319-39519-7
- *IFIP conference: Coordination Models and Languages* , Alberto Lluch Lafuente, José Proença (Editors), COORDINATION 2016, Lecture Notes in Computer Science, Volume 10487, 2017. https://link.springer.com/book/10.1007/978-3-319-68034-7
- *International Workshop on Foundations of Coordination Languages and Self-Adaptive Systems (FOCLASA)* , José Proença, Massimo Tivoli (Editors), FOCLASA 2015, Electronic Proceedings in Theoretical Computer Science, Volume 201, 2015. http://dx.doi.org/10.4204/EPTCS.201
- *International Workshop on Foundations of Coordination Languages and Self-Adaptive Systems (FOCLASA)* , Javier Cámara, José Proença (Editors), FOCLASA 2014, Electronic Proceedings in Theoretical Computer Science, Volume 175, 2015. http://dx.doi.org/10.4204/EPTCS.175

I also organised local seminars and invited talks, including the ones listed below.

- Invited tutorial from prof. Farhad Arbab on Interaction-Based Programming, targetting to MSc students, under the DaVinci FCT project (that I am currently leading), on May 2019. More information on http://davinci.di.uminho.pt/#dissemination.
- Created and managed a small research cluster *Arca* (http://arca.di.uminho.pt) within HASLab, about Software Architecture & Design Calculi. This included the organization of local seminars (2016–2019), opened to all scientific community, advertised in http://arca.di.uminho.pt/#events.

Technology transfer

This section compiles research activities which are more applied or with a more direct connection to industrial partners.

- *Case-study in the DaVinci project* – The industrial partner of this recent FCT project, which I'm leading, is Altreonic: a Belgium company developing software for Real Time embedded systems. I visited them in September 2018, and are on ongoing collaboration to devise orchestration mechanisms between tasks being scheduled in a real time operating system. The specific case-study consists of the analysis of the software running in the modular electric cars being built at Altreonic, the *Kurt vehicles*, including a remote steering functionality.

- *Case-study in the LightKone project* – One of the case-studies in the LightKone project was given by the German company Peer Stritzinger GmbH, consisting of a network of nodes attached to a conveyor belt in a manufacturing process. Each node interacts with RFID tags placed on products being assembled, and controls where these products should go. Furthermore, nodes share information about these tags. I formalised this use-case using a model-checker for timed-automata, reasoning about the time the building process could take.

- *Analysis and verification of WSN* – I was part of a group working on Wireless Sensor Networks in KU Leuven, Belgium, in 2013-2015. During that period, I developed algorithms and approaches to analyse and monitor wireless sensor applications, leading to several publications [26, 27, 29, 35]. The work carried at this group led to a spin-off company —VersaSense.com—providing an IoT platform for industrial facilities.

- *Participation in the TRANSITION project (2014-2015)* – This was a Belgium project carried at KU Leuven, supported by an Industrial Research Fund aiming at a closer collaboration with industrial partners. It combines efforts between the computer science department (DistriNet group) and the mechanical engineering department (PMA group), investigating how to use lightweight wireless nodes to interact and reconfigure larger robots.

- *Open-source software artefacts* – Some of my proposed concepts and methodologies are supported by a companion tool or library that realises it. These are listed below, including frameworks to verify software connectors that rely on external model checkers and constraint solvers.

Tool development

- **ArcaTools** – Web-based interactive framework to combine existing (independent) Reo tools [21] and tools for hybrid programming, previously known as *ReoLive*. It consists of a Scala and JavaScript implementation of a framework that provides the bridge between a browser-based IDE and a set of tools, using several widgets to provide quick feedback over the connectors or programs being build. Available at `https://github.com/ReoLanguage/ReoLive`, and usable at `http://arcatools.org`.

- **ARx** – Reactive programming language for synchronous connectors. An operational model that gives semantics to a reactive language that combines reactive programming concepts with synchronous communication aspects [16]. Available at `https://github.com/arcalab/arx`, and usable at `http://arcatools.org/#arx`. It consists of a Scala and JavaScript implementation that parses and analyses synchronous connectors written in a reactive programming style.

- **HubAutomata** – Hub Automata for coordination of tasks on a Real-Time OS: an automata model that gives semantics to connectors combining tasks on the VirtuosoNext$^{\text{TM}}$ framework [18, 1]. Available at `https://github.com/arcalab/hubAutomata`, and usable at `http://arcatools.org/#virtuoso`.

- **Lince** – Lightweight prototyping of Hybrid Programs. It uses a DSL for Hybrid Programs, and produces simulations that take advantage of symbolic computations by SageMath and of perturbation analysis using quadratic programming. Available at `https://github.com/arcalab/hybrid-programming`, and usable at `http://arcatools.org/#lince`

- **Preo** – Parameterised Reo: a concrete language for a calculus of variable connectors [2]. It consists of a Scala implementation of a set of tools to parse, compose, inspect, and visualise families of connectors based on the Reo coordination language. Available at https://github.com/ReoLanguage/Preo, and usable at http://arcatools.org/#reo.
- **HAAP** – Haskell Automated Assessment Platform [20]. It consists of a Haskell implementation of a platform used to automatically analyse and evaluate student assignments, used to teach first-year students how to program in Haskell. Available at https://github.com/haslab/HAAP.
- **ITFA** – Scala implementation of the Interface Featured Timed Automata [23]. It provides libraries with an embedded DSL to describe timed automata with variability, methods to provide complex composition mechanisms, and methods to export the resulting automata to the UPPAAL model checker or to different visualisers. Available at https://github.com/haslab/ifta.
- **PICC** – Partial Interaction Coordination Constraints [30] - an interactive Reo implementation. It consists of a Scala implementation that explores how to include constraints with side-effects when describing communication protocols, based on transactions with compensations. Available at https://github.com/joseproenca/picc.

Languages

Portuguese: Mother tongue
English: Excellent
Spanish: Good
French: Basic (3 years of courses)
Dutch: Basic (2 years of courses)
Russian: Basic (3 years of courses)
German: Poor (2 semesters of courses)

Porto, January 21, 2021

(José Miguel Paiva Proença)

Full list of publications, based on DBLP (http://dblp.uni-trier.de)

This list of publications includes only the peer-reviewed publications in international journals and proceedings, and does not include technical reports.

Journal publications

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[4] Sung-Shik T. Q. Jongmans, Dave Clarke, and José Proença. A procedure for splitting data-aware processes and its application to coordination. *Science of Computer Programming, Elsevier*, 115-116:47–78, 2016.

[5] Radu Muschevici, Jose Paiva Proenca, and Dave Clarke. Feature nets: behavioural modelling of software product lines. *Software and Systems Modeling (SoSyM)*, pages 1–26, Springer, June 2015.

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Edited proceedings, journals, and books

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Proceedings of international peer-reviewed conferences and workshops

[15] Sergey Goncharov, Renato Neves, and José Proença. Implementing hybrid semantics: From functional to imperative. In Violet Ka I Pun, Volker Stolz, and Adenilso Simão, editors, *Theoretical Aspects of Computing - ICTAC 2020 - 17th International Colloquium, Macau, China, November 30 - December 4, 2020, Proceedings*, volume 12545 of *Lecture Notes in Computer Science*, pages 262–282. Springer, 2020.

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