

ANA DE ALMEIDA BORGES

Logician and formal verification engineer

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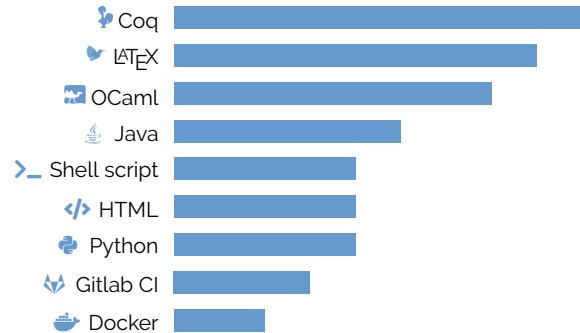
ABOUT ME

I am a mathematician, a computer scientist, a logician, a proof theorist, a researcher, a software developer, a formal verification engineer, a teacher, an organizer. I came by these roles through a mix of formal education, practical experience, and personality.

I see the trees more easily than the forest, and yet I have gained some forest-seeing habits through experience.

I want things to *work*, to work well, to work simply, to work beautifully, and when it's in my power I make it so.

SOFTWARE SKILLS



EDUCATION

- 01/2017–01/2024 **PhD in Mathematics and Computer Science** Universitat de Barcelona, Spain
Research areas: provability logic, modal logic, formal verification.
📄 *Suitable logics: provability, temporal laws, and formalization*
Adviser: Joost J. Joosten
- 07/2014–12/2016 **Master Degree (MSc) in Mathematics and Applications** Instituto Superior Técnico, Portugal
Erasmus at Technische Universität Darmstadt, Germany
Focus: logic, theoretical computer science
📄 *On the herbrandised interpretation for nonstandard arithmetic*
Advisers: Fernando Ferreira, Ulrich Kohlenbach, and Carlos Caleiro
- 09/2011–07/2014 **Degree (BSc) in Applied Mathematics and Computation** Instituto Superior Técnico, Portugal
📄 *Brands' cash system and a proposed attack*
Adviser: Paulo Mateus

WORK EXPERIENCE

- 01/2017–04/2022 **Team lead and formal verification engineer** Formal Vindications S.L. and Fundació Bosch i Gimpera, Spain
📄 Part of a project funded by the European Regional Development Plan (ERDP) and developed jointly with the University of Barcelona.
📄 Formally verified software development related to the legal road transport of goods and people in the European Union. During much of my time here I was the most senior developer and took on a leadership role, which entailed being responsible for prioritization, assignments, production, and the surrounding infrastructure, such as code reviewing, code refactoring, CI, packaging, and organizational and infrastructural documentation.
- 06/2020–10/2020 **Formal verification engineer** University of Bergen, Norway (remote)
📄 Part of the AUTOPROVING — Automated Theorem Proving from the Mindset of Parameterized Complexity Theory project.
📄 Formal verification in Coq of basic concepts from tree automata theory.

SOFTWARE PROJECTS

- 2024 **3, 2, 5, Can you count?** <https://github.com/ana-borges/Counting-Simulator>
📄 with N. Roth and J. Simões
A game in which you need to count how many goats are on the screen.
Developed as part of the Global Game Jam 2024.
- 2023 **QRC₁ in Coq** <https://gitlab.com/ana-borges/QRC1-Coq>
📄 A Coq formalization of the Quantified Reflection Calculus with one modality from the modal point of view.
- 2023 **Coq development** <https://github.com/coq/coq/pulls?q=is%3Apr+author%3Aana-borges+is%3Aclosed>
📄 Contributions to Coq development, most notably:
 - Signed primitive integers** with G. Melquiond and P. Roux
 - Print Notation** with A. Caglayan and E. J. Gallego Arias
- 2022 **FormalV open source libraries** <https://gitlab.com/formalv/formalv>
📄 with Q. Casals Buñuel, J. Conejero Rodriguez, M. González Bedmar and E. Hermo Reyes
Libraries for the conversion between Coq primitive integers and MathComp unary numbers, boolean goal automation, and UTC time management.
- 2020 **Tree automata theory in Coq** <https://github.com/AutoProving/TreeAutomataFormalization>
📄 Formalization of basic concepts from tree automata theory.

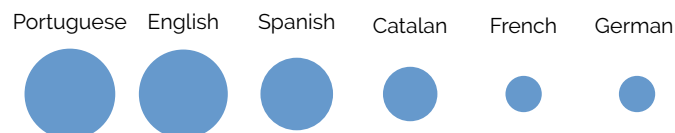
PUBLICATIONS

- 2024 **Strictly positive fragments of the provability logic of Heyting Arithmetic** *Studia Logica*
A. de Almeida Borges and J. J. Joosten
- 2024 **UTC time, formally verified** *Certified Programs and Proofs (CPP 2024)*
A. de Almeida Borges, M. González Bedmar, J. J. Conejero Rodríguez, E. Hermo Reyes, J. Casals Buñuel, and J. J. Joosten
- 2023 **Suitable logics: provability, temporal laws, and formalization** *Universitat de Barcelona, Spain*
A. de Almeida Borges
PhD Thesis
- 2023 **Lessons for interactive theorem proving researchers from a survey of Coq users** *Interactive Theorem Proving (ITP 2023)*
A. de Almeida Borges, A. Casanueva Artis, J.-R. Falleri, E. J. Gallego Arias, É. Martin-Dorel, K. Palmiskog, A. Serebrenik, and T. Zimmermann
- 2023 **An escape from Vardanyan's Theorem** *The Journal of Symbolic Logic 88(4)*
A. de Almeida Borges and J. J. Joosten
- 2022 **Towards a Coq formalization of a quantified modal logic** *Automated Reasoning in Quantified Non-Classical Logics (ARQNL 2022)*
A. de Almeida Borges
- 2021 **To drive or not to drive: A logical and computational analysis of European transport regulations** *Information and Computation 280*
A. de Almeida Borges, J. J. Conejero Rodríguez, D. Fernández-Duque, M. González Bedmar, and J. J. Joosten
- 2020 **Quantified Reflection Calculus with one modality** *Advances in Modal Logic (AiML 13)*
A. de Almeida Borges and J. J. Joosten
- 2019 **The second order traffic fine: Temporal reasoning in European transport regulations** *Temporal Representation and Reasoning (TIME 2019)*
A. de Almeida Borges, J. J. Conejero Rodríguez, D. Fernández-Duque, M. González Bedmar, and J. J. Joosten
- 2018 **The Worm Calculus** *Advances in Modal Logic (AiML 12)*
A. de Almeida Borges and J. J. Joosten
- 2016 **On the herbrandised interpretation for nonstandard arithmetic** *Instituto Superior Técnico, Portugal*
A. de Almeida Borges
Master's Thesis

ADMINISTRATIVE EXPERIENCE

- 01/2019–04/2022 **Chair / member of several hiring committees** *Universitat de Barcelona and Fundació Bosch i Gimpera, Spain*
Hiring for positions such as programmer, researcher, and project manager.
- 12/2018–04/2022 **Seminari Cuc (Worm Seminar) organizer** *Universitat de Barcelona, Spain*
Responsible for selecting and inviting speakers, advertising, and supervising regular seminars on proof theory and modal logic.
- 03/2019–11/2019 **Workshop organizer** *Universitat de Barcelona, Spain*
5th Workshop on Proof Theory, Modal Logic and Reflection Principles
- 09/2011–07/2016 **Student representative** *Instituto Superior Técnico, Portugal*
Regular meetings with professors addressing various issues concerning fellow students.
- 09/2013–01/2016 **Seminário Diagonal (Diagonal Seminar) organizer** *Instituto Superior Técnico, Portugal*
Responsible for selecting and inviting speakers, advertising, and supervising regular seminars on Mathematics and its applications.

LANGUAGES



REFERENCES

The following people may be contacted to provide references on my professional background and abilities.

Joost J. Joosten
Professor at Universitat de Barcelona, Spain

jjjoosten@ub.edu

Mireia González Bedmar
CTO at Formal Vindications S.L.

mireia.gbedmar@formalv.com

Lisbon, November 18, 2024