# Diego de Freitas Aranha

Associate Professor at Department of Computer Science, Aarhus University, Denmark
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**RESEARCH OBJECTIVES**

Enable the development of secure computer systems through efficient and robust cryptography, privacy-preserving protocols and lessons from security analysis of real-world systems.

**RESEARCH INTERESTS**

Efficient algorithms and software implementations for symmetric and public key cryptography; privacy-preserving cryptographic protocols; security of real-world systems.

**PUBLIC PROFILES**

- ORCID: `https://orcid.org/0000-0002-2457-0783`
- ResearcherID: `https://www.researcherid.com/rid/J-9961-2012`
- Google Scholar: `https://scholar.google.com/citations?user=FF26-mIAAAAJ`
- SCOPUS: `https://www.scopus.com/authid/detail.uri?authorId=16041624100`
- DBLP: `http://dblp.uni-trier.de/pers/hy/a/Aranha:Diego_F=`

**EDUCATION**

**University of Waterloo**, Waterloo, Canada
*Visiting PhD student*                                                  04/2010 − 04/2011
- Project: Pairing-Based Cryptography: Theory and Practice
- Advisor: Alfred Menezes
- Area of study: Cryptographic Engineering

**University of Campinas**, Campinas, Brazil
*PhD in Computer Science*                                               03/2007 − 08/2011
- Thesis: Efficient software implementation of curve-based cryptography
- Advisor: Julio López
- Area of study: Cryptographic Engineering

*Master of Computer Science*                                            03/2005 − 02/2007
- Dissertation: Name services and routing in anonymizing networks
- Advisor: Julio López
- Area of study: Computational anonymity

**University of Brasília**, Brasília, Brazil
*Bachelor of Computer Science*                                          02/2000 − 02/2005
- Project: An anonymizing transport layer with applications to censorship-resistant services
- Advisor: João Gondim
- Area of study: Computational anonymity

**PROFESSIONAL EXPERIENCE**

**Aarhus University**, Aarhus, Denmark
*Associate Professor, Department of Computer Science*                   08/2020 − **Present**
- Researcher on Cryptographic Engineering and Systems Security.
- Lectured courses on Computer Architecture and Systems Security.

*Assistant Professor, Department of Engineering*                        07/2018 − 07/2020
- Researcher on Cryptographic Engineering and Network Security.
- Lectured courses on Data Structures and Network Security.

**University of Campinas**, Campinas, Brazil
*Assistant Professor, Institute of Computing*                           02/2014 − 06/2018
- Researcher on Cryptographic Engineering and Systems Security.
- Lectured undergrads on Algorithms and Computer Programming, Computer Architecture, Assembly Programming, and Competitive Programming.
- Lectured graduate courses on Cryptography, Secure Programming and Algorithm Complexity.

**University of Brasília**, Brasília, Brazil
*Assistant Professor, Department of Computer Science*                   11/2011 − 02/2014
- Researcher on PUF-based Cryptography and Electronic Voting.
- Lectured courses on Cryptography, Object-Oriented Programming, Computer Architecture, Competitive Programming, Computational Logic, Systems Software.

**CertiVox/MIRACL**, London, UK
*Contractor/Developer*                                                  09/2010 − 11/2011
- Implemented pairing-based cryptography for secure messaging in C++ and JavaScript.

| HONORS AND AWARDS | • Distinsguished Program Committee Member at EUROCRYPT 2024 | **2024** |
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- Distinsguished Program Committee Member at EUROCRYPT 2024 **2024**
- Supervisor of Best MSc. Dissertation defended in Brazil on Computer Architecture and High-Performance Computing **2019**
- Invited to discuss security issues with electronic voting at Brazilian Senate **2018**
- Defended strong encryption on public hearing at Brazilian Supreme Court **2017**
- Google Research Awards in Latin America for research in privacy **2015/2016**
- Innovators Under 35 Brazil by MIT TechReview for work in electronic voting **2015**
- Raised US\$ 30,000 in crowdfunding campaign for YouInspect project **2014**
- Best Paper Award in Cryptographic Hardware and Embedded Systems (CHES) **2013**
- Best PhD dissertation in Brazil on Computer Security and Cryptography **2012**
- 2nd Best Computer Science PhD Thesis in Brazil by Brazilian Computer Society **2012**
- Best PhD dissertation defended in 2011 at Institute of Computing, University of Campinas **2012**
- Invited to discuss security issues with electronic voting at Brazilian Congress **2012**
- 1st place at the 2nd Edition of the Public Security Tests of the Electronic Voting System organized by the Brazilian Electoral Authority **2012**
- Visiting PhD Student Scholarship by CAPES funding agency **2010-2011**
- Prestigious PhD Scholarship by FAPESP funding agency **2007-2010**
- 5th/8th place in South American ACM International Collegiate Programming Contest **2003/2004**

**QUANTITATIVE INDICATORS**

**Current supervisions**: 1 PhD supervision, 1 PhD co-supervision.

**Completed supervisions:** 51 undergrad research and final projects, 48 MSc. dissertations (with co-supervisions), 9 PhD theses (with co-supervisions), 1 Postdoc.

**Publications:** 31 journal articles, 2 edited volumes, 3 book chapters, 57 papers in conference proceedings, 12 papers in peer-reviewed workshops.

**Citations**: 3649 (Google Scholar), 1913 (ResearchGate), 1340 (Scopus), 782 (ISI).

**H-Index**: 29 (Google Scholar), 22 (ResearchGate), 20 (Scopus), 15 (ISI).

**FUNDING**

**Aarhus University**, Aarhus, Denmark
*Enhanced Cybersecurity in the Retail Sector (PI)* **10/2024 − Present**
- Grant: Salling Foundation, DKK 4,800,000
- Objective: Develop MPC and authentication solutions for the retail industry.

*RENAIS: Residue Number Systems for Cryptography (PI)* **07/2021 − Present**
- Grant: Independent Research Fund Denmark, DKK 2,871,000
- Objective: Develop algorithms for high-assurance field arithmetic in RNS representation.

*Verifiable cryptographic software (PI)* **08/2019 − 12/2022**
- Grant: Partnership with Concordium Blockchain Research Center, DKK 2,250,000.
- Objective: Develop techniques for formal verification of cryptographic software.

*BAN – Blockchain Network Academy (PI)* **01/2020 − 06/2022**
- Grant: Danish Industry Fund, DKK 1,673,000 for AU within total of 6,750,000 to consortium.
- Objective: Develop training materials and use cases for secure blockchain applications.

*Cybersecurity in secure manufacturing (PI)* **12/2018 − 10/2020**
- Grant: Partnership with Aerospace & Defence Manufacturing Groupe (ADMAG) in the Smart Industry program, DKK 1,000,000.
- Objective: Prototype and deploy techniques for secure sharing of production data.

**University of Campinas**, Campinas, Brazil
*Privacy-preserving analytics with differential privacy (PI)* **04/2018 − 04/2019**
- Grant: Seed funding from LG Electronics, US\$ 50,000.
- Objective: Design efficient protocols and implementations satisfying differential privacy.

*Efficient and secure cryptography for IoT (PI)* **02/2015 − 03/2018**
- Grant: Partnership with LG Electronics, US\$ 250,000.
- Objective: Design efficient software implementations for lightweight cryptography.

*Machine learning over encrypted data using homomorphic encryption (PI)* **10/2015 − 10/2017**
- Grant: Google Research Awards for Latin America, US\$ 40,000.
- Objective: Design algorithms and protocols for machine learning tasks over encrypted data.

*Secure execution of cryptographic algorithms (co-PI)* **11/2015 − 12/2018**
- Grant: Intel/FAPESP Research Partnership for Technological Innovation, US\$ 160,000.
- Objective: Design instruction set extensions for side-channel resistant cryptography.

**University of Brasília**, Brasília, Brazil
*Physical Unclonable Functions for SoC Devices (co-PI)* **07/2012 − 11/2015**
- Grant: Partnership with Intel Labs, US\$ 87,000.
- Objective: Design energy-efficient constructions and protocols for PUF-based cryptography.

"**Efficient software implementation of curve-based cryptography**". In Summer School on Real-world Crypto and Privacy, Croatia, 2022.

"**Security and privacy challenges in modern embedded systems**". In *Grundfos Archimedes Lecture*, Denmark, 2019.

"**Return of the insecure Brazilian voting machines**". In *DEF CON Voting Village*, USA, 2018; *Black Hat Asia*, Singapore, 2019; *Workshop on E-lections*, Israel, 2019; InfoSecurity Denmark, 2019.

"**Pairings are not dead, just resting**", "**Introduction to pairings**". In *21st Workshop on Elliptic Curve Cryptography (ECC)*, Netherlands, 2017.

"**Lightweight cryptography on ARM**". In *Software Performance Enhancement of Encryption and Decryption and Benchmarking (SPEED-B)*, Netherlands, 2016; and NIST Lightweight Cryptography Workshop (LWC), USA, 2016.

"**Software vulnerabilities in the Brazilian voting machine**". In *5th Real World Cryptography Conference (RWC)*, Stanford, USA, 2016.

"**Security Analysis of the Brazilian voting machine**", "**Software implementation of pairings**". In *3rd Advanced School on Cryptology and Information Security in Latin America (AS-Crypto)*, Mexico, 2015.

"**Efficient binary field arithmetic and applications to curve-based cryptography**". In *14th International Workshop on Cryptographic Hardware and Embedded Systems (CHES)*, Belgium, 2012; and Microsoft Research (MSR), USA, 2012.

"**Software vulnerabilities in the Brazilian voting machine**". In *Electronic Voting Technology/Workshop on Trustworthy Elections (USENIX EVT/WOTE)*, USA, 2012.

"**Software implementation of pairings**". In *The 15th Workshop on Elliptic Curve Cryptography (ECC)*, France, 2011.

"**High-speed parallel software implementation of the $\eta_T$ pairing**". In *Software Performance Enhancement of Encryption and Decryption and Cryptographic Compilers (SPEED-CC)*, Germany, 2009.

**Marius Andre Årdal**, PhD student at Aarhus University
Topic: *Residue Number Systems in Cryptography*                  **02/2022 − Present**
**Adam Blatchley Hansen**, PhD student at Aarhus University (co-supervision)
Topic: *Distributed cryptographic protocols*                  **02/2021 − Present**
**Antônio Carlos Guimarães Junior**, PhD student at University of Campinas (co-supervision)
Topic: *Privacy-preserving computation in the cloud*          **07/2019 − 09/2023**
**Benjamin Salling Hvaas**, PhD student at Aarhus University
Topic: *Verifiable pairing-based cryptographic software*         **08/2019 − 12/2022**
**Pedro Geraldo Morelli Rodrigues Alves**, PhD student at University of Campinas
Topic: *GPU-accelerated homomorphic encryption*           **03/2016 − 03/2023**
**Akira Takahashi**, PhD student at Aarhus University (co-supervision)
Topic: *Cryptography from Zero Knowledge*                **01/2019 − 06/2022**
**Jheyne Nayara Ortiz**, PhD student at University of Campinas (co-supervision)
Topic: *Efficient parameters for lattice-based cryptography*      **03/2016 − 03/2021**
**Amanda Cristina Davi Resende**, PhD student at University of Campinas
Topic: *Private Set Intersection protocols*                 **03/2015 − 05/2021**
**Narcise B. Mbiang**, PhD student at University of Dschang, Cameroon (co-supervision)
Topic: *Computing the Optimal Ate pairing at high security levels*   **03/2015 − 12/2020**
**Caio Hoffman**, PhD at University of Campinas (co-supervision)
Topic: *Computer Security by Hardware-Intrinsic Authentication*    **09/2015 − 01/2019**
**Eduardo Moraes de Morais**, PhD at University of Campinas (co-supervision)
Topic: *CCA1-Secure Somewhat Homomorphic Encryption*        **04/2010 − 06/2016**
**Karina Mochetti de Magalhães**, Postdoc at University of Campinas
Topic: *Formal security analysis of PUF-based protocols*         **04/2015 − 11/2015**

**Jonathan Eliath, Johan T. Degn, Kent Nielsen**: MSc at AU CS
Topic: *FAEST for Memory-Constrained Devices with Side-Channel Analysis*   **02/2024 − 07/2024**
**Mariam Shamsali, Anna Gorska**: MSc at AU CS
Topic: *Privacy Preservation via MPC for Intrusion Detection Systems*    **02/2024 − 07/2024**
**Josephine Scharf, Jakob Roosgard, Jakob Jehøg-Krokager**: MSc at AU CS
Topic: *Data Structures for Certificate Transparency*               **02/2024 − 07/2024**
**Christer B. Knorborg, Søren Peter K. Grarup, Mathias Bennick**: MSc at AU CS
Topic: *Oil and Vinegar in Post-Quantum Signature Schemes*        **02/2024 − 07/2024**
**Niels Bjørn Christensen, Simon Daugaard Nielsen**: MSc at AU CS
Topic: *Securing MQTT with Lightweight and Post-Quantum Cryptography*   **08/2023 − 01/2024**

**Radu Aron**: MSc at AU CS
Topic: *Post-Quantum Blind Signatures with LaBRADOR Proofs*                 **02/2023 − 10/2023**
**Nijithaan Selvaratnam**: MSc at AU CS
Topic: *Security Analysis of Privacy Sensitive IoT Devices*                 **02/2023 − 07/2023**
**Malthe Glent-Madsen, Thomas Normann Luxhøj**: MSc at AU CS
Topic: *Towards Masking the Falcon Signature Scheme*                 **02/2023 − 07/2023**
**Anders Skov, Oliver Hansen, Victor Kjelde**: MSc at AU CS
Topic: *Lightweight Cryptography – implementing ASCON and ISAP*                 **02/2023 − 07/2023**
**Nicklas Vested**: MSc at AU CS
Topic: *Masked GIFT implementation*                 **02/2022 − 10/2022**
**Benjamin B. Hansen, Viktor H. Miltersen, Jonas H. Salomonsson**: MSc at AU CS
Topic: *Optimising Key-Policy Attribute-Based Encryption Schemes*                 **02/2022 − 07/2022**
**Rasmus Christensen, Søren A. Sørensen, Jesper Jon Jensen**: MSc at AU CS
Topic: *Efficient accumulators and authenticated dictonaries*                 **02/2022 − 07/2022**
**Jiakai Cai, Joachim B. Strudsholm, Mathias M. Kjeldbjerg**: MSc at AU CS (co-supervision)
Topic: *Security of the Swiss e-Voting System*                 **02/2022 − 07/2022**
**Jesper V. Skipper, Anders Stormer, Mark N. Jensen**: MSc at AU CS
Topic: *Implementation of a coercion-resistant voting system*                 **02/2021 − 07/2021**
**Morten Erfurt Hansen, Johannes Ernstsen, Mathias Søby Jensen**: MSc at AU CS
Topic: *Extended Electronic Voting using Homomorphic Encryption*                 **02/2021 − 07/2021**
**Lucija Kovač**, MSc at AU MATH
Topic: *Isogeny-Based Delay Cryptography*                 **02/2021 − 07/2021**
**Casper Pages:**, MSc at AU MATH (co-supervision)
Topic: *Isogeny-Based Cryptography: CSIDH and SeaSign*                 **02/2020 − 07/2020**
**Joseph Alnajjar**, MSc at AU MATH (co-supervision)
Topic: *Efficient implementation of new families of pairing-friendly curves*                 **02/2019 − 07/2019**
**Rafael Junio da Cruz**, MSc student at University of Campinas
Topic: *RowHammer attacks against ECC signatures*                 **07/2016 − 10/2023**
**Antônio Carlos Guimarães Junior**, MSc at University of Campinas
Topic: *Secure and efficient implementation of code-based cryptography*                 **03/2017 − 01/2019**
**Otávio Oliveira Napoli**, MSc at University of Campinas (co-supervision)
Topic: *Timing Side-Channel Analysis of Dynamic Binary Translators*                 **03/2017 − 04/2019**
**Hayato Fujii**, MSc at University of Campinas
Topic: *Efficient Curve25519 Implementation for ARM Microcontrollers*                 **03/2016 − 05/2018**
**Edson Floriano de Sousa Junior**, MSc at University of Brasília (co-supervision)
Topic: *Privacy in Shared-memory Tuple Spaces*                 **03/2015 − 12/2017**
**Jheyne Nayara Ortiz**, MSc at University of Campinas (co-supervision)
Topic: *Efficient secure Gaussian sampling for lattice-based cryptography*                 **03/2014 − 03/2016**
**Hilder Vitor Lima Pereira**, MSc at University of Campinas
Topic: *Machine learning over encrypted data*                 **07/2014 − 09/2016**
**Pedro Geraldo Morelli Rodrigues Alves**, MSc at University of Campinas
Topic: *Computing over encrypted data using GPGPUs*                 **07/2014 − 07/2016**
**Amanda Cristina Davi Resende**, MSc at University of Brasília
Topic: *PUF-based cryptographic protocols*                 **02/2013 − 02/2015**

PROFESSIONAL
SERVICE

**Co-Editor in Chief** of IACR Transactions on Cryptographic Hardware and Embedded Systems (TCHES) and **Program co-Chair** of CHES 2023.

**Program co-Chair** of LATINCRYPT 2014 and SBSEG 2014 (Brazilian Symposium on Information and Computational Systems Security).

**Co-founder and Program Co-Chair** for two editions of the Workshop on Election Technology (WTE), the first academic workshop in Brazil for research on this topic.

**Steering Committee** member of the LATINCRYPT conference. **Editoral Board** member of Journal of Universal Computer Science (JUCS) and Cambridge Experimental Results (ER).

**Program Committee** member of top conferences in Computer Security and Cryptography, including EUROCRYPT 2024/2025, USENIX Security 2024, LATINCRYPT 2015/2017/2019/2023, PKC 2018-2019, INDOCRYPT 2016/2018/2019, SAC 2018-2021, FC 2017-2021, CHES 2017-2019/2021-2022/2025.

**Reviewer** for over 40 academic journals, including Journal of Cryptographic Engineering, IEEE Transactions on Computers, IEEE Security and Privacy, IEEE Transactions on Circuits and Systems, IEEE Transactions on Dependable and Secure Computing, IEEE Transactions on Information Forensics and Security, IEEE Transactions on VLSI, IEEE Transactions on Information Theory, ACM Transactions on Embedded Computing Systems, The Computer Journal, Designs, Codes and Cryptography, Journal of Cryptology.

**Reviewer** for grant proposals submitted to the Israeli Ministry of Science, Technology and Space in Israel; the São Paulo Research Support Foundation (FAPESP) in Brazil; and Comisión Nacional de Investigación Científica y Tecnológica (CONACYCT) in Chile, European Research Council (ERC).

MEMBERSHIP      Principal Investigator at the Concordium Blockchain Research Center. Work Package Leader in Cybersecurity at the DIGIT Centre for Digitalisation, Big Data and Data Analytics.

Member of the International Association for Cryptologic Research (IACR).

COMMUNITY OUTREACH      Co-founder and leader of YouInspect project (*Projeto Você Fiscal*) for voting machine (in)security awareness, election observation and crowdsourced verification of election results.

INTERNATIONAL RELATIONS      Long-term collaborations with groups at University of Campinas (Brazil), Radboud University Neijmegen (Netherlands), NTT Secure Platform Laboratories (Japan), NTNU (Norway). My research has been featured in more than 150 news pieces in Brazil and international press, including La Nación, Ars Technica, Spiegel Online, The Economist, ZDNet, New York Times.

SOFTWARE      Lead developer and founder of the RELIC cryptographic toolkit: `http://github.com/relic-toolkit`