Gabriel Nunes

nunesgh.com nunesgh.com/orcid nunesgh.com/scholar

PhD Candidate in Computer Science | MSc in Computer Science, BSc in Physics — Sydney, NSW, Australia

Cotutelle Doctoral candidate in Computer Science at the Federal University of Minas Gerais (UFMG), Brazil, and at Macquarie University, Australia. Master in Computer Science and Bachelor in Physics from UFMG. Recipient of the Google LARA Research Scholarship and the Excellence in Higher Degree Research (Student Award) from the Faculty of Science and Engineering, Macquarie University. Interested in Formal Methods, Quantitative Information Flow, Responsible Computing (e.g. Privacy, Utility, Fairness), Artificial Intelligence, and Neuroscience.
Member of Topete Research Group and INSCRYPT | T-Rex Laboratory.

Education

- **Doctoral Degree in Computer Science** (Researcher Profile) 2023-02 – 2025-12
  School of Computing, Macquarie University — Sydney, New South Wales, Australia
  Recipient of an International Macquarie University Research Excellence (iMQRES) Scholarship.
  Supervised under Cotutelle by Annabelle McIver. (Thesis submitted for evaluation.)
- **Doctoral Degree in Computer Science** 2021-07 – 2025-12
  Graduate Program in Computer Science, UFMG — Belo Horizonte, Minas Gerais, Brazil
  Recipient of a CAPES Scholarship. Supervised under Cotutelle by Mário Alvim.
  - Cotutelle research area: Quantitative Information Flow theory and its application to precisely characterise how different methods of noise introduction affect the trade-off between privacy and utility in microdata and statistical data publications.
- **Master Degree in Computer Science** 2019-03 – 2021-04
  Graduate Program in Computer Science, UFMG — Belo Horizonte, Minas Gerais, Brazil
  Recipient of a CNPq Scholarship. Supervised by Mário Alvim and by Annabelle McIver.
  - Dissertation defended and approved on April 28, 2021: A formal quantitative study of privacy in the publication of official educational censuses in Brazil (**HDL**: 1843/38085).
  - Dissertation selected for the 35th Thesis and Dissertation Contest (CTD 2022), as part of the 42nd Congress of the Brazilian Computing Society (CSBC 2022) (**DOI**: 10.5753/ctd.2022.223158).
- **Bachelor Degree in Physics** 2014-03 – 2018-07
  Federal University of Minas Gerais (UFMG) — Belo Horizonte, Minas Gerais, Brazil

Experience

- Sessional Teaching Academic 2023-07 – **Present**
  School of Computing, Macquarie University — Sydney, New South Wales, Australia
  - Taught small groups of undergraduate students (20 to 30 students) in laboratories.
  - Assisted with advanced technical concepts, programming, and troubleshooting.
  - Facilitated learning and group discussions.

  Units: Offensive Security (COMP2320/COMP6320), Data Privacy and Information Security (COMP3300), Secure Applications Development (COMP3310), Formal Methods (COMP4000).
  Skills: Bash, Burp Suite, Dafny, Differential Privacy, Django, Flask, Git, GitHub, Java, Jupyter, Kali Linux, Linux, Python, Shell.
- Intern (Student Researcher) 2022-07 – 2022-11
  Google LLC — New York, New York, United States of America
  - Developed and delivered formal analyses of complex privacy software algorithms (Google Topics API).
  - Delivered technical presentations to Google colleagues.
  - Published findings in a scientific paper.

  Internship supervised by Andrés Muñoz Medina.
  Skills: Algorithms, Apache Beam, Differential Privacy, Git, LaTeX, Machine Learning, Python, Web Technologies.
- Information Security Analyst 2020-12 – 2021-03
  FUNDEP, UFMG — Belo Horizonte, Minas Gerais, Brazil
  - Developed and delivered formal analyses of the privacy properties of big datasets.
  - Developed and delivered high performance software for experimentation.

  Project: PRICE - Privacy in Educational Censuses. Directed by Mário Alvim.
  Skills: Git, GitLab, Java, Jupyter, LaTeX, Pandas, Python.
- Visiting Scholar 2019-09 – 2019-11
  School of Computing, Macquarie University — Sydney, New South Wales, Australia
  Internship supervised by Annabelle McIver.
- PhD & MSc Researcher 2019-03 – **Present**
  INSCRYPT | T-Rex Laboratory, UFMG — Remote & Belo Horizonte, Minas Gerais, Brazil
- Scientific Initiation 2016-03 – 2016-06
  Federal University of Minas Gerais (UFMG) — Belo Horizonte, Minas Gerais, Brazil
  Research on electronic structures and electrical properties of surfaces using scanning tunnelling microscopy (STM) and photoluminescence spectroscopy. Recipient of a FAPEMIG Scholarship. Supervised by Gustavo Sáfar.
- Undergraduate Tutoring & Technological and Industrial Initiation 2014-10 – 2016-01
  Room of Physics Demonstrations, UFMG — Belo Horizonte, Minas Gerais, Brazil
  - Developed and delivered a high-resolution and low-cost Optical Spectrometer and its software.

  Recipient of a PROGRAD/UFMG & a CNPq Scholarships. Supervised by Elmo Salomão.
  Skills: LabVIEW, SolidWorks.

Volunteering

- Volunteer IT System Administrator 2019-03 – **Present**
  INSCRYPT | T-Rex Laboratory, UFMG Remote & Belo Horizonte, Minas Gerais, Brazil
  - Deployed and maintained the Linux servers for high performance computing of research software.
  - Deployed and maintained the Linux virtual machines for infrastructure services, including websites and Continuous Integration and Continuous Delivery (CI/CD) pipelines and runners.

  Skills: Apache, Bash, CI/CD Pipelines and Runners, Debian, Docker Products, Git, GitLab, Linux, Shell.

Skills

- Programming Languages: C++ (1 year), Java (1 year), LabVIEW (2 years), MATLAB (1 year), **Python (6 years)**.
- Technologies: Alloy, Apache, Apache Beam, Bash, Burp Suite, Caesar, Continuous Integration and Continuous Delivery (CI/CD), Dafny, Debian, Differential Privacy, Django, Docker Products, Flask, Git, GitHub, GitLab, Jupyter, Kali Linux, LaTeX, Linux, Pandas, Shell, SolidWorks, Web Technologies.
- Skills: Abstract Thinking, Algorithms, Collaboration, Communication, Cybersecurity, Data Privacy, Data Structures, Differential Privacy, Ethical Hacking, Formal Methods, Information Security, Information Theory, IT System Administration, Machine Learning, Privacy Compliance, Problem Solving, Quantitative Information Flow, Scientific Research, Scientific Writing, Teaching, University Teaching, Volunteering.

Awards

- **Excellence in Higher Degree Research (Student Award)** 2024-12
  Faculty of Science and Engineering, Macquarie University.
- Outstanding Poster 2024-06
  Future Communications Research Centre, Macquarie University.
  Poster: Quantitative Information Flow for Privacy Analysis (Future Communications Research Centre Workshop).
- Research Rising Star 2023-10
  School of Computing, Faculty of Science and Engineering, Macquarie University.
  Paper: A Novel Analysis of Utility in Privacy Pipelines, Using Kronecker Products and Quantitative Information Flow.
- **Google LARA Research Scholarship** 2022-02
  9^{th} Google Latin America Research Awards (LARA).
  A robust and explainable QIF-based framework for assessing big data privacy risks.

Conference Papers

- The Privacy-Utility Trade-off in the Topics API 2024-10
  2024 ACM SIGSAC Conference on Computer and Communications Security.
  DOI: 10.1145/3658644.3670368. **arXiv**: 2406.15309.
- A Novel Analysis of Utility in Privacy Pipelines, 2023-11
  Using Kronecker Products and Quantitative Information Flow
  2023 ACM SIGSAC Conference on Computer and Communications Security.
  DOI: 10.1145/3576915.3623081. **arXiv**: 2308.11110.
- Measuring Re-identification Risk 2023-06
  2023 ACM SIGMOD/PODS Conference.
  DOI: 10.1145/3589294. **arXiv**: 2304.07210.
- Flexible and scalable privacy assessment for very large datasets, 2022-07
  with an application to official governmental microdata
  22nd Privacy Enhancing Technologies Symposium (PETS 2022).
  DOI: 10.56553/popets-2022-0114. **arXiv**: 2204.13734.
- A formal quantitative study of privacy in the publication of official educational censuses in Brazil 2022-07
  Proceedings of the XXXV Thesis and Dissertation Contest (CTD 2022).
  DOI: 10.5753/ctd.2022.223158.
- On Privacy and Accuracy in Data Releases 2020-08
  31^{st} International Conference on Concurrency Theory (CONCUR 2020).
  DOI: 10.4230/LIPIcs.CONCUR.2020.1.

Software

- Topics API Analysis 2024-06
  Zenodo. **DOI**: 10.5281/zenodo.11032230.
- Bayes Vulnerability for Microdata (BVM) library 2021-04
  Zenodo. **DOI**: 10.5281/zenodo.6533703.

Datasets

- AOL Dataset for Browsing History and Topics of Interest 2024-06
  Zenodo. **DOI**: 10.5281/zenodo.11029571.

Workshop Papers

- A new Framework for Measuring Re-Identification Risk 2023-12
  Workshop on Regulatable Machine Learning at the 37th Conference on Neural Information Processing Systems (RegML @ NeurIPS 2023).
- A Quantitative Information Flow Analysis of the Topics API 2023-11
  Proceedings of the 22nd Workshop on Privacy in the Electronic Society (WPES 2023).
  DOI: 10.1145/3603216.3624959.
- A novel analysis of utility in privacy pipelines, 2023-09
  using Kronecker products and quantitative information flow
  Theory and Practice of Differential Privacy (TPDP) 2023.
- Measuring Re-identification Risk 2023-05
  2023 Security for the Web Workshop.

Academic Publications

- A formal quantitative study of privacy in the publication of official educational censuses in Brazil 2021-04
  Universidade Federal de Minas Gerais.
  HDL: 1843/38085.
- An Introduction to Raman Spectroscopy 2017-11
  Didactic or instructional material. Supervised by Leandro Malard.
- A Geometric Introduction to Lie Groups 2016-11
  III National Scientific Initiation and Master Program (PICME) Symposium.
- Coupling optical techniques with scanning tunneling microscopy to investigate organic films 2016-09
  XV Brazilian Materials Research Society (SBPMat) Meeting.

Projects

- PRICE – Privacy in Educational Censuses 2020 – 2021
  INSCRYPT | T-Rex Laboratory, UFMG Information Security Analyst
  The new Brazilian privacy legislation legally holds entities as responsible for the quality, confidentiality, and privacy of data they keep about individuals. INEP, the National Institute of Educational Studies and Research of the Ministry of Education, publishes very detailed educational data annually. The PRICE project was a study commissioned by INEP on how to transform the data to be published in a way that the privacy of students is not violated, while maintaining its utility for statistical research.
  Technical Work:
  - Report 01: Report on the international panorama and the INEP context regarding methods of handling privacy control in statistical disclosure.
  - Report 02: Report on the risks to privacy arising from the current form of disclosure of microdata from INEP Educational Censuses.
  - Report 03: Technical report on treatment methods applicable to the dissemination microdata of INEP's Educational Censuses.
  - Report 04: Technological solution and its documentation.
  - Report 05: Final technical report of the pilot project.
  - Report 06: Technical Implementation Report.
  - Report 07: Assisted Operation Report.
  - Report 08: Project closure report.

  Decentralized Execution Term (TED) INEP-UFMG 8750. Coordinator: Mário Alvim.
- Workshop on database anonymization techniques 2018-11-30
  Educational Statistics Directorate (DEED/INEP)
  Regional Planning and Development Center (CEDEPLAR/UFMG)
  The workshop aims to present INEP professionals with the state of the art of data anonymization techniques with the most recurrent use, their advantages and disadvantages, in order to support organizational decisions regarding the adoption of one or more techniques, considering the technical capacity of the teams , infrastructure, operation and any existing legal limitations.
  Coordinator: Mário Alvim.
- Lumus Max Optical Spectrometer 2014 – 2015
  Lumus Max (in Portuguese) | Room of Physics Demonstrations (in Portuguese)
  Development of a high-resolution and low-cost optical spectrometer. Some parts of the hardware were designed using Dassault Systèmes' SolidWorks and the software was implemented using National Instruments' LabVIEW visual programming language.
  Coordinator: Elmo Salomão.
  Skills: LabVIEW, SolidWorks.
- Electrical Paul's Trap 2014
  Electrical Paul's Trap (in Portuguese) | Room of Physics Demonstrations (in Portuguese)
  Development of an electrical Paul's Trap (quadrupole ion trap).
  Coordinator: Elmo Salomão.

Languages

	Understanding		Speaking		Writing
	Listening	Reading	Spoken Interaction	Spoken Production	
Portuguese	C2	C2	C2	C2	C2
English	C2	C2	C1	C1	C2
Spanish	B1	B1	B1	B1	B1

Common European Framework of Reference for Languages

Exam	Listening	Reading	Writing	Speaking	Overall	Level	Date
TOEFL iBT	30	28	26	24	108	-	2020-07
IELTS Academic	8.0	8.0	6.5	6.5	7.5	C1	2015-11

Personal Interests

- Passionate about Animal Welfare, Education, Environment, and Human Rights.
- Passionate about Data Privacy, Formal Methods for Algorithm Verification, and Information Security.
- Staying fit by hiking, running, and weightlifting.
- Staying informed on historical and current events on Economics, Politics, Science, and Technology.

Referees

Available upon request.