

Gabriel Henrique LOPES GOMES ALVES NUNES

PhD candidate in Computer Science | MSc in Computer Science, BSc in Physics

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Belo Horizonte, Minas Gerais, Brazil | Born September 22, 1990 (31 years old) in Brazil



Doctoral candidate in Computer Science at the Federal University of Minas Gerais (UFMG), Brazil. Master in Computer Science and Bachelor in Physics from UFMG. Interested in Formal Methods, Quantitative Information Flow, Privacy, Justice, Artificial Intelligence, and Neuroscience.

EDUCATION

- 07/2021 – current | Doctoral Degree in Computer Science with a [CAPES](#) Scholarship at the [Graduate Program in Computer Science](#) of [UFMG](#). Supervised by [Prof. Mário Alvim](#), from [INSCRYPT](#) Laboratory at [UFMG](#).
 - > Research area: Quantitative Information Flow theory and its application to precisely characterize how different methods of noise introduction affect the trade-off between privacy and utility in microdata and statistical data publications.
- 03/2019 – 04/2021 | Master Degree in Computer Science with a [CNPq](#) Scholarship at the [Graduate Program in Computer Science](#) of [UFMG](#). Supervised by [Prof. Mário Alvim](#), from [INSCRYPT](#) Laboratory at [UFMG](#), and by [Prof. Annabelle Mclver](#), from [Macquarie University](#).
 - > Dissertation defended and approved in April 28, 2021, titled [A formal quantitative study of privacy in the publication of official educational censuses in Brazil](#).
- 03/2014 – 07/2018 | Bachelor Degree in Physics at [UFMG](#).
- 03/2012 – 12/2013 | Bachelor Degree in Nanotechnology at [Federal University of Rio de Janeiro](#). Unfinished.
- 02/2011 – 06/2011 | Bachelor Degree in Medicine at [Medical Sciences of Minas Gerais](#). Unfinished.

EXPERIENCE

- 12/2020 | Information Security Analyst, [Research Development Foundation, UFMG](#), Belo Horizonte, Minas Gerais, Brazil
 - 03/2021 > Information Security Analyst in the project PRICE - Privacy in Educational Censuses.
[Computer Science](#) [Privacy](#) [Transparency](#) [Quantitative Information Flow](#)
 - 09/2019 | Visiting Scholar, [MACQUARIE UNIVERSITY](#), Sydney, New South Wales, Australia
 - 11/2019 > Internship at the [Department of Computing](#). Supervised by [Prof. Annabelle Mclver](#).
[Computer Science](#) [Privacy](#) [Transparency](#) [Quantitative Information Flow](#)
 - 06/2018 | Reporter, [NEOWIN LLC](#), Remote
 - 01/2017 > Coverage of the latest science and technology news. Portfolio: [published articles](#).
[News](#)
 - 06/2016 | Scientific Initiation, [UFMG](#), Belo Horizonte, Minas Gerais, Brazil
 - 03/2016 > Research on electronic structures and electrical properties of surfaces using scanning tunneling microscopy (STM) and photoluminescence spectroscopy.
 - > [FAPEMIG](#) Scholarship. Supervised by [Prof. Gustavo Sáfar](#).[Physics](#) [Scanning Tunneling Microscopy](#) [Photoluminescence Spectroscopy](#)
- 01/2016 | Undergraduate Tutoring & Technological and Industrial Initiation, [Room of Physics Demonstrations, UFMG](#), Belo Horizonte, Minas Gerais, Brazil
 - 10/2014 > Development of a high-resolution and low-cost optical spectrometer and of an electrical Paul's Trap.
 - > [PROGRAD/UFMG](#) & [CNPq](#) Scholarships. Supervised by [Prof. Elmo Salomão](#).[Physics](#) [Spectrometer](#) [LabVIEW](#) [SolidWorks](#)
- 01/2014 | Scientific Initiation, [FEDERAL UNIVERSITY OF RIO DE JANEIRO](#), Rio de Janeiro, Rio de Janeiro, Brazil
 - 08/2013 > Application of vibrational spectroscopy and theoretical calculations to bioinorganic metal-amino acid complexes.
 - > [CNPq](#) Scholarship. Supervised by [Prof. Joanna Ramos](#).[Chemistry](#) [Spectroscopy](#)

A FORMAL QUANTITATIVE STUDY OF PRIVACY IN THE PUBLICATION OF OFFICIAL EDUCATIONAL CENSUSES IN BRAZIL APRIL 2021

Universidade Federal de Minas Gerais. DOI: [hdl:1843/38085](https://doi.org/10.18433/38085).

In this thesis, we provide a thorough quantitative study of privacy risks in the release of the official Brazilian Educational Censuses provided annually by INEP, which is Brazil's governmental agency responsible for the development and maintenance of educational statistics systems. More precisely, we formally analyze privacy risks in databases released as microdata, i.e. data at each individual's record level, and protected by the technique of de-identification, i.e. the removal of direct identifying information such as the individuals' names or personal identification numbers.

Computer Science Quantitative Information Flow Disclosure Control Microdata Differential Privacy Privacy Utility

ON PRIVACY AND ACCURACY IN DATA RELEASES AUGUST 2020

31st International Conference on Concurrency Theory (CONCUR 2020). DOI: [10.4230/LIPIcs.CONCUR.2020.1](https://doi.org/10.4230/LIPIcs.CONCUR.2020.1).

In this paper we study the relationship between privacy and accuracy in the context of correlated datasets. We use a model of quantitative information flow to describe the trade-off between privacy of individuals' data and the utility of queries to that data by modelling the effectiveness of adversaries attempting to make inferences after a data release. We show that, where correlations exist in datasets, it is not possible to implement optimal noise-adding mechanisms that give the best possible accuracy or the best possible privacy in all situations. Finally we illustrate the trade-off between accuracy and privacy for local and oblivious differentially private mechanisms in terms of inference attacks on medium-scale datasets.

Co-authors: Prof. [Mário Alvim](#), Natasha Fernandes, Prof. [Annabelle McIver](#).

Computer Science Privacy and Utility Trade-off Quantitative Information Flow Inference Attacks

CASE STUDY ON PRIVACY AND TRANSPARENCY IN DATA PUBLISHING FEBRUARY 2020

9th Summer School in Computer Science, UFMG. (YouTube)

In this lecture, we addressed some anonymization techniques that have been proposed and applied in an attempt to balance the right to privacy while maintaining the usefulness of databases, their advantages and disadvantages, and presented real cases of individuals who have been reidentified, both in Brazil and worldwide.

Computer Science Privacy Transparency

AN INTRODUCTION TO RAMAN SPECTROSCOPY NOVEMBER 2017

Didactic or instructional material.

Raman Spectroscopy applications are vast in Physics, Chemistry, Geology and in other areas, because it is possible to characterize different materials through their vibrational spectra. It is an efficient and non-destructive method, hence not only useful inside a laboratory, but also for some real-world problems. In this study, some of the classical Raman Spectroscopy theory shall be developed so it can be applied to a specific case on an experimental example. By the end of this study, one will have covered all the basic ideas behind the Raman Spectroscopy technique.

Supervised by Prof. [Leandro Malard](#).

Physics Raman Spectroscopy

A GEOMETRIC INTRODUCTION TO LIE GROUPS NOVEMBER 2016

III National Scientific Initiation and Master Program (PICME) Symposium.

Co-authors: André Nascimento, Cássio Feitosa, Cleber Barreto, Diego Carriel. Supervised by Romero Solha.

Mathematics Lie Groups

COUPLING OPTICAL TECHNIQUES WITH SCANNING TUNNELING MICROSCOPY TO INVESTIGATE ORGANIC FILMS SEPTEMBER 2016

XV Brazilian Materials Research Society (SBPMat) Meeting.

Co-authors: Otávio Alonso, Prof. Rogerio Magalhães-Paniago, Prof. Angelo Malachias, Prof. [Gustavo Sáfar](#).

Physics Scanning Tunneling Microscopy Photoluminescence Spectroscopy

 SKILLS

Programming Languages C, C++, Dafny, LabVIEW, MATLAB, Python.
Tools Alloy, Git, Jupyter, LaTeX, Linux, SolidWorks, Vim.

 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	-	07/2020
IELTS Academic	8.0	8.0	6.5	6.5	7.5	C1	11/2015

PRICE - PRIVACY IN EDUCATIONAL CENSUSES

2020 - 2021

 [PRICE](#)  [INSCRIPT](#)  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. (2020)
- > Report 02: Report on the risks to privacy arising from the current form of disclosure of microdata from INEP Educational Censuses. (2020)
- > Report 04: Technological solution and its documentation. (2021)
- > Report 05: Final technical report of the pilot project. (2021)
- > Report 06: Technical Implementation Report. (2021)
- > Report 07: Assisted Operation Report. (2021)
- > Report 08: Project closure report. (2021)

Decentralized Execution Term (TED) INEP-UFMG 8750.


Coordinator: [Prof. Mário Alvim](#).

[Computer Science](#) [Privacy](#) [Transparency](#) [Python](#)

WORKSHOP ON DATABASE ANONYMIZATION TECHNIQUES

NOVEMBER 30, 2018

 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: [Prof. Mário Alvim](#).

[Computer Science](#) [Privacy](#) [Transparency](#)

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: [Prof. Elmo Salomão](#).

[Physics](#) [Spectrometer](#) [LabVIEW](#) [SolidWorks](#)

ELECTRICAL PAUL'S TRAP

2014 - 2015

 [Electrical Paul's Trap \(in Portuguese\)](#)  [Room of Physics Demonstrations \(in Portuguese\)](#)

Development of an electrical Paul's Trap (quadrupole ion trap).

Coordinator: [Prof. Elmo Salomão](#).

[Physics](#)

 EVENTS

- > 9th Summer School in Computer Science, at the Department of Computer Science ([PDF](#)) ([YouTube](#)) 2020
Universidade Federal de Minas Gerais *Seminary. Belo Horizonte, MG, Brazil.*
- > 8th Summer School in Computer Science, at the Department of Computer Science 2019
Universidade Federal de Minas Gerais *Seminary. Belo Horizonte, MG, Brazil.*
- > VII Summer School in Computer Science, at the Department of Computer Science 2018
Universidade Federal de Minas Gerais *Seminary. Belo Horizonte, MG, Brazil.*
- > III National Scientific Initiation and Master Program (PICME) Symposium ([PDF](#)) 2016
Universidade Federal de Minas Gerais *Symposium. Belo Horizonte, MG, Brazil.*
- > X CBPF'S School, at the Brazilian Center for Physics Research 2015
Centro Brasileiro de Pesquisas Físicas *Seminary. Rio de Janeiro, RJ, Brazil.*
- > XXV School of Physics, at the Department of Physics 2014
Universidade Federal de Minas Gerais *Seminary. Belo Horizonte, MG, Brazil.*
- > 6th School of Nanoscience and Nanotechnology 2012
Universidade Federal do Rio de Janeiro *Seminary. Rio de Janeiro, RJ, Brazil.*