Antonio L. R. Manesco

Curriculum Vitae

Currently

Employing computational methods to study electronic properties of quantum materials and devices.

Expertise

Computational condensed matter physics, topological materials, mesoscopic physics, two-dimensional materials, research code development.

Education

2016–2021 **Honors Doctorate (without master title)**, *Universidade de São Paulo*, Lorena.
Thesis title: "Correlations and topology in hybrid graphene-based devices"

2012–2016 **Bachelor in Engineering Physics**, *Universidade de São Paulo*, Lorena, *First Class Honours*.

Experience

Research

2021–ongoing **Postdoctoral researcher**, *Delft University of Technology*, Delft, The Netherlands.
I am conducting independent research on realistic simulations of quantum materials and devices. My work also include the supervision of bachelor, master, and doctorate students. I am also the curator of website and outreach issues of the Quantum Tinkerer group.

2022–2022 **Visiting researcher**, *Cornell University*, Ithaca - NY, USA.
I developed simulations to guide the design of ongoing experiments in the Fatemi lab.

2016–2021 **Doctoral researcher**, *Universidade de São Paulo*, Lorena-SP, Brazil.
I developed research on graphene-based devices. My research provided theoretical explanation to Andreev phenomena in quantum Hall graphene. Also, I predicted the existence of correlated topological phenomena in strained graphene devices, which was already partially confirmed experimentally. I also supervised bachelor and master students, and worked as a teaching assistant.

2019–2020 **Visiting researcher**, *Delft University of Technology*, Delft, The Netherlands.
I developed theoretical research on nonlocal transport in proximitized quantum Hall graphene. I also supervised bachelor and master students in the Quantum Tinkerer group.

2013–2016 **Undergraduate researcher**, *Universidade de São Paulo*, Lorena-SP, Brazil.
I developed three different projects as an undergraduate researcher:
- preparation and characterization of superconducting samples;
- electronic structure (tight-binding and DFT) calculations of graphene;
- DFT calculations of electron and phonon spectrum of superconducting materials.

Teaching

2018–2018 **Teaching assistant on *Linear Algebra***, *Universidade de São Paulo*, Lorena-SP, Brazil.

2018–2018 **Teaching assistant on *Statistical Physics***, *Universidade de São Paulo*, Lorena-SP, Brazil.

2015–2015 **Teaching assistant on *Quantum Mechanics***, *Universidade de São Paulo*, Lorena-SP, Brazil.

Supervisions

2020–2021 **Katya Fouka**, *Leiden University*, Leiden, Netherlands.
Master thesis: Can we employ disorder to filter topological Quantum Spin Hall Effect edge states?

✉ *am@antoniomanesco.org* • *antoniomanesco.org*
antonio-manesco-689751131 • *antoniolrm*

2019–2020 **Gilliard Franken**, *Delft University of Technology*, Delft, Netherlands.
Bachelor thesis: Tunneling barrier strength dependency of zero bias conductance in a multi-subband Majorana quantum wire with and without inter-band communication

2019–2020 **Eduardo Ribeiro**, *University of São Paulo*, Lorena-SP, Brazil.
Research internship: Generation of valley currents in strained quantum Hall graphene

2016–2017 **Murilo Bigoto**, *University of São Paulo*, Lorena-SP, Brazil.
Undergrad research project: Simulations of a Kitaev chain and Majorana zero modes

Extracurricular

2018–2019 **Organizer of the Journal Club in Condensed Matter Theory**, *Universidade de São Paulo*, Lorena-SP, Brazil.

2013–2015 **Representative student in the Comission for the Organization of the Engineering Physics bachelor program**, *Universidade de São Paulo*, Lorena-SP, Brazil.

2014–2015 **Director of academic issues of the Engineering Physics Student Academic Center**, *Universidade de São Paulo*, Lorena-SP, Brazil.

Awards and grants

2016–2021 **Doctorate fellowship**.
São Paulo Research Foundation (FAPESP)

2019–2020 **Research Internship Abroad**.
São Paulo Research Foundation (FAPESP)

2018–2018 **Teaching assistant**.
Universidade de São Paulo Educational Support Program

2016 **Quantum Design International Award for first class student**.

2014–2016 **Undergraduate reasearch fellowship**.
São Paulo Research Foundation (FAPESP)

2005 **Municipal Mathematics Olympiad**, *Gold award*, Jacareí - SP, Brazil.

Science outreach and event organization

2021–ongoing **Quantum Tinkerer website and outreach curator**.
Activities: update and mantain the group's website and Twitter page; handle other outreach activities.

2021 **Mini-workshop: Introduction to computational quantum transport with Kwant**, *Virtual Science Forum*.
Instructor (`https://virtualscienceforum.org/quantum-transport-workshop`).

2015–2019 **Personal blog**, (`https://antoniomanesco.org/pt/post/`).
Blog about Physics (in Portuguese).

2015–2019 **umengenheirofisico**, (`https://umengenheirofisico.wordpress.com/`).
Blog about Engineering Physics and Physics (in Portuguese).

2016 **Brazilian Symposium in Engineering Physics**.
Member of the organization committee.

2014–2016 **Engineering Physics Week**, *Universidade de São Paulo*, Lorena-SP, Brazil.
Member of the organization committee.

2014–2016 γ **na Engenharia Física**, *Universidade de São Paulo*, Lorena-SP, Brazil.
Organization of seminars from students to students on the Engineering Physics bachelor program.

2013–2014 **Física WTF**.
Blog about Physics (now offline).

Skills

✉ *am@antoniomanesco.org* • *antoniomanesco.org*
antonio-manesco-689751131 • *antoniolrm*

- **Theory**: tight-binding, density functional theory (DFT), quantum transport, superconductivity.
- **Coding:** Python (numpy, scipy, kwant, sympy, xarray, matplotlib, dask), bash, Quantum ESPRESSO.
- **Soft**: project supervision, communication (presentating, writing, dissemination of scientific results).

External links

Scholar	`https://scholar.google.com.br/citations?user=NnwQ6j0AAAAJ&hl`.
ORCID	`https://orcid.org/0000-0001-7667-6283`.
arXiv	`https://arxiv.org/a/manesco_a_1.html`.
Personal page	`https://antoniomanesco.org`.

Languages

Portuguese	Native proficiency
English	Full professional proficiency
Dutch	Introductory level

Coding projects

pyDACP `https://gitlab.kwant-project.org/qt/pyDACP`.
A python package to compute eigenvalues using the dual applications of Chebyshev polynomials algorithm. The algorithm is described in SciPost Phys. 11, 103 (2021).

✉ *am@antoniomanesco.org* • *antoniomanesco.org*
antonio-manesco-689751131 • *antoniolrm*

Publications

[1] D. Rodrigues, L. H. M. Antunes, **Antonio L. R. Manesco**, E. M. Moraes, and L. B. S. da Silva. Development and characterization of Cu–Nb–MgB_2 and CuNi–Nb–MgB_2 wires with VB_2 and carbon nanotube additions. *IEEE Transactions on Applied Superconductivity*, 25(3):1–5, June 2015.

[2] L. B. S. Da Silva, A. A. Vianna, **Antonio L. R. Manesco**, E. E. Hellstrom, and D. Rodrigues. The influence of stearic acid addition on the superconducting properties of MgB_2. *IEEE Transactions on Applied Superconductivity*, 26(3):1–4, April 2016.

[3] B.S. de Lima, R.R. de Cassia, F.B. Santos, L.E. Correa, T.W. Grant, **Antonio L. R. Manesco**, G.W. Martins, L.T.F. Eleno, M.S. Torikachvili, and A.J.S. Machado. Properties and superconductivity in Ti-doped $NiTe_2$ single crystals. *Solid State Communications*, 283:27 – 31, 2018.

[4] **Antonio L. R. Manesco**, G. Weber, and D. Rodrigues. One-dimensional p-wave superconductor toy-model for Majorana fermions in multiband semiconductor nanowires. *IEEE Transactions on Applied Superconductivity*, 28(4):1–5, June 2018.

[5] **Antonio L R Manesco**, Gabriel Weber, and Durval Rodrigues Jr. Hidden chiral symmetries in bdi multichannel kitaev chains. *Journal of Physics: Condensed Matter*, 30(17):175401, 2018.

[6] **Antonio L. R. Manesco**, G. Weber, and D. Rodrigues. Effective model for majorana modes in graphene. *Phys. Rev. B*, 100:125411, Sep 2019.

[7] A. Bhattacharyya, P. P. Ferreira, F. B. Santos, D. T. Adroja, J. S. Lord, L. E. Correa, A. J. S. Machado, **Antonio L. R. Manesco**, and L T. F. Eleno. Two-band superconductivity with unconventional pairing symmetry in HfV_2Ga_4. *Phys. Rev. Research*, 2:022001, Apr 2020.

[8] **Antonio L. R. Manesco**, J L Lado, E V S Ribeiro, G Weber, and D Rodrigues Jr. Correlations in the elastic Landau level of spontaneously buckled graphene. *2D Materials*, 8(1):015011, oct 2020.

[9] P. P. Ferreira, **Antonio L. R. Manesco**, T. T. Dorini, L. E. Correa, G. Weber, A. J. S. Machado, and L. T. F. Eleno. Strain engineering the topological type-II dirac semimetal $NiTe_2$. *Phys. Rev. B*, 103:125134, Mar 2021.

[10] Chun-Xiao Liu, Sergej Schuwalow, Yu Liu, Kostas Vilkelis, **Antonio L. R. Manesco**, P. Krogstrup, and Michael Wimmer. Electronic properties of InAs/EuS/Al hybrid nanowires. *Phys. Rev. B*, 104:014516, Jul 2021.

[11] **Antonio L. R. Manesco** and Jose L Lado. Correlation-induced valley topology in buckled graphene superlattices. *2D Materials*, 8(3):035057, Jun 2021.

[12] Bruna S. de Mendonça, **Antonio L. R. Manesco**, Nancy Sandler, and Luis G. G. V. Dias da Silva. Can Caroli-de Gennes-Matricon and Majorana vortex states be distinguished in the presence of impurities? *arXiv preprint arXiv:2204.05078*, 2022.

[13] Antonio L. R. Manesco, Ian Matthias Flór, Chun-Xiao Liu, and Anton R. Akhmerov. Mechanisms of Andreev reflection in quantum Hall graphene. *SciPost Phys. Core*, 5:045, 2022.

[14] **Antonio L.R. Manesco** and Artem Pulkin. Spatial separation of spin currents in transition metal dichalcogenides. *arXiv preprint arXiv:2206.07333*, 2022.