

Leonardo Novo

Personal Data

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| Place and date of birth | Matosinhos, Portugal – 10th December 1988 |
| Email contact | leonardo.novo@inl.int |
| Current position | Staff Researcher at Iberian Institute of Nanotechnology (INL), Braga, Portugal |
| Group webpage | https://inl.int/quantum-and-linear-optical-computation/ |

Education

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| JUNE 2017 | Concluded PhD in Physics, University of Lisbon, Portugal. Final Grade: Pass with Distinction |
| NOVEMBER 2011 | Concluded MSc in Physics, University of Bonn, Germany. |
| JULY 2009 | Concluded BSc in Physics, University of Porto, Portugal. |

Research interests

quantum computation, quantum simulation, quantum optics

Research experience

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| AUG 2022 - onwards | Staff Researcher at Iberian Institute of Nanotechnology (INL) in Braga, Portugal |
| AUG 2017 - JUL 2022 | Postdoc at Center for Quantum Information and Communications at Université Libre de Bruxelles. |
| JAN. 2014 - JUN. 2017 | Phd in Physics in the framework of the Doctoral Programme of Physics and Mathematics of Information in the University of Lisbon, under the supervision of Prof. Yasser Omar. The general scope of my thesis was to study the role of disorder and decoherence in quantum transport and quantum computation. |
| MAR. 2016 - JUL. 2016 | Research visit to Macquarie University in Sydney to work with Prof. Dominic Berry. The aim of the work was to improve recently developed quantum algorithms for the problem of simulating Hamiltonian evolution, in order to get closer to the proven lower bound for the complexity of this problem. |

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| OCT. 2012 - DEC. 2013 | Research scholarship at Instituto de Telecomunicações under the supervision of Prof. Yasser Omar. The work was related to quantum transport in disordered structures interacting with an external environment. |
| APR. 2012 - SEP. 2012 | Research assistant (“Wissenschaftliche Hilfskraft”) at the Theoretical Quantum Optics group in the University of Siegen. I worked for six months on a project aiming at the characterization of multiparticle entanglement using methods from semidefinite programming. The supervisor of this work was Prof. Otfried Gühne. |
| DEC. 2010 - NOV. 2011 | Master thesis entitled “The Roper resonance in a finite volume” supervised by Prof. Dr. Ulf-G. Meissner. In this project I worked on a method to extract the mass and width of the Roper resonance from lattice QCD simulations. |

Teaching experience

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| 2019 - 2021 | Teaching assistant for the exercise classes of various courses of the Masters in Physical Engineering at Université libre de Bruxelles (ULB), Belgium. Sep. - Oct. 2021: <i>Quantum Mechanics II</i> Nov. - Dec. 2020: <i>Quantum Mechanics II</i> Feb. - May 2020: <i>Quantum Information and Computation</i> Sep. - Oct. 2019: <i>Quantum Mechanics II</i> . Feb. - May 2019: <i>Quantum Information and Computation</i> . |
| APR. 2012 - SEP. 2012 | Teaching assistant for the exercise classes of <i>Statistical Mechanics</i> at University of Siegen, Germany. |
| OCT. 2010- MAR. 2012 | Teaching assistant at the University of Bonn in Germany for the exercise classes of various courses of the Masters in Physics: Winter Semester 2010/11 - <i>Advanced Quantum theory</i> ; Summer Semester 2011 - <i>Group Theory</i> ; Winter Semester 2011/12 - <i>Advanced Quantum Theory</i> . |

Publications

My list of publications can also be consulted at:

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| arXiv | https://arxiv.org/a/novo_1_1.html |
| Google scholar | https://scholar.google.com/citations?user=z8UzSTYAAAAJ&hl=en-EN |

Preprints

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| 2022 | B. Seron, L. Novo, N. J. Cerf, Boson bunching is not maximized by indistinguishable particles, arXiv:2203.01306 |
| 2021 | S. Apers, S. Chakraborty, L. Novo, J. Roland, Quadratic speed-up for spatial search by continuous-time quantum walk, arXiv:2112.12746 |

Publications in peer-reviewed journals

- 2021 L. Novo, J. Bermejo-Vega, R. Garcia-Patron, Quantum advantage from energy measurements of many-body quantum systems, *Quantum* 5, 465. (Popular summary available [here](#)).
- L. Novo, S. Ribeiro, Floquet engineering of continuous-time quantum walks: Toward the simulation of complex and next-nearest-neighbor couplings, *Physical Review A* 103 (4), 042219.
- 2020 S. Chakraborty, L. Novo, J. Roland, Finding a marked node on any graph by continuous time quantum walk, *Physical Review A* 102 (2), 022227.
- S. Chakraborty, L. Novo, J. Roland, Optimality of spatial search via continuous-time quantum walks, *Physical Review A* 102 (3), 032214.
- 2018 L Novo*, S Chakraborty*, M Mohseni, Y Omar, Environment-assisted analog quantum search, *Physical Review A* 98 (2), 022316.
- 2017 S. Chakraborty, L. Novo, S. Di Giorgio, Y. Omar, Optimal quantum spatial search on random temporal networks, *Physical Review Letters* 119, 220503. (Popular summary available [here](#))
- L. Novo, D. Berry, Improved Hamiltonian simulation via a truncated Taylor series and corrections, *Quantum Information and Computation* Vol.17 No.7&8 0623-0635.
- O. Boada, L. Novo, F. Sciarrino, Y. Omar, Quantum walks in synthetic gauge fields with 3D integrated photonics, *Physical Review A* 95, 013830.
- 2016 D. Berry, L. Novo, Corrected quantum walk for optimal Hamiltonian simulation, *Quantum Information and Computation* Vol. 16 No. 15&16, (pp1295-1317).
- S. Chakraborty*, L. Novo*, A. Ambainis, Y. Omar, Spatial search by quantum walk is optimal for almost all graphs, *Physical Review Letters* 116, 100501, Editors' Suggestion. (Popular summary available [here](#))
- L. Novo, M. Mohseni, Y. Omar, Disorder-assisted quantum transport in suboptimal decoherence regimes, *Scientific Reports* 6, 18142.
- 2015 L. Novo*, S. Chakraborty*, M. Mohseni, H. Neven, Y. Omar, Systematic Dimensionality Reduction for Quantum Walks: Optimal Spatial Search and Transport on Non-Regular Graphs, *Scientific Reports* 5, 13304.
- 2013 L. Novo, T. Moroder, O. Gühne, Genuine multiparticle entanglement of permutationally invariant states, *Phys. Rev. A* 88, 012305.
- (*both authors have equal contribution)

Perspective articles

- 2020 L Novo, Bridging gaps between random approaches to quantum simulation, *Quantum Views* 4, 33.

Media Coverage

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| Phys.org | <i>The benefits of quantum effects for biological, social and technological networks</i> (article available here) |
| Exame Informática | <i>Em Portugal, já há quem faça passeios quânticos que valem artigos na Nature</i> (article available here) |

Grants and awards

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| Postdoctoral level | F.R.S-FNRS, Belgium (Duration: 10/2019 - 09/2022) Seal of Excellence (application to Marie-Curie postdoctoral fellowship) Wallonie-Brussels International Excellence grant (Duration: 10/2018 - 12/2018) |
| Others | 4th place in the National Physics Olympiads, Portugal (2005) 1st place in the Regional Physics Olympiads, Portugal (North region, 2005) |

Participation in international projects

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| AppQInfo | H2020 project on Applications and Hardware for Photonic Quantum Information Processing involving 9 academic and industrial partners (Duration: 03/2021 - 02/2023) |
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Referee for

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| Scientific Journals | New Journal of Physics, Scientific Reports, International Journal of Quantum Information, Quantum, Physical Review A, Physical Review Letters |
| Conferences | QIP 2020 (Conference on Quantum Information Processing) |

Supervision experience

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| PhD students | Co-supervisor of Benoit Seron (started: Oct. 2020, expected to finish: Oct. 2023) |
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Participation in thesis committees

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| Master thesis | <p>Student: Théo Lisart, Université Libre de Bruxelles, Belgium. Degree: Master in Physics Engineering Thesis title: <i>Quantum computation model based on adiabatic open system dynamics</i>, (defended in September 2021)</p> <p>Student: Stéphane Louïes, Université Libre de Bruxelles, Belgium. Degree: Master in Cybersecurity Corporate Strategies Thesis title: <i>Quantum algorithm for the estimation of Markov chain hitting times</i> (defended in November 2021)</p> |
| PhD students | <p>Student: Luca Razzoli, University of Modena and Reggio Emilia, Italy. Degree: PhD in Physics Thesis title: <i>Continuous-time quantum walks for quantum technology: quantum estimation and modeling of transport phenomena</i> (to be defended in March/April 2022)</p> |

Invited talks

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| June 8, 2022 | Online seminar for CQT, Singapore, “Quadratic speedup for spatial search by continuous-time quantum walk” |
| March 22, 2022 | Seminar at Laboratoire Bordelais de Recherche en Informatique (LaBRI), France, Bordeaux, France, “Spatial search by continuous-time quantum walk” |
| November 16, 2021 | Seminar at Laboratoire d’Informatique et Systèmes (LIS), Marseille, France, “Spatial search by continuous-time quantum walk” |
| October 15, 2021 | Seminar at Quantum Physics and Information Technology (QPIT), DTU, Copenhagen, “Enhancing multimode photonic bunching with partially distinguishable photons” |
| November 25, 2020 | Bristol QIT online seminar, University of Bristol, “Spatial search by continuous-time quantum walk” |
| October 4, 2019 | Seminar at DAMTP, University of Cambridge, “Quantum advantage from energy measurements of many-body systems” |
| October 4, 2018 | Talk at BQPi meeting, Academie Royale de Belgique, Belgium - “The complexity of measuring the energy of a quantum system” |
| June 13, 2017 | Talk at Quantum Technologies for Information Science Group, University of the Basque country - “Optimal search in random graphs using quantum walks”. |
| May 11, 2017 | Talk at Center for Quantum Technologies, Singapore - “Optimal search in random graphs using quantum walks”. |
| January 11, 2017 | QI seminar at University of Innsbruck, - “Optimal search in random graphs using quantum walks”. |
| July 8, 2016 | Seminar at QSciTech Center, Macquarie University, Sydney - “Optimal search in random graphs using quantum walks”. |

Presentations in Conferences and Workshops

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| May 30 - June 1, 2022 | Quantalgo workshop, ULB, Belgium Oral presentation: "Quadratic speedup for spatial search by continuous-time quantum walk" |
| January 6-10, 2020 | QIP, Shenzhen, China Poster presentation: "Quantum Advantage from Energy Measurements of many-body quantum systems" |
| October 22-24, 2019 | International Conference Mission 10.000: Quantum Science & Technologies, INL, Braga, Portugal Contributed Talk: "Quantum Advantage from Energy Measurements" |
| October 2-3, 2019 | Continuous-time quantum computing and simulation: perspectives and challenges, Kavli Royal Society Centre, Chicheley Hall, UK Poster presentation: "Continuous-time quantum search on graphs and its applications to optimization problems" |
| November 26-30, 2018 | ICoQC 2018 - International Conference on Quantum Computing, Paris Poster presentation: "Complexity of spectral sampling" |
| November 17-20, 2016 | WQSQW 2016 - Workshop of Quantum Simulation and Quantum Walks 2016, Prague Poster presentation: "Quantum walks in synthetic gauge fields with 3D integrated photonics" |
| September 20-23, 2016 | IQIS 2016 - 9th Italian Quantum Information Science Conference, Rome Poster presentation: "Quantum walks in synthetic gauge fields with 3D integrated photonics" |
| June 21-27, 2015 | QUTE-EUROPE Summer School 2015, Gothenburg Poster presentation: "Systematic dimensionality reduction for quantum walks" |
| August 25-29, 2014 | 2nd International Workshop on Quantum Coherence and Decoherence (IWQCD2), Medellin Talk: "Disorder-assisted quantum transport in suboptimal decoherence regimes" |
| November 11-15, 2013 | Conference on Quantum Simulations and Quantum Walks, Pisa Poster presentation: "Environment-assisted quantum transport in disordered graphs" |
| March 25-27, 2013 | 38th Conference of the Middle European Cooperation in Statistical Physics (MECO38), ICTP, Trieste Poster presentation: "Environment-assisted quantum transport in disordered graphs" |
| September 3-7, 2012 | 3rd International Workshop on Quantum Entanglement and its Detection (QED3), Bilbao. Talk: "Detecting entanglement of permutationally invariant states with PPT mixtures" |
| July 25-27, 2012 | Greenhorn Meeting, Munich. Poster presentation: "Characterizing multipartite entanglement with PPT mixtures" |

Research visits*

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| 2022 | California Institute of Technology, USA (28th Feb - 11 March) |
| 2021 | Laboratoire d'Informatique et Systèmes (LIS), Marseille, France (02 November - 10 November) |
| 2018 | University of Twente, Netherlands (25 June - 06 July) Institut Henri Poincare, Paris, France (28 May - 15 June) |
| 2016 | Macquarie University, Sydney (March to July) |

(*visits of more than one week)

Languages

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| PORTUGUESE | Mothertongue |
| ENGLISH | Fluent |
| SPANISH | Fluent |
| FRENCH | Fluent |

Computer skills

Experience with: | Mathematica, MatLab