Mariano Caruso

Education

Universitary

2013–2017 **PhD in Physics-Mathematics**, *University of Granada*, Spain. [*topics*] probability theory, stochastic processes, random matrices, machine learning, genetic algorithms. **Thesis** *The principle of least action in stochastic processes*. Calf.: **Cum Laude**.

2011–2012 **Master in Physics**, *University of Granada*, Spain. [*topics*] advanced statistics applied to particle physics, effective models, physics beyond the standard model. **Thesis** *Study of the triple interactions of neutral electroweak gauge bosons*.

2005–2010 **Degree in Physics**, *National University of La Plata*, Argentina. [*topics*] quantum mechanics, classical circuit theory. **Thesis** *Isomorphism between Schrödinger and Schrödinger dynamics and classical dynamics*.

2002–2004 **Senior Technician in Electronics**, *National Technological University*, Argentina.

High School

1997–2001 **Electronics Technician**, *Technical of Technical Education Escuela N°2 Paula Albarracín de Sarmiento*, Argentina.

Experience

2023–··· **Senior Quantum Advisor**, `QCentroid`, *Spain*, [*topics*] **quantum algorithms**: machine learning | **secure task algorithms**: homologic encryption.

2021–··· **Research & Development**, *Centre for Technology Innovation Support,* `CaIT` || *Fundación I+D del Software Libre,* `FIDESOL`, *Spain*, **Google Scholar**, [*topics*] **quantum physics**: shortcuts to adiabaticity, equivalence between quantum systems, classical simulation through electrical networks | **machine learning**: recurrent neural networks | **cryptography**: homomorphic encryption, random number generators, IoT communications.

2022–··· **Professor**, *Master in Quantum Computing*, University of La Rioja, `UNIR`, Spain, **University faculty**.

2022–··· **Associate Research**, *Thermodynamics and Quantum Computation*, group FQM-411-TCC. University of de Granada, Spain, [*topics*] quantum machine learning.

2019–2021 **Acting Professor**, *University of Granada*, Spain, Department of Mathematics.
Statistics and Operations Research

2019–2021 **Postdoctoral degree in Physics-Mathematics**, *Regional Centre for Genomic Studies*, CREG, National Council for Scientific and Technical Research | CONICET, Argentina. [*topics*] new stochastic methods for the study of gene expression.

2018–2019 **Postdoctorate degree in Mathematics**, *Ultrasonics Lab*, group TEP-959-UL, University of Granada, Spain. [*topics*] mechanics of continuous media, biomechanics, statistics, material wave propagation in non-linear soft tissues, cancer therapies. cancer therapies.

2018–2019 **Contract Researcher**, *ibs.GRANADA*, Spain.
European Biomechanics Research Project.

2018–2019 **Contract Research**, *Public Foundation for Biomedical Research in Eastern Andalusia*, FIBAO, Spain. [*topics*] fundamentals of the theory of deformations in non-linear in non-linear media.

2016–2016 **International research**, *International Mobility Programme of the Proprietay Plan of the University of Granada*, Spain, National University of La Plata, Argentina. Research stay abroad.

2017–2017 **International research**, *International Research, Mobility Programme between Andalusian and Ibero-American Universities*, AUIP, Bilateral Cooperation: Spain – Argentina. Research stay abroad.

2011–2014 **EADIC–European Union**, *EADIC II Programme*, European Union–University of Granada, Department of Theoretical Physics.

2009–2010 **Scientific Research Commission –** CIC, National University of La Plata, Department of Physics, Argentina: [*topics*] quantum mechanics, classical circuit theory.

2005–2006 **Institute of Theoretical and Applied Physicochemical Research –** INIFTA, La Plata, Argentina: [*topics*] nanoscience, study of nanoparticles with synchrotron light.

Computational

Data python, R

Scientific C, C++, Mathematica, MATLAB, LaTeX

Quantum qiskit, pennylane, cirq

Office autom. Microsoft Office, OpenOffice, Mathpix, Overleaf, Canva

Op. Systems Microsoft Windows, Linux

Languages

Spanish **Native**

English **Advanced**

Italian **Intermediate**

Acknowledgements

2017 International Mention Doctorate UGR

2016 Royal Society Front Cover (link). Press releases **A**, **B** and **C**

Extra

- Piano
- Guitar
- Charango
- Philosophy
- Literature

NOTE

These lines aim to introduce some aspects of my training and experience in both the private and academic sectors. I developed a rigorous technical education, starting with a degree in Electronic Engineering, where I began working with programming languages, followed by a degree in Physics, both in Argentina. Later, I was hired to pursue postgraduate training in Europe, completing a Master's in Mathematical Physics and a PhD in Mathematical Physics at the University of Granada. I also conducted research stays at the Max Planck Institute for Physics in Munich, Germany, in collaboration with the University of Granada, and at the National University of La Plata, Argentina, to earn an international mention in my PhD.

I have applied these ideas in the field of Biomedicine at the IBS and FIBAO, both in Granada. Regarding languages, it is worth mentioning that I can learn new ones, as having experience with several makes learning others easier.

Working in academia has allowed me to develop the ability to tackle problems that, *a priori*, one cannot even know if they have a solution. My experience in the private sector, on the other hand, has helped me gain efficiency in finding such solutions. In both fields, I have worked both in teams and individually, depending on the task's objectives.

My teaching experience, both at the university level (UNLP, UTN in Argentina, and UGR, UNIR in Spain) and at the secondary level, has helped me improve my communication skills. In fact, conveying ideas through dissemination (to expert audiences) and popularization (to non-expert audiences) is something I enjoy doing.

I have experience in developing analytical and/or algorithmic mathematical models for specific business situations, even in more abstract situations related to stochastic (random) processes, for which I developed a new tool that quantifies the degree of uncertainty in random processes. This has direct applications to any process involving decision-making under incomplete information, among other fields.

Currently, I remain committed to the intersection of various disciplines: applying optimization techniques from quantum physics to control and catalyze chemical reactions, with the aim of improving cell reprogramming protocols and nitrogen fixation in soil. This line of research stems from ideas developed during my PhD, initiated with researchers from both the academic (UC3M) and business worlds (IBM).

I am also interested in the fusion of machine learning and quantum computing, in this emerging field known as quantum machine learning. Currently, I am part of a research group at UGR working

on quantum machine learning, funded by European grants.

My activities have spanned two main areas: academic and industrial. On the one hand, I have engaged in research, supervision of undergraduate and master's theses, publication of scientific papers, participation in conferences, and creation of technical and non-technical content. On the other hand, I have been involved in creating hybrid work consortia, combining academic and business entities, including CSIC, Inspiration-Q, QCentroid, UGR, GRADIANT, QURECA, atlanTTic, IBM, Atos, IFLP, Satellogic, Quiside, Accenture, Telefónica, Instituto de Astrofísica de Canarias, Navantia, Orange, Moody's Analytics, Quantum Mads, Xanadú, Qureca, Unconventional Computing Lab, Arquimea, Multiverse Computing, Navantia, Quantum South, and Fujitsu.

In my work experience, I have collaborated in both the private and academic sectors, and I am currently highly interested in the fusion of machine learning and quantum physics. I would like to apply my skills and knowledge in a technology center like FIDESOL, where I could act as the main point of contact throughout the partner's lifecycle, driving successful partnerships and project management with tangible results for multiple European partners. I consider myself a creative problem-solver and capable of navigating complex stakeholder management, often in deeply technical environments. Additionally, I have worked in teams and individually, depending on the task objectives, which has helped me improve my communication skills and collaborate on projects to achieve set goals. I also have experience developing analytical and/or algorithmic mathematical models for specific business situations, which would enable me to create customized roadmaps for partners to ensure successful project delivery.

In summary, if asked about something outside my expertise, I can honestly say that I do not know it but you can be sure that I will find a way to learn it and provide the answers.