

Alba Cervera-Lierta | Full CV

✉ alba.cervera@bsc.es • 📄 albacl.github.io • Updated: May 27, 2023

Senior researcher in quantum computation at the Barcelona Supercomputing Center and coordinator of the Quantum Spain project.

Education

Doctor of Philosophy (PhD) in Physics <i>Supervisor: Dr. José Ignacio Latorre</i> Title: Maximal Entanglement: Applications to Quantum Computation and Particle Physics.	Universitat de Barcelona 2015 – 2019
Master in Astrophysics, Particle Physics and Cosmology <i>Specialized in Particle Physics and Gravitation.</i> Thesis title: Non-unitary neutrino oscillations.	Universitat de Barcelona 2014 – 2015
Bachelor in Physics <i>Specialized in Fundamental Physics</i> Thesis title: Scaling of entanglement support for iTEBD algorithm.	Universitat de Barcelona 2009 – 2014

Positions

Research

Senior Researcher <i>Quantic group (CASE department)</i>	Barcelona Supercomputing Center 2021 – Present
Postdoctoral Fellow <i>Alán Aspuru-Guzik group</i>	University of Toronto 2019 – 2021
Technical Researcher <i>Quantic group (CASE department)</i>	Barcelona Supercomputing Center 2017 – 2019
Specialized Technician <i>Project: "Entanglement, tensor networks and cold gases"</i>	Universitat de Barcelona 2014

Coordinator

EuroQCS-Spain project <i>Quantum computing technology responsible (budget: 12,5 M €)</i>	Barcelona Supercomputing Center 2022 – Present
Quantum Spain project <i>Project Principal Investigator (budget: 22M €)</i>	Barcelona Supercomputing Center 2021 – Present

Visitor

Center of Quantum Technologies <i>Prof. Kwek Leong Chuan group.</i>	National University of Singapore May 2017
Instituto de Física Teórica <i>Dr. César Gómez's group.</i>	CSIC Feb 2017
Grupo de investigación en Información y Computación Cuántica <i>Dr. Vicente Martín group</i>	Universidad Politécnica de Madrid Sep 2016
Rudolph Piers Institute for Theoretical Physics <i>Dr. Juan Rojo's group.</i>	University of Oxford Jan - May 2016

Teaching

Teacher Assistant <i>Calculus I-II, Theoretical Mechanics, Physics I - II.</i>	Universitat Autònoma de Barcelona 2017 – 2019
Teacher Assistant <i>Modern Physics Laboratory, Computational Physics.</i>	Universitat de Barcelona 2016 – 2017

Funded projects

European.....

EuroQCS-Spain project

Budget: 12,5 M €, Role: Quantum computing technology responsible

EuroHPC - Joint Undertaking

2022 – 2026

National.....

Quantum Spain project

Budget: 22M €, Role: principal investigator

<https://quantumspain-project.es>

Secretary of State of Digitalization and AI (SEDIA)

2021 – 2025

Industry.....

Quantum Experience for Academic Research Program

Funding: Exclusive access to pulse-level control of IBM quantum devices, Role: co-PI.

Project: High-dimensional quantum experiments superconducting circuits.

IBM

2021 – 2022

Awards and Honors

PhD Excellent Cum Laude

Universitat de Barcelona

Jun 2019

Teach Me QISKit Award

<https://www.ibm.com/blogs/research/2018/06/teach-qiskit-winner/>

Best interactive self-paced tutorial that explains a specific focus topic in quantum computing using QISKit and the IBM Q Experience.

IBM

Jun 2018

Publications

Link to [Google Scholar](#) and [OrcID](#).

19. Workflows Community Summit 2022: A Roadmap Revolution

R. Ferreira da Silva, R. M. Badia, V. Bala, et. al.

arXiv:2304.00019 [cs.DC].

Preprint

2023

18. Multi-dimensional Fourier series with quantum circuits

B. Casas, A. Cervera-Liarta

arXiv:2302.03389 [quant-ph].

Preprint (accepted PRA)

2023

17. Design of quantum optical experiments with Logic Artificial Intelligence

A. Cervera-Liarta, M. Krenn, A. Aspuru-Guzik

Quantum **6**, 836 (2022).

Quantum

2022

16. On scientific understanding with artificial intelligence

M. Krenn, R. Pollice, S. Y. Guo, et. al.

Nature Review Physics (2022).

Nat. Rev. Phys.

2022

15. Modern applications of machine learning in quantum sciences

A. Dawid, J. Arnold, B. Requena, et. al.

arXiv:2204.04198 [quant-ph].

Preprint/Book

2022

14. Toward Reliability in the NISQ Era: Robust Interval Guarantee for Quantum Measurements on Approximate States

M. Weber, A. Anand, A. Cervera-Liarta, J. S. Kottmann, T. H. Kyaw, et. al.

Physical Review Research **4**, 033217 (2022).

Phys. Rev. Research

2022

13. Programming Physical Quantum Systems with Pulse-Level Control

K. N. Smith, G. S. Ravi, T. Alexander, et. al.

Frontiers in Physics, **672** (2022).

Front. Phys.

2022

12. Learning Interpretable Representations of Entanglement in Quantum Optics Experiments using Deep Generative Models

D. Flam-Shepherd, T. Wu, X. Gu, A. Cervera-Liarta, M. Krenn, A. Aspuru-Guzik

Nature Machine Intelligence **4** (6), 544-554 (2022).

Nat. Mach. Intell.

2021

11. **Experimental high-dimensional Greenberger–Horne–Zeilinger entanglement with superconducting transmon qutrits** Phys. Rev. Appl. 2022
A. Cervera-Liarta, M. Krenn, A. Aspuru-Guzik, A. Galda
Physical Review Applied **17**, 024062 (2022).
10. **Noisy intermediate-scale quantum algorithms** Rev. Mod. Phys. 2022
K. Bharti, A. Cervera-Liarta, T. H. Kyaw, T. Haug, et. al.
Review of Modern Physics **94**, 015004 (2022).
9. **The Meta-Variational Quantum Eigensolver (Meta-VQE): Learning energy profiles of parameterized Hamiltonians for quantum simulation** PRX Quantum 2021
A. Cervera-Liarta, J. S. Kottmann and A. Aspuru-Guzik
PRX Quantum **2**, 020329 (2021).
8. **Tequila: A platform for rapid development of quantum algorithms** Quantum Sci. Technol. 2021
J. S. Kottmann, S. Alperin-Lea, T. Tamayo-Mendoza, A. Cervera-Liarta et. al.
Quantum Science and Technology **6** 024009 (2021).
7. **Data Re-uploading for a Universal Quantum Classifier** Quantum 2020
A. Pérez-Salinas, A. Cervera-Liarta, E. Gil-Fuster, J. I. Latorre
Quantum **4**, 226 (2020).
6. **Maximal Entanglement: Applications in Quantum Information and Particle Physics** PhD Thesis 2019
A. Cervera-Liarta
arXiv:1906.12099 [quant-ph].
5. **Quantum Circuits for Maximally Entangled States** Phys. Rev. A 2019
A. Cervera-Liarta, J. I. Latorre, D. Goyeneche
Physical Review A **100**, 022342 (2019).
4. **Exact Ising Simulation on a Quantum Computer** Quantum 2018
A. Cervera-Liarta
Quantum **2**, 114 (2018).
3. **Multipartite Entanglement in Spin Chains and the Hyperdeterminant** J. Phys. A Math. Theor. 2018
A. Cervera-Liarta, A. Gasull, J. I. Latorre and G. Sierra.
Journal of Physics A: Mathematical and Theoretical **51**, 505301 (2018).
2. **Maximal Entanglement in High Energy Physics** SciPost Phys. 2017
A. Cervera-Liarta, J. I. Latorre, J. Rojo and L. Rottoli
SciPost Physics **3**, 036 (2017).
1. **Operational Approach to Bell Inequalities: Application to qutrits** Phys. Rev. A 2016
D. Alsina, A. Cervera, D. Goyeneche, J. I. Latorre and K. Zyczkowski
Physical Review A **94**, 032102 (2016).

Software development

Libraries

Quantum computing open-source library “Tequila” Python 2021
Developer., <https://github.com/tequilahub/>

Codes and demos

Logic AI algorithm “Klaus” Mathematica 2022
Creator and developer., <https://github.com/AlbaCL/Klaus>

Meta Variational Quantum Eigensolver Python 2021
Co-creator and developer., <https://github.com/aspuru-guzik-group/Meta-VQE>

Talks and seminars

* Virtual talks due to COVID-19 pandemic.

Keynote

The quest for the quantum computer 10th BSC Doctoral Symposium May 9, 2023
Barcelona, Spain

The Noisy Intermediate-Scale Quantum era
Porto Alegre, Brasil

CARLA 2022
Sep 28-30, 2022

Colloquium.....

Tecnologies quàntiques: present i futur
Universitat de Barcelona

ICCUB Colloquia
Feb 16, 2022

Invited.....

High-dimensional quantum computation: opportunities and challenges
Symposium on Open-Source Tools for Quantum Computing & Simulation

ICFO
Mar 31, 2023

High-dimensional quantum computation
CERN

QT4HPC
Nov 2, 2022

Quantum algorithms in near term devices
IQTC, University of Barcelona (Spain).

New Trends in Computational Chemistry
Sep 9, 2022

Quantum Spain
Barcelona (Spain).

Quantum 2022
Jun 22, 2022

Quantum Spain: un impulso para el ecosistema de computación cuántica
NASERTIC, Pamplona (Spain).

Jornada cuántica
May 4, 2022

Quantum Spain: un impulso para el ecosistema de computación cuántica
SCAYLE, León (Spain).

Jornada Eco. Cuántico
Mar 1, 2022

Near term quantum computation: opportunities and challenges
Bilbao (Spain).

Quantum 2021
Nov 24, 2021

Noisy Intermediate-Scale Quantum era
Virtual ().*

JURES 2021
Sep 17, 2021

Noisy Intermediate-Scale Quantum algorithms
Perspectives on Quantum Sensing and Computation for Particle Physics. Virtual ().*

CERN
Jul 15, 2021

The Meta-Variational Quantum Eigensolver
Virtual ().*

Machine Learning for Quantum X
Jul 6, 2021

The Meta-Variational Quantum Eigensolver
Virtual ().*

QWorld Quantum Science Days
Jun 1, 2021

Chronicles of Entangland, the foundation of the SC town
Virtual ().*

Qiskit Hackathon Europe
May 26, 2021

Experimental high-dimensional GHZ entanglement with superconducting transmon qutrits
Chicago. Virtual ().*

Pulse-level Quantum Control Workshop
May 18, 2021

Maximal Entanglement in High Energy Physics
Topical Group on Hadronic Physics. Virtual ().*

APS April Meeting
Apr 15, 2021

Noisy Intermediate-Scale Quantum algorithms
Virtual ().*

Universidad Iberoamericana
Apr 13, 2021

Please, feed the quantum troll!
Virtual ().*

Q-Hack 2021
Feb 19, 2021

Testing and designing quantum algorithms for the NISQ era
Quantum Computing and Simulation on Near-Term Devices. Virtual ().*

INT-20-3
Nov 21, 2020

Maximal Entanglement in High Energy Physics, Quantum Entanglement at Collider Energies
Stony Brook (United States).

CFNS Stony Brook
Sep 11, 2018

Exact simulation of a Quantum Phase Transition on a quantum computer
Barcelona (Spain).

Quantum Phase Transitions
Apr 05, 2018

**Emergence of Gauge Symmetry
from a Maximal Entanglement Principle**
Madrid (Spain).

Universidad Complutense de Madrid
Sep 21, 2016

Contributed.....

The Meta-Variational Quantum Eigensolver
Virtual (*).

APS March Meeting 2021
Mar 18, 2021

Data re-uploading for a universal quantum classifier
Virtual (*).

Q-Turn 2020
Nov 24, 2020

Data re-uploading for a universal quantum classifier
Quantum Techniques Machine Learning. Virtual (*).

QTML 2020
Nov 12, 2020

Maximal Entanglement in Quantum Computation
Barcelona (Spain).

BSC Severo Ochoa Doctoral Symposium
May 07, 2019

Seminars.....

A roadmap to quantum computing integration into HPC infrastructures

RISC2 Seminar Series
Mar 15, 2023

Noisy Intermediate Scale Quantum Computation
Dept. Condensed Matter Physics.

Universidad de Zaragoza
Jun 3, 2022

Noisy Intermediate Scale Quantum Computation
Virtual.

Universidad Nacional de Colombia
Apr 21, 2022

Design of quantum optical experiments with logic artificial intelligence
Quantum Optics group seminar.

MPQ
Oct 29, 2021

High-dimensional quantum computing experiments
Prof. Manas Mukherjee group meeting (Singapore, Virtual *)

CQT
Aug 03, 2021

Maximal Entanglement in a Quantum Computer
Fermilab theory seminars. Virtual (*)

Fermilab
Jun 15, 2021

The Meta-Variational Quantum Eigensolver
Oxford Quantum Information Society. Virtual (*)

Oxford
May 20, 2021

The Meta-Variational Quantum Eigensolver
Virtual.

Scientific Machine Learning Webinars
May 6, 2021

Noisy Intermediate-Scale Quantum algorithms
Hypatia Series. Virtual(*).

Alexandria University
Apr 8, 2021

Maximal Entanglement in High Energy Physics
Nuclear Theory series. Virtual(*).

University of Maryland
Apr 2, 2021

Noisy Intermediate-Scale Quantum algorithms
Belgian Quantum Physics Initiative. Virtual(*).

Académie Royale de Belgique
Mar 4, 2021

Designing VQA with Tequila
Virtual.

Quantum Conversations by the Bay
Nov 28, 2020

Maximal Entanglement. Applications to Quantum Computation and Particle Physics
Matterlab group meeting. Toronto (Canada).

UofT
Mar 1, 2029

Committees.....

European.....

Quantum Computing working group
Quantum Coordination Board

European Quantum Flagship and EuroHPC
2023 - Present

Quantum Standardization working group
Quantum Coordination Board

European Quantum Flagship and EuroHPC
2023 - Present

Scientific Advisory Board.....

Finish Quantum Initiative

CSC, Aalto University, VTT
2023 - PresentConsell de les Tecnologies Quàntiques de Catalunya
Board memberGeneralitat de Catalunya
2022 - Present

Scientific Committee.....

Quantum Techniques in Machine Learning 2023, CERN.

ICE8 2023, Santiago de Compostela.

Quantum Matter 2023, Madrid.

Quantum Matter 2022, Barcelona.

Quantum Techniques in Machine Learning 2020, Virtual.

PhD Thesis committees.....

Fault tolerant quantum algorithms

Universidad Complutense de Madrid
Jan 17, 2023

Pablo Moreno-Casares

Supervisor: Miguel Ángel Martín-Delgado

Quantum information in lattices

Universitat Autònoma de Barcelona
Jul 22, 2022

Bruna Gabrielly De Moraes Araújo

Supervisors: Antonio Acín dal Maschio, Daniel Cavalcanti Santos and Stephan Jean Louis Roche

Conference and seminars organization

Quantum Matter International Conference

Madrid

Industrial forum co-organizer.

May 22-25, 2023

Quantum Research Seminars Toronto.

Virtual

Co-organizer and chair. Youtube: Quantum Research Seminars Toronto.

2020 - 2021

Lectures and courses

Quantum Algorithms I and II

Centro de Ciencias de Benasque Pedro Pascual
Apr 11-21, 2023

Spring School on Superconducting Qubit Technology

The Noisy Intermediate Scale Quantum Computation

Universidad Complutense de Madrid
Mar 14, 2023

Escenarios Científicos

The Noisy Intermediate Scale Quantum Computation

Universitat Autònoma de Barcelona
Oct 4, 2022

Master Modelling for Science and Engineering Research and Innovation

Variational Quantum Computing

Universidad Internacional Menéndez-Pelayo
Sep 5-9, 2022

IV Summer School on Quantum Computing

Near-term quantum computing

Universidad Castilla La-Mancha
Jun 20, 2022

Clase introducción al curso en Quantum Computing software.

NISQ computing

Institut de Ciències Fotòniques (ICFO)
Mar 15-24, 2022

Theory lectures

Variational Quantum Computing

Universidad Internacional Menéndez-Pelayo
Sep 7, 2021

III Summer School on Quantum and Q-Inspired Computing

Noisy Intermediate-Scale Quantum Algorithms

Warsaw, Poland
Aug 25, 2021

Summer School "Machine Learning in Quantum Physics and Chemistry"

Quantum Computing in the NISQ era

UCL

Talk in Quantum Technologies Winter School

Dec 10, 2020

Bojos per la Supercomputació

Introductory course in quantum computation for high-school students

The Quantum Revolution

Seminar at Master in Finance

BSC

26 Apr – 04 May, 2019

ESADE Business School

Jun 07, 2018

Panels and round tables

As a moderator.....

Round table Industrial forum

Participants: Marta Estarellas, Richard Kienhoefer, Pascale Senellart, Fernando de la Iglesia and Bilal Kalyoncu

Quantum Matter 2023

May 24, 2023

Round table Industrial forum

Participants: Marc Almendros, Niels Bultink, Gianni del Bimbo, Daniel Szombati, Yonatan Cohen, Josep M. Martorell, Heike Riel and Carmen Palacios.

Quantum Matter 2022

Jun 22, 2022

As a participant.....

Quantum computing + Communications: meet at the halfway.

Pannel with Hugues de Riedmatten.

Moderated by Carmen G. Almudéver.

PuzzleX

Oct 7, 2022

Catalan Nanotech Ecosystem Session

Moderated by Stephan Roche.

ACM Nanocomm

Oct 7, 2022

Women in ACM/IEEE WICE Luncheon

Moderated by Núria Castell.

ACM Nanocomm

Oct 6, 2022

Quantum Computing: Changing the Course of Industry

Round table with Carlos Kuchkovsky, Marta Pita, and Enrique Sanchez.

Moderated by Jaime Gómez.

Barcelona New Economy Week

Oct 3, 2022

Quantum Technologies

Panel with Silvia Carrasco, Carlos Abellán and Enrique Mora.

Moderated by Rubén Criado

Barcelona Deep Tech Summit

Sep 22, 2022

The Impact of Advanced Computing in AI

Round table with Jean Pierre Panziera and Nicolas Moes.

Moderated by David Pringle

Science|Business

Sep 19 2022

The Future of HPC

Panel with Paul Messina, Per Stenström, Uri Weiser and Min Li.

Moderated by Josephine Wood

ACM Europe Summer School

Sep 2 2022

Young People Program Career Panel

DATE 2022

Mar 21 2022

Quantum Software Ecosystem

Pannel discussion with industry and academic members

IEEE Services

Sep 9 2021

Students

PhD.....

Berta Casas Font

University of Barcelona

Sep 2022 – Present

Master.....

Juan Francisco Martín Bravo

Entanglement Benchmarks in quantum computers

Master Quantum Science and Technology.

University of Barcelona

Feb 2023 – Jul 2023

Berta Casas Font

Quantum function fitting and classification beyond the single-qubit model

Master Quantum Science and Technology.

University of Barcelona

Feb 2022 – Jul 2022

Undergraduate (degree)

Marc Farreras

Exact XY model simulation with a quantum computer

Physics Degree

University of Barcelona

Feb 2023 – Jul 2023

Alex Alemany

The HHL algorithm

Computer Science Degree. Co-supervised with Jordi Delgado.

Universitat Politècnica de Catalunya

Feb 2023 – Jul 2023

Júlia Barberà Rodríguez

Application of Grover's quantum algorithm for string matching

Physics Degree

University of Barcelona

Feb 2022 – Jul 2022

Elies M. Gil Fuster

Variational Quantum Classifier

Physics Degree. Co-supervised with J. I. Latorre.

University of Barcelona

Feb 2019 – Jul 2019

Outreach

Mentorship programs

Quantum Open Source Foundation mentorship program

Mentor

QOSF

Sep 2020 – Jan 2021

Girls E-Mentorship program

Mentor

GEM

Sep 2020 – June 2021

Panels and round tables

Jornades REACT

Round table with Teresa Riesgo Alcaide, Laia Bonet, Xavier Azemar Mallard Mateo Valero Cortes. Mar 29, 2023

Moderated by Elena Arrieta Palacio.

Barcelona

Premios Nacionales de Investigación

Presenter and moderator of the act.

Chaired by HRH King and Queen of Spain, Spanish Minister of Science and Universities and Barcelona Mayor.

Barcelona

May 5, 2022

Mujeres y Digitalización: Por una España Igualitaria

Round table with Marta Villegas, Lucía Flecha and Susana Fernández.

Moderated by the Secretary of State of Digitalization and AI Carme Artigas.

MINECO

Mar 8, 2022

Dia Internacional Dona i Nena a la ciència

Event with Barcelona city Mayor and government.

Ajuntament de Barcelona

Feb 11, 2022

Women in Physics path

Organized by the Equality commission from the Physics Faculty

Universitat de Barcelona

Mar 3 2021

Keynote speech

Margarita Salas Honoris Causa PhD act

Talk "De las computadoras a los ordenadores"

Universidad de Extremadura

Feb 2 2019

Bojos de la Ciència

Speech about Bojos per la Supercomputació program

Fundació Catalunya-La Pedrera

Dec 10 2018

Bojos de la Ciència

Speech at Master grants act

Fundació Catalunya-La Pedrera

Oct 16 2018

Articles

Computación Cuántica en la Nube

Revista Española de Física

RSEF

Mar 2020

How I became a quantum computation scientist

Medium article for @qiskit

Jul 2018

Contributing Writer

Medium articles, @quantum_wa.

Quantum World Association

2018 – 2019

Talks and courses.....

Computació quàntica: passat, present i futur d'una (r)evolució tecnològica Cicle Últimes fronteres: la ciència del segle XXI	Universitat de Girona May 4, 2023
Computación cuántica: presente y futuro de una revolución tecn. Jornada tecnología.	Uni. Las Palmas de Gran Canaria Apr 18, 2023
Computació Quàntica i els reptes de Talent TIC en els propers anys Col·legi d'Informàtica de Catalunya	Lul·liana Nov 24, 2022
Tecnologies quàntiques: present i futur d'una (r)evolució tecnològica Casal de Joves Sant Just Desvern	Jornades Feministes Nov 20, 2022
Present i futur de les tecnologies quàntiques Two-day introductory course for senior citizens.	A-12 Estudis i Recerca Universitaria Oct 20-26, 2022
Computació quàntica: present i futur d'una revolució tecnològica Universitat Politècnica de Catalunya.	Open Day TIC May 12, 2022
Tecnologías Cuánticas: presente y futuro Barcelona.	Pint of Science May 11, 2022
Quantum Spain: un impulso para el ecosistema de computación cuántica Seminar for the Corporación Tecnológica de Andalucía. Virtual.	CTA Apr 26, 2022
Supercomputación y Quantum Spain Seminar for the Plataforma Tecnológica Española y de Tecnologías Disruptivas. Virtual.	PTE Disruptive Mar 22, 2022
Tecnologías cuánticas: presente y futuro Virtual.	Col·legi de Biòlegs de Catalunya Mar 16, 2022
Computación Cuántica Cosmocaixa (Barcelona)	Live Talks Cosmocaixa Feb 16, 2022
Quantum Spain Quantum Barcelona and Madrid meet-up.	Meet-up Dec 13, 2021/Feb 9, 2022
Quantum Calling Waterloo Quantum Meet-up	K-W Quantum Enthusiasts Meetup Jun 18, 2020
Quantica Quantum computing talk and participation in the exhibition (video)	CCCB Apr 10-Sep 26, 2019
De las computadoras a los ordenadores Badajoz, Spain	Margarita Salas Honoris Causa PhD event Feb 26, 2019
Technology to manipulate Nature Madrid, Spain	El País con tu Futuro Dec 18, 2018
Quantum Computation: a new paradigm Sant Feliu de Llobregat, Barcelona, Spain	TEDx talk Sep 15, 2018
Quantum Computation Researcher's Night 2018	Cosmocaixa (Science Museum) Sep 28, 2018

Other skills

Programming Languages.....

Classical: Fortran, Python, Mathematica.

Quantum: QisKit (IBM), Qiskit Pulse (IBM), pyquil (Rigetti Computing), Cirq (Google), Tequila (MatterLab), Qibo.

Languages.....

English (fluent), Spanish (mothertongue), Catalan (mothertongue).

Media.....

All videos, links and audio can be found in my webpage.

Television: Interviews in Spanish and Catalan television (Orbita Laika, Els Matins TV3, News, ...)

Newspapers: Several interviews in Spanish and Catalan newspapers (La Contra de La Vanguardia, El Periódico, El Mundo, ...)

Radio and podcast: Several interviews in Spanish and Catalan radio programs and English podcasts (RAC1, Catalunya Radio, RNE, ...)

Twitter: Creator and manager of research group's account, @QUANTIC_BSC (until Jul 2019) and @QRSToronto (until Sep 2021).