Alba Cervera-Lierta | Full CV

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

Education

Doctor of Philosophy (PhD) in Physics   **Universitat de Barcelona**
Supervisor: Dr. José Ignacio Latorre   *2015 – 2019*
Title: Maximal Entanglement: Applications to Quantum Computation and Particle Physics.

Master in Astrophysics, Particle Physics and Cosmology   **Universitat de Barcelona**
Specialized in Particle Physics and Gravitation.   *2014 – 2015*
Thesis title: Non-unitary neutrino oscillations.

Bachelor in Physics   **Universitat de Barcelona**
Specialized in Fundamental Physics   *2009 – 2014*
Thesis title: Scaling of entanglement support for iTEBD algorithm.

Positions

Research

Senior Researcher   **Barcelona Supercomputing Center**
Quantic group (CASE department)   *2021 – Present*

Postdoctoral Fellow   **University of Toronto**
Alán Aspuru-Guzik group   *2019 – 2021*

Technical Researcher   **Barcelona Supercomputing Center**
Quantic group (CASE department)   *2017 – 2019*

Specialized Technician   **Universitat de Barcelona**
Project: "Entanglement, tensor networks and cold gases"   *2014*

Coordinator

Quantum Spain project   **Barcelona Supercomputing Center**
Project Principal Investigator (budget: 22M €)   *2021 – Present*

Quantum Research Seminars Toronto.   **Virtual**
Co-organizer and chair. Youtube: Quantum Research Seminars Toronto.   *2020 – 2021*

Visitor

Center of Quantum Technologies   **National University of Singapore**
Prof. Kwek Leong Chuan group.   *May 2017*

Instituto de Física Teórica   **CSIC**
Dr. César Gómez's group.   *Feb 2017*

Grupo de investigación en Información y Computación Cuántica   **Universidad Politécnica de Madrid**
Dr. Vicente Martín group   *Sep 2016*

Rudolph Pierls Institute for Theoretical Physics   **University of Oxford**
Dr. Juan Rojo's group.   *Jan - May 2016*

Teaching

Teacher Assistant   **Universitat Autònoma de Barcelona**
Calculus I-II, Theoretical Mechanics, Physics I - II.   *2017 – 2019*

Teacher Assistant   **Universitat de Barcelona**
Modern Physics Laboratory, Computational Physics.   *2016 – 2017*

Funded projects

Quantum Spain project — **SEDIA (NextGeneration EU funds)**
Budget: 22M €, Role: principal investigator — *2021 – 2025*
`https://quantumspain-project.es`

Quantum Experience for Academic Research Program — **IBM**
Funding: Exclusive access to pulse-level control of IBM quantum devices, Role: co-PI. — *2021 – 2022*
Project: High-dimensional quantum experiments superconducting circuits.

Awards and Honors

PhD Excellent Cum Laude — **Universitat de Barcelona**
Jun 2019

Teach Me QISKit Award — **IBM**
`https://www.ibm.com/blogs/research/2018/06/teach-qiskit-winner/` — *Jun 2018*
Best interactive self-paced tutorial that explains a specific focus topic in quantum computing using QISKit and the IBM Q Experience.

Publications

Link to Google Scholar and OrcID.

17. Modern applications of machine learning in quantum sciences — **Preprint/Book**
A. Dawid, J. Arnold, B. Requena, et. al. — *2022*
arXiv:2204.04198 [quant-ph].

16. On scientific understanding with artificial intelligence — **Preprint**
M. Krenn, R. Pollice, S. Y. Guo, et. al. — *2022*
arXiv:2204.01467 [cs.CY].

15. Design of quantum optical experiments with Logic Artificial Intelligence — **Preprint**
A. Cervera-Lierta, M. Krenn, A. Aspuru-Guzik — *2021*
arXiv:2109.13273 [quant-ph].

14. Toward Reliability in the NISQ Era: Robust Interval Guarantee for Quantum Measurements on Approximate States — **Phys. Rev. Research**
2022
M. Weber, A. Anand, A. Cervera-Lierta, J. S. Kottmann, T. H. Kyaw, et. al.
Physical Review Research **4**, 033217 (2022).

13. Programming Physical Quantum Systems with Pulse-Level Control — **Front. Phys.**
K. N. Smith, G. S. Ravi, T. Alexander, et. al. — *2022*
Frontiers in Physics, **672** (2022).

12. Learning Interpretable Representations of Entanglement in Quantum Optics Experiments using Deep Generative Models — **Nat. Mach. Intell.**
2021
D. Flam-Shepherd, T. Wu, X. Gu, A. Cervera-Lierta, M. Krenn, A. Aspuru-Guzik
Nature Machine Intelligence **4** (6), 544-554 (2022).

11. Experimental high-dimensional Greenberger–Horne–Zeilinger entanglement with superconducting transmon qutrits — **Phys. Rev. Appl.**
2022
A. Cervera-Lierta, M. Krenn, A. Aspuru-Guzik, A. Galda
Phyical Review Applied **17**, 024062 (2022).

10. Noisy intermediate-scale quantum algorithms — **Rev. Mod. Phys.**
K. Bharti, A. Cervera-Lierta, T. H. Kyaw, T. Haug, et. al. — *2022*
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-Lierta, 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.**

J. S. Kottmann, S. Alperin-Lea, T. Tamayo-Mendoza, <u>A. Cervera-Lierta</u> et. al. 2021

Quantum Science and Technology **6** 024009 (2021).

7. Data Re-uploading for a Universal Quantum Classifier **Quantum**

A. Pérez-Salinas, <u>A. Cervera-Lierta</u>, E. Gil-Fuster, J. I. Latorre 2020

Quantum **4**, 226 (2020).

6. Maximal Entanglement: Applications in Quantum Information and Particle Physics **PhD Thesis**

<u>A. Cervera-Lierta</u> 2019

arXiv:1906.12099 [quant-ph].

5. Quantum Circuits for Maximally Entangled States **Phys. Rev. A**

<u>A. Cervera-Lierta</u>, J. I. Latorre, D. Goyeneche 2019

Physical Review A **100**, 022342 (2019).

4. Exact Ising Simulation on a Quantum Computer **Quantum**

<u>A. Cervera-Lierta</u> 2018

Quantum **2**, 114 (2018).

3. Multipartite Entanglement in Spin Chains and the Hyperdeterminant **J. Phys. A Math. Theor.**

<u>A. Cervera-Lierta</u>, A. Gasull, J. I. Latorre and G. Sierra. 2018

Journal of Physics A: Mathematical and Theoretical **51**, 505301 (2018).

2. Maximal Entanglement in High Energy Physics **SciPost Phys.**

<u>A. Cervera-Lierta</u>, J. I. Latorre, J. Rojo and L. Rottoli 2017

SciPost Physics **3**, 036 (2017).

1. Operational Approach to Bell Inequalities: Application to qutrits **Phys. Rev. A**

D. Alsina, <u>A. Cervera</u>, D. Goyeneche, J. I. Latorre and K. Zyczkowski 2016

Physical Review A **94**, 032102 (2016).

Talks and seminars

* Virtual talks due to COVID-19 pandemic.

Keynote

The Noisy Intermediate-Scale Quantum era **CARLA 2022**

Porto Alegre, Brasil *Sep 28-30, 2022*

Colloquium

Tecnologies quàntiques: present i futur **ICCUB Colloquia**

Universitat de Barcelona *Feb 16, 2022*

Invited

Quantum algorithms in near term devices **New Trends in Computational Chemistry**

IQTC, University of Barcelona (Spain). *Sep 9, 2022*

Quantum Spain **Quantum 2022**

Barcelona (Spain). *Jun 22, 2022*

Quantum Spain: un impulso para el ecosistema de computación cuántica **Jornada cuántica**

NASERTIC, Pamplona (Spain). *May 4, 2022*

Quantum Spain: un impulso para el ecosistema de computación cuántica **Jornada Eco. Cuántico**

SCAYLE, León (Spain). *Mar 1, 2022*

Near term quantum computation: opportunities and challenges **Quantum 2021**

Bilbao (Spain). *Nov 24, 2021*

Noisy Intermediate-Scale Quantum era **JURES 2021**

Virtual (*). *Sep 17, 2021*

Noisy Intermediate-Scale Quantum algorithms **CERN**

Perspectives on Quantum Sensing and Computation for Particle Physics. Virtual (*). *Jul 15, 2021*

The Meta-Variational Quantum Eigensolver **Machine Learning for Quantum X**
Virtual (*). *Jul 6, 2021*

The Meta-Variational Quantum Eigensolver **QWorld Quantum Science Days**
Virtual (*). *Jun 1, 2021*

Chronicles of Entangland, the foundation of the SC town **Qiskit Hackathon Europe**
Virtual (*). *May 26, 2021*

Experimental high-dimensional GHZ entanglement with **Pulse-level Quantum Control Workshop**
superconducting transmon qutrits *May 18, 2021*
Chicago. Virtual (*).

Maximal Entanglement in High Energy Physics **APS April Meeting**
Topical Group on Hadronic Physics. Virtual (*). *Apr 15, 2021*

Noisy Intermediate-Scale Quantum algorithms **Universidad Iberoamericana**
Virtual (*). *Apr 13, 2021*

Please, feed the quantum troll! **Q-Hack 2021**
Virtual (*). *Feb 19, 2021*

Testing and designing quantum algorithms for the NISQ era **INT-20-3**
Quantum Computing and Simulation on Near-Term Devices. Virtual (*). *Nov 21, 2020*

Maximal Entanglement in High Energy Physics, Quantum Entanglement **CFNS Stony Brook**
at Collider Energies *Sep 11, 2018*
Stony Brook (United States).

Exact simulation of a Quantum Phase Transition **Quantum Phase Transitions**
on a quantum computer *Apr 05, 2018*
Barcelona (Spain).

Emergence of Gauge Symmetry **Universidad Complutense de Madrid**
from a Maximal Entanglement Principle *Sep 21, 2016*
Madrid (Spain).

Contributed

The Meta-Variational Quantum Eigensolver **APS March Meeting 2021**
Virtual (*). *Mar 18, 2021*

Data re-uploading for a universal quantum classifier **Q-Turn 2020**
Virtual (*). *Nov 24, 2020*

Data re-uploading for a universal quantum classifier **QTML 2020**
Quantum Techniques Machine Learning. Virtual (*). *Nov 12, 2020*

Maximal Entanglement in Quantum Computation **BSC Severo Ochoa Doctoral Symposium**
Barcelona (Spain). *May 07, 2019*

Seminars

Noisy Intermediate Scale Quantum Computation **Universidad de Zaragoza**
Dept. Condensed Matter Physics. *Jun 3, 2022*

Noisy Intermediate Scale Quantum Computation **Universidad Nacional de Colombia**
Virtual. *Apr 21, 2022*

Design of quantum optical experiments with logic artificial intelligence **MPQ**
Quantum Optics group seminar. *Oct 29, 2021*

High-dimensional quantum computing experiments **CQT**
Prof. Manas Mukherjee group meeting (Singapore, Virtual *) *Aug 03, 2021*

Maximal Entanglement in a Quantum Computer **Fermilab**
Fermilab theory seminars. Virtual (*) *Jun 15, 2021*

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

Lectures and courses

Variational Quantum Computing
IV Summer School on Quantum Computing

Universidad Internacional Menéndez-Pelayo
Sep 5-9, 2022

Near-term quantum computing
Clase introducción al curso en Quantum Computing software.

Universidad Castilla La-Mancha
Jun 20, 2022

NISQ computing
Theory lectures

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

Variational Quantum Computing
III Summer School on Quantum and Q-Inspired Computing

Universidad Internacional Menéndez-Pelayo
Sep 7, 2021

Noisy Intermediate-Scale Quantum Algorithms
Summer School "Machine Learning in Quantum Physics and Chemistry"

Warsaw, Poland
Aug 25, 2021

Quantum Computing in the NISQ era
Talk in Quantum Technologies Winter School

UCL
Dec 10, 2020

Bojos per la Supercomputació
Introductory course in quantum computation for high-school students

BSC
26 Apr – 04 May, 2019

The Quantum Revolution
Seminar at Master in Finance

ESADE Business School
Jun 07, 2018

Panels and round tables

As a moderator

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 2022
Jun 22, 2022

As a participant

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   **IEEE Services**
Pannel discussion with industry and academic members   *Sep 9 2021*

Students

PhD

Berta Casas Font   **University of Barcelona**
                                                              Sep 2022 – Present

Master

Berta Casas Font   **University of Barcelona**
Quantum function fitting and classification beyond the single-qubit model   *Feb 2022 – Jul 2022*
Master Quantum Science and Technology

Undergraduate (degree)

Júlia Barberà Rodríguez   **University of Barcelona**
Application of Grover's quantum algorithm for string matching   *Feb 2022 – Jul 2022*
Physics Degree

Elies M. Gil Fuster   **University of Barcelona**
Variational Quantum Classifier   *Feb 2019 – Jul 2019*
Physics Degree. Co-supervised with J. I. Latorre.

Outreach

Mentorship programs

Quantum Open Source Foundation mentorship program   **QOSF**
Mentor   *Sep 2020 – Jan 2021*

Girls E-Mentorship program   **GEM**
Mentor   *Sep 2020 – June 2021*

Panels and round tables

Premios Nacionales de Investigación   **Barcelona.**
Presenter and moderator of the act.   *May 5, 2022*
Chaired by HRH King and Queen of Spain, Spanish Minister of Science and Universities and Barcelona Mayor.

Mujeres y Digitalización: Por una España Igualitaria   **MINECO**
Round table with Marta Villegas, Lucía Flecha and Susana Fernández.   *Mar 8, 2022*
Moderated by the Secretary of State of Digitalization and AI Carme Artigas.

Dia Internacional Dona i Nena a la ciència   **Ajuntament de Barcelona**
Event with Barcelona city Mayor and government.   *Feb 11, 2022*

Women in Physics path   **Universitat de Barcelona**
Organized by the Equality commission from the Physics Faculty   *Mar 3 2021*

Keynote speech

Margarita Salas Honoris Causa PhD act   **Universidad de Extremadura**
Talk "De las computadoras a los ordenadores"   *Feb 2 2019*

Bojos de la Ciència   **Fundació Catalunya-La Pedrera**
Speech about Bojos per la Supercomputació program   *Dec 10 2018*

Bojos de la Ciència   **Fundació Catalunya-La Pedrera**
Speech at Master grants act   *Oct 16 2018*

Articles

Computación Cuántica en la Nube   **RSEF**
Revista Española de Física   *Mar 2020*

How I became a quantum computation scientist
Medium article for @qiskit   *Jul 2018*

Contributing Writer — **Quantum World Association**
Medium articles, @quantum_wa. — *2018 – 2019*

Talks

Computació quàntica: present i futur d'una revolució tecnològica — **Open Day TIC**
Universitat Politècnica de Catalunya. — *May 12, 2022*

Tecnologías Cuánticas: presente y futuro — **Pint of Science**
Barcelona. — *May 11, 2022*

Quantum Spain: un impulso para el ecosistema de computación cuántica — **CTA**
Seminar for the Corporación Tecnológica de Andalucía. Virtual. — *Apr 26, 2022*

Supercomputación y Quantum Spain — **PTE Disruptive**
Seminar for the Plataforma Tecnologíca Española y de Tecnologías Disruptivas. Virtual. — *Mar 22, 2022*

Tecnologías cuánticas: presente y futuro — **Col·legi de Biòlegs de Catalunya**
Virtual. — *Mar 16, 2022*

Computación Cuántica — **Live Talks Cosmocaixa**
Cosmocaixa (Barcelona) — *Feb 16, 2022*

Quantum Spain — **Meet-up**
Quantum Barcelona and Madrid meet-up. — *Dec 13, 2021/Feb 9, 2022*

Quantum Calling — **K-W Quantum Enthusiasts Meetup**
Waterloo Quantum Meet-up — *Jun 18, 2020*

Quantica — **CCCB**
Quantum computing talk and participation in the exhibition (video) — *Apr 10-Sep 26, 2019*

De las computadoras a los ordenadores — **Margarita Salas Honoris Causa PhD event**
Badajoz, Spain — *Feb 26, 2019*

Technology to manipulate Nature — **El País con tu Futuro**
Madrid, Spain — *Dec 18, 2018*

Quantum Computation: a new paradigm — **TEDx talk**
Sant Feliu de Llobregat, Barcelona, Spain — *Sep 15, 2018*

Quantum Computation — **Cosmocaixa (Science Museum)**
Researcher's Night 2018 — *Sep 28, 2018*

Other skills

Programming Languages

Classical: Fortran, Python, Mathematica.

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

Languages

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

Social Media

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

Media: Several interviews in Spanish national newspapers and participated in radio programs (see my personal webpage for more information and links).