Alba Cervera-Lierta | Full CV

✉ alba.cervera@bsc.es • albacl.github.io • Updated: October 16, 2022

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. Design of quantum optical experiments with Logic Artificial Intelligence — **Quantum** *2022*
A. Cervera-Lierta, M. Krenn, A. Aspuru-Guzik
Quantum **6**, 836 (2022).

16. On scientific understanding with artificial intelligence — **Nat. Rev. Phys.** *2022*
M. Krenn, R. Pollice, S. Y. Guo, et. al.
Nature Review Physics (2022).

15. Modern applications of machine learning in quantum sciences — **Preprint/Book** *2022*
A. Dawid, J. Arnold, B. Requena, et. al.
arXiv:2204.04198 [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.** *2022*
K. N. Smith, G. S. Ravi, T. Alexander, et. al.
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.** *2022*
K. Bharti, A. Cervera-Lierta, 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-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, A. Cervera-Lierta et. al. *2021*
Quantum Science and Technology **6** 024009 (2021).

7. Data Re-uploading for a Universal Quantum Classifier **Quantum**
A. Pérez-Salinas, A. Cervera-Lierta, E. Gil-Fuster, J. I. Latorre *2020*
Quantum **4**, 226 (2020).

6. Maximal Entanglement: Applications in Quantum Information and Particle Physics **PhD Thesis**
A. Cervera-Lierta *2019*
arXiv:1906.12099 [quant-ph].

5. Quantum Circuits for Maximally Entangled States **Phys. Rev. A**
A. Cervera-Lierta, J. I. Latorre, D. Goyeneche *2019*
Physical Review A **100**, 022342 (2019).

4. Exact Ising Simulation on a Quantum Computer **Quantum**
A. Cervera-Lierta *2018*
Quantum **2**, 114 (2018).

3. Multipartite Entanglement in Spin Chains and the Hyperdeterminant **J. Phys. A Math. Theor.**
A. Cervera-Lierta, 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.**
A. Cervera-Lierta, 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, A. Cervera, 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 *superconducting transmon qutrits* — **Pulse-level Quantum Control Workshop**
Chicago. Virtual (*). — *May 18, 2021*

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 *at Collider Energies* — **CFNS Stony Brook**
Stony Brook (United States). — *Sep 11, 2018*

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

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

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 — **Scientific Machine Learning Webinars**
Virtual. — *May 6, 2021*

Noisy Intermediate-Scale Quantum algorithms — **Alexandria University**
Hypatia Series. Virtual(*). — *Apr 8, 2021*

Maximal Entanglement in High Energy Physics — **University of Maryland**
Nuclear Theory series. Virtual(*). — *Apr 2, 2021*

Noisy Intermediate-Scale Quantum algorithms — **Académie Royale de Belgique**
Belgian Quantum Physics Initiative. Virtual(*). — *Mar 4, 2021*

Designing VQA with Tequila — **Quantum Conversations by the Bay**
Virtual. — *Nov 28, 2020*

Maximal Entanglement. Applications to Quantum Computation and Particle Physics — **UofT**
Matterlab group meeting. Toronto (Canada). — *Mar 1, 2029*

Lectures and courses

Variational Quantum Computing — **Universidad Internacional Menéndez-Pelayo**
IV Summer School on Quantum Computing — *Sep 5-9, 2022*

Near-term quantum computing — **Universidad Castilla La-Mancha**
Clase introducción al curso en Quantum Computing software. — *Jun 20, 2022*

NISQ computing — **Institut de Ciències Fotòniques (ICFO)**
Theory lectures — *Mar 15-24, 2022*

Variational Quantum Computing — **Universidad Internacional Menéndez-Pelayo**
III Summer School on Quantum and Q-Inspired Computing — *Sep 7, 2021*

Noisy Intermediate-Scale Quantum Algorithms — **Warsaw, Poland**
Summer School "Machine Learning in Quantum Physics and Chemistry" — *Aug 25, 2021*

Quantum Computing in the NISQ era — **UCL**
Talk in Quantum Technologies Winter School — *Dec 10, 2020*

Bojos per la Supercomputació — **BSC**
Introductory course in quantum computation for high-school students — *26 Apr – 04 May, 2019*

The Quantum Revolution — **ESADE Business School**
Seminar at Master in Finance — *Jun 07, 2018*

Panels and round tables

As a moderator

Round table Industrial forum — **Quantum 2022**
Participants: Marc Almendros, Niels Bultink, Gianni del Bimbo, Daniel Szombati, Yonatan Cohen, Josep M. Martorell, Heike Riel and Carmen Palacios. — *Jun 22, 2022*

As a participant

Quantum Technologies — **Barcelona Deep Tech Summit**
Panel with Silvia Carrasco, Carlos Abellán and Enrique Mora. — *Sep 22, 2022*
Moderated by Rubén Criado

The Impact of Advanced Computing in AI — **Science|Business**
Round table with Jean Pierre Panziera and Nicolas Moes. — *Sep 19 2022*
Moderated by David Pringle

The Future of HPC — **ACM Europe Summer School**
Panel with Paul Messina, Per Stenström, Uri Weiser and Min Li. — *Sep 2 2022*
Moderated by Josephine Wood

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).