

Silvia Rodríguez Alcaraz

PhD in High-Performance Computing

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Research Interests

My scientific interests focus on the field of High-Performance Computing (HPC), more specifically on heterogeneous computing and distributed HPC systems. During my PhD, I developed portable heterogeneous applications using SYCL, a unified programming model, evaluating their performance on CPU, GPU and FPGA platforms hosted on cloud and cluster systems. In addition, I have experience in the efficient processing of 3D point clouds, both aerial and terrestrial, obtained through photogrammetry techniques or LiDAR sensors.

Keywords: High-Performance Computing (HPC); heterogeneous computing; performance portability; High-Level Synthesis (HLS); 3D point clouds

Education

2020–2025	PhD Cum Laude in Computer Science , specialised in High-Performance Computing, University of Santiago de Compostela. Thesis: “Portable heterogeneous computing on distributed HPC systems”.
2019–2020	MSc in High-Performance Computing , University of Santiago de Compostela. Thesis: “Parallelization and optimization of the Prometheus model using LiDAR point clouds”.
2014–2019	BSc in Computer Science , University of Santiago de Compostela. Thesis: “FlinkBWA: Big Data technologies for genetic sequence alignment”.

Research Experience

2021-2025	Singular Research Center for Intelligent Technologies (CiTIUS) Predoctoral researcher — PhD student (FPI scholarship, Spanish Ministry)
2019-2021	Singular Research Center for Intelligent Technologies (CiTIUS) Research assistant
2019	Singular Research Center for Intelligent Technologies (CiTIUS) Collaboration scholarship holder

Research Visits

Fall 2024	Systems Group, ETH Zürich Guest researcher
Spring 2023	ESRG Group, University of Minho Guest researcher

Industry Experience

- Spring 2019 **Galicia Supercomputing Center (CESGA)**
 Graduated intern
- Summer 2018 **Hewlett-Packard Enterprise (HPE)**
 Undergraduated intern

Publications

- 2026 Alberto M. Esmorís, Miguel Yermo, **Silvia R. Alcaraz**, Samuel Soutullo, Francisco F. Rivera (2026). “Deep Learning for Ultra-Large-Scale Semantic Segmentation of Geographic 3D Point Clouds With Missing Labels”. In: *IEEE Access* 14, pp. 485–501. DOI: [10.1109/ACCESS.2025.3647154](https://doi.org/10.1109/ACCESS.2025.3647154)
- 2025 **Silvia R. Alcaraz**, Ruben Laso, David L. Vilariño, Francisco F. Rivera (2025). “SYCL for CPU+GPU Heterogeneous Computing: A Study on Integrated and Discrete GPUs”. In: *2025 IEEE International Conference on Cluster Computing Workshops (CLUSTER Workshops)*, pp. 1–2. DOI: [10.1109/CLUSTERWorkshops65972.2025.11164210](https://doi.org/10.1109/CLUSTERWorkshops65972.2025.11164210)
- 2025 Pablo Liste, **Silvia R. Alcaraz**, Oscar G. Lorenzo, José C. Cabaleiro, Francisco F. Rivera (2025). “Evaluación de modelos de DL en nubes de puntos LiDAR para aplicaciones de automoción en tiempo real”. es. In: *Avances en arquitectura y tecnología de computadores. Actas de las Jornadas SARTECO 2025*. Sevilla, Spain: Zenodo, pp. 43–51. ISBN: 978-84-09-74530-2. DOI: [10.5281/ZENODO.16633724](https://doi.org/10.5281/ZENODO.16633724)
- 2024 **Silvia R. Alcaraz**, Ruben Laso, Oscar G. Lorenzo, David L. Vilariño, Tomás F. Pena, Francisco F. Rivera (2024). “Assessing Intel OneAPI capabilities and cloud-performance for heterogeneous computing”. In: *The Journal of Supercomputing* 80, pp. 13295–13316. ISSN: 1573-0484. DOI: [10.1007/s11227-024-05958-5](https://doi.org/10.1007/s11227-024-05958-5)
- 2023 **Silvia R. Alcaraz**, Ruben Laso, Oscar G. Lorenzo, David L. Vilariño, Tomás F. Pena, Francisco F. Rivera (2023). “Performance evaluation of heterogeneous CPU+iGPU and CPU+FPGA schemes using Intel OneAPI on the cloud”. In: *International Conference Computational and Mathematical Methods in Science and Engineering (CMMSE)*. Rota (Spain)

Teaching Experience

University of Santiago de Compostela

- Spring 2025 **Teaching assistant**
 Operating Systems II, Computer Science Degree.
- Fall 2023 **Teaching assistant**
 Networks, Computer Science Degree.
- Fall 2022 **Teaching assistant**
 Operating Systems I, Computer Science Degree.

Tutoring Experience

University of Santiago de Compostela

- Master thesis
 2023/2024 Evaluation of the SYCLomatic tool.

- 2021/2022 Parallelization of a graph-based 3D point cloud segmentation algorithm using heterogeneous programming.
- Bachelor thesis
 - 2024/2025 Real-time processing of terrestrial LiDAR point clouds.
 - 2023/2024 Digital audio signal processing over programmable logic.
 - 2022/2023 Multieffect system for electric guitar on programmable logic.
 - 2022/2023 FPGA image and video processing using high-level languages.
 - 2021/2022 Edge computing of LiDAR data on heterogeneous systems.
 - 2021/2022 Semi-automatic vegetation classification tool using LiDAR.

Awards & Fellowships

- 2023 **IACOBUS Scholarship**
European Grouping of Territorial Cooperation - Galicia-Northern Portugal (GNP-ECTC) Grant for a short research stay at the Universidade do Minho (Portugal).
- 2021 **FPI Scholarship**
Scholarship supported by the Spanish Ministry of Science, Innovation and Universities for pursuing a PhD in the field of Computer Science at CiTIUS.
- 2019 **Collaboration Scholarship**
Scholarship supported by the Spanish Ministry of Education and Professional Training for collaborating during 8 months in reseach activities at the Department of Electronics and Computing of the University of Santiago de Compostela.
- 2019 **Altia Award Finalist**
Top 5 best Bachelor Theses in Computer Science at the University of Santiago de Compostela in the 2019 Altia Premia program.

Languages

Spanish (native), Galician (native), English (advanced).

Certificates

- 2023 **English Level C1 Certificate (CEFR).**
Centre for Modern Languages, University of Santiago de Compostela.
- 2014 **Galician CELGA 4a Certificate. Council of Europe C1.**
Obtained after completing official secondary education in Galicia (Spain).

Open-source projects

- 2023 (v1)  [ihp-sycl](#)
- 2025 (v2)
- 2018 (v1)  [FlinkBWA](#)