Carmen Amo Alonso

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Research Interests

- Large Language Models, Natural Language Processing, Computational Linguistics.
- Data-driven Approaches, Machine Learning, Artificial Intelligence.
- Robust and Distributed Optimal Control, Convex Optimization, Cyber-Physical Systems.

Postdoctoral Positions

Schmidt Science Fellow — 2024 – Present
Computer Science Department, Stanford University — *Stanford, CA*

Postdoctoral Fellow — 2023 – 2024
Artificial Intelligence Center, ETH — *Zurich, Switzerland*

Education

California Institute of Technology — Pasadena, CA
Ph.D. in Control and Dynamical Systems — *2017 – 2023*
Thesis topic: "Distributed and Localized Model Predictive Control". Advised by Dr. John C. Doyle.

California Institute of Technology — Pasadena, CA
M.Sc. in Space Engineering — *2016 – 2017*

Technical University of Madrid — Madrid, Spain
B.Sc. in Aerospace Engineering — *2012 – 2016*

Selected Research Experience

Computer Science Department, Stanford University — Stanford, CA
Postdoctoral Fellow with Dr. Christopher Ré — *2024 – Present*

Artificial Intelligence Center, ETH — Zürich, Switzerland
Postdoctoral Fellow with Dr. Melanie Zeilinger, Dr. Florian Dorfler, and Dr. Ryan Cotterell — *2023 – 2024*

Control and Dynamical Systems, California Institute of Technology — Pasadena, CA
Graduate Research Assistant with Dr. John Doyle — *2017 – 2023*

Modeling and Optimization Engineering Team, Tesla Inc. — Palo Alto, CA
Graduate Student Intern — *Spring 2022*

Space Propulsion Laboratory, Massachusets Institute of Technology — Cambridge, MA
Undergraduate Research Assistant with Dr. Manuel Martinez-Sanchez — *Winter 2016*

Applied Mathematics Department, Technical University of Madrid — Madrid, Spain
Undergraduate Research Assistant with Dr. Ignacio Gomez — *2015-2016*

Computational Mechanics Group, California Institute of Technology — Pasadena, CA
Undergraduate Research Assistant with Dr. Michael Ortiz — *Summer 2015*

Turbocharger Research Group, Imperial College of London — London, UK
Undergraduate Research Assistant with Dr. Ricardo Martinez-Botas — *Summer 2014*

Teaching and Mentoring Experience

Graduate Mentoring, ETH — Zürich, Switzerland

Mentor of master student Federico Arangath — *2024*

Mentor of master student Alessandro Tuccillo — *2024*

Mentor of master student Gaia Lauper — *2024*

Mentor of master student Seif Ismail — *2023*

Undergraduate and Graduate Mentoring, California Institute of Technology — Pasadena, CA

Mentor of master visiting student Siqi Li — *2022–2023*

Mentor of PhD student Lauren Conger — *Winter 2022*

Mentor of PhD student Fengjun Yang — *Spring 2021*

Certificate of Interest in Undergraduate Research Mentoring — *Spring 2020*

Mentor of undergraduate summer student Sabina Gutheim — *Summer 2019*

Undergraduate and Graduate Teaching, ETH — Zürich, Switzerland

Co-instructor of Distributed Model Predictive Control — *Spring 2024*

Co-instructor of AI Center Projects in Machine Learning Research — *Winter 2024*

Undergraduate Teaching, Merida Autonomous University — Merida, Mexico

Creator and co-instructor of a one week course on Control Theory and Natural Language — *July 2023*

(Selected by the non-profit organization Clubes de Ciencia Mexico. Taught in Spanish)

Undergraduate and Graduate Teaching, California Institute of Technology — Pasadena, CA

Teaching Assistant of CDS 231 (Robust Control Theory) — *Spring 2023*

Teaching Assistant of CDS 112 (Optimal Control and Estimation) — *Winter 2023*

Teaching Assistant of CDS 141 (Network Control Systems) — *Spring 2021*

Teaching Assistant of CDS 231 (Robust Control Theory) — *Winter 2020*

Head of Teaching Assistants of ACM 95/100 (Introductory Methods of Applied Mathematics) — *Winter 2019*

Head of Teaching Assistants of ACM 116 (Introduction to Probability Models) — *Fall 2019*

Teaching Assistant of ACM 95/100 (Introductory Methods of Applied Mathematics) — *Winter 2018*

Selected Honors and Awards

Schmidt Science Fellowship — *2024*

Milton and Francis Clauser Doctoral Prize - *For the **best PhD thesis** at Caltech across all disciplines* — *2023*

MIT Engineering Excellence Postdoctoral Fellowship — *2023*

ETH Artificial Intelligence Center Postdoctoral Fellowship — *2023*

Best Student Paper Award at the International Conference on Control and Automation — *2022*

Named Rising Star in Electrical Engineering & Computer Science — *2022*

Named Rising Star in Cyber-Physical Systems — *2022*

Amazon AI4Science Fellowship — *2021*

D.E. Shaw Exploration Fellowship — *2019*

Foster and Coco Stanback Fellowships in Engineering and Applied Science — *2016*

UPM-MIT Exchange Fellowship — *2016*

Undergraduate Research Collaboration Fellowship - *Awarded by the Department of Education of Spain* — *2015*

Summer Undergraduate Research Fellowship - *Awarded by California Institute of Technology* *2015*

Undergraduate Researcher Fellowship - *Awarded by Technical University of Madrid* *2015*

Undergraduate Research Opportunity Program - *Awarded by Imperial College London* *2014*

Gold Medal at the XXV Competition of Young Researchers in Spain *2012*

Journal Publications

* denotes equal contribution

[J1] J. S. Li and **C. Amo Alonso**. Global performance guarantees for localized model predictive control. To appear in *IEEE Open Journal of Control Systems*, 2023

[J2] **C. Amo Alonso**, J. S. Li, J. Anderson, and N. Matni. Distributed and localized model predictive control. Part II: Theoretical guarantees. *IEEE Transactions on Control of Network Systems*, 10(3):1113 – 1123, 2023

[J3] **C. Amo Alonso**, J. S. Li, J. Anderson, and N. Matni. Distributed and localized model predictive control. Part I: Synthesis and implementation. *IEEE Transactions on Control of Network Systems*, 10(2):1058 – 1068, 2023

[J4] **C. Amo Alonso***, F. Yang*, and N. Matni. Data-driven distributed and localized model predictive control. *IEEE Open Journal of Control Systems*, 1:29–40, 2022

Conference Publications

[C1] F. A. Joseph, J. Sieber, M. N. Zeilinger, and **C. Amo Alonso**. Lambda-Skip Connections: the architectural component that prevents Rank Collapse. In Submitted to *Proceedings of the International Conference on Learning Representations (ICLR)*, 2025

[C2] E. Cheng, M. Baroni, and **C. Amo Alonso**. Linearly Controlled Language Generation with Performative Guarantees. In Submitted to *Proceedings of the International Conference on Learning Representations (ICLR)*, 2025

[C3] **C. Amo Alonso***, J. Sieber*, and M. N. Zeilinger. State Space Models as Foundation Models: A Control Theoretic Overview. In Submitted to *Proceedings of the 2025 IEEE American Control Conference*. IEEE, 2025

[C4] J. Sieber*, **C. Amo Alonso***, A. Didier, M. N. Zeilinger, and A. Orvieto. Understanding the differences in Foundation Models: Attention, State Space Models, and Recurrent Neural Networks. In Accepted to *Proceedings of the Conference on Neural Information Processing Systems (NeurIPS)*, 2024

[C5] S. Ismail*, A. Arbues*, R. Cotterell, R. Zurbrügg, and **C. Amo Alonso**. NARRATE: Versatile Language Architecture for Optimal Control in Robotics. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems*. IEEE/RSJ, 2024

[C6] **C. Amo Alonso** and S.-H. Tseng. Effective GPU Parallelization of Distributed and Localized Model Predictive Control. In *Proceedings of the 17^{th} IEEE International Conference on Control and Automation*. IEEE, 2022. **Best Student Paper Award**

[C7] J. S. Li, **C. Amo Alonso**, and J. C. Doyle. Frontiers in Scalable Distributed Control: SLS, MPC, and beyond. In *Proceedings of the 2021 IEEE American Control Conference*. IEEE, 2021

[C8] **C. Amo Alonso**, J. Anderson, and N. Matni. Explicit Distributed and Localized Model Predictive Control via System Level Synthesis. In *Proceedings of the 59^{th} IEEE Conference on Decision and Control*. IEEE, 2020

[C9] **C. Amo Alonso** and N. Matni. Distributed and Localized Model Predictive Control via System Level Synthesis. In *Proceedings of the 59th IEEE Conference on Decision and Control*. IEEE, 2020

[C10] S.-H. Tseng, **C. Amo Alonso**, and S. J.Han. System Level Synthesis via Dynamic Programming. In *Proceedings of the 59th IEEE Conference on Decision and Control*. IEEE, 2020

[C11] **C. Amo Alonso**, D. Ho, and J. M. Maestre. Distributed linear quadratic regulator robust to communication dropouts. In *Proceedings of the 21st World Congress of the International Federation of Automatic Control*. IFAC, 2020

[C12] N. Olsman, **C. Amo Alonso**, and J. C. Doyle. Architecture and trade-offs in the heat shock response system. In *Proceedings of the 57th IEEE Conference on Decision and Control*. IEEE, 2018

Academic Service

Co-organizer

Next Generation of Sequence Modeling – Workshop at the International Conference on Machine Learning (ICML) *2024*
System Level Synthesis and its frontiers – Workshop at the IEEE Conference on Decision and Control (CDC) *2022*

Member of Future of Life Institute

Member of the Future of Life Institute community, whose mission to ensure that transformative technology is developed responsibly and for the benefit of society as a whole. *2022*

Named Leap Fellow

Fellow of the LEAP Alliance, whose mission is to diversify future leadership in the computing professoriate as a way to increase diversity across the field of computing. *2022*

Co-founder

Hispanics in Computing and Mathematical Sciences – Affinity group at Caltech to carry out outreach activities in Hispanic communities *2021*

Peer Reviewer

IEEE Conference on Decision and Control, IEEE American Control Conference, IEEE Transactions on Automatic Control, IEEE Transactions on Vehicular Technology, IEEE Transactions on Control of Network Systems, Learning for Dynamics & Control Conference *Ongoing*