

Josué Ortega Caro, PhD

CONTACT

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GitHub: [josueortc](https://github.com/josueortc)

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INTEREST

Perceptual Representation, Neural Predictive Models, Recurrent Computation, High Dimensional Neural Data Analysis

EDUCATION

Baylor College of Medicine, TX 2016–2022

Ph.D., Quantitative and Computational Biosciences, • Advisor: *Prof. Ankit Patel*

Universidad Peruana Cayetano Heredia, PE 2010–2014

B.Sc., *Biology*, • Advisor: *Mirko Zimic*, GPA: 4.0

WORK EXPERIENCE

Department of Neuroscience, Yale University, CT 2025–

Swartz Postdoctoral Fellow • Mentor: *Prof. Jess Cardin*

Wu Tsai Institute, Yale University, CT 2022–2025

Wu Tsai Fellow • Mentors: *Prof. Jess Cardin & Prof. David van Dijk*

PUBLICATIONS AND PREPRINTS

Ortega Caro, J., Zhang, Y., Batchelor, H., Cardin, J. A. & Saxena, S. (2026). *FLUX: Longitudinal Flow Matching with Mixture of Experts*. In Proceedings of the NeurIPS 2026

Zhang, Y., **Ortega Caro, J.**, Oren, R., Cardin, J. A., Higley, M. & Saxena, S. (2026). *Learning Interpretable Switching Dynamics in Shared Neural-Behavioral Latent Space*. In Proceedings of the NeurIPS 2026

Rizvi, S., Nguyen, N., Lyu, H., Christensen, B., **Caro, J. O.**, Zappala, E., Brbic, M., and Dhodapkar, R. M. & van Dijk, D. (2026). *FIMP: Foundation Model-Informed Message Passing for Graph Neural Networks*. Transactions on Machine Learning Research. August 2026.

Ortega Caro, J., Batchelor, H. M., Lohani, S., van Dijk, D., & Cardin, J. A. (2025). *Selective changes in cortical cholinergic signaling during learning*. bioRxiv, 2025-08.

Zappala, E., Fonseca, A., **Caro, J. O.** & van Dijk, D. (2024). *Learning integral operators via neural integral equations*. Nature Machine Intelligence, 1-17.

Levine, D., Lévy, S., Rizvi, S. A., Pallikkavaliyaveetil, N., Chen, X., Zhang, D., ... **Ortega Caro, J.**, Karbasi, A., Dhodapkar, R., & van Dijk, D. (2024). *Cell2sentence: Teaching large language models the language of biology*. In Proceedings of the ICML, July 2024.

Ortega Caro, J., Oliveira Fonseca, A. H., Averill, C., Rizvi, S. A., Rosati, M., Cross, J. L., ... & van Dijk, D. (2024). **BrainLM: A foundation model for brain activity recordings**. In Proceedings of the ICLR, May 2024.

Caro, J. O., Ju, Y., Pyle, R., Dey S., Brendel W., Anselmi F. & Patel, A. (2024). **Translational symmetry in convolutions with localized kernels causes an implicit bias toward high frequency adversarial examples**. Frontiers in Computational Neuroscience, 18, 1387077.

Liang H., **Caro, J. O.**, Maheshri V., Patel, A. B., & Balakrishnan, G. (2024). **Linking convolutional kernel size to generalization bias in face analysis CNNs**. In Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision (pp. 4705-4715).

Fonseca, A., Zappala, E., **Caro, J. O.** & van Dijk, D. (2023). **Continuous Spatiotemporal Transformers**. In Proceedings of the ICML, July 2023

Li, Z.(*), **Caro, J. O.**(*), Rusak E., Brendel W., Bethge M., Anselmi F., Patel A. B., Tolias A. & Pitkow X. (2023). **Robust deep learning object recognition models rely on low frequency information in natural images**, PLOS Computational Biology, 19(3), e1010932.
(*) Co-first Authors

Karantzas, N., Besier, E., **Caro, J. O.**, Pitkow, X., Tolias, A. S., Patel, A. B., & Anselmi, F. (2022). **Understanding robustness and generalization of artificial neural networks through Fourier masks**. Frontiers in Artificial Intelligence, 2022.

Sahs, J., Pyle, R., Damaraju, **A., Caro, J. O.**, Tavaslioglu, O., Lu, A., & Patel, A. (2022). **Shallow Univariate ReLu Networks as Splines: Initialization, Loss Surface, Hessian, & Gradient Flow Dynamics**. Frontiers in Artificial Intelligence, 2022.

Tang, H., Schrimpf, M., Lotter, W., Moerman, C., Paredes, A., **Caro, J. O.**, ... & Kreiman, G. (2017). **Recurrent computations for visual pattern completion**. Proceedings of the National Academy of Sciences, 2017, 19397.

HONORS AND AWARDS	Swartz Postdoctoral Fellowship	2026 - 2027
	Champalimaud Research Symposium Best Talk and Travel Award	2025
	Wu Tsai Postdoctoral Fellowship	2022 - 2025
	International Conference in Machine Learning Travel Award	2020
	Best Poster Award, Quantitative and Computational Biosciences PhD Retreat	2019
	Fondo de Movilidad Estudiantil (Traveling Award), UPCH	2014

INVITED TALKS	Neuro-cibernetics At Scale , Champalimaud Research Symposium, Lisbon, Portugal (2025). Talk Title: Spatiotemporal Modeling of Cortical Cholinergic and Calcium Signaling Dynamics Across Learning
	Foundation Models in Neuroscience Workshop , Computational and Systems Neuro (COSYNE) Conference, Montreal, Canada (2025). Talk Title: BrainLM: A foundation model for brain activity recordings
	Shared Visual Representation between Humans and Machine Workshop , NeurIPS Conference, New Orleans, LA USA (2022). Talk Title: Local Convolutions Cause an Implicit Bias towards High Frequency Adversarial Examples
	Center for Brain, Minds and Machines , MIT, Cambridge, MA USA (2021). Talk Title: Local Convolutions Cause an Implicit Bias towards High-Frequency Adversarial Examples
	Theoretical and Computational Neuroscience Conference , Houston, TX, USA (2019). Talk Title: A Simple Visual Task Demonstrating the Benefit of Lateral or Feedback

Connections.

CONFERENCES AND COURSES

COSYNE Conference (2024), Lisbon, Portugal. Poster Title: Spatiotemporal modeling of cortical cholinergic and calcium signaling dynamics across learning.

NeuroNex Workshop (2019), San Diego, CA, USA. Poster Title: A Simple Visual Task Demonstrating the Benefit of Lateral or Feedback Connections.

Brains and Bits: Neuroscience Meets Machine Learning Workshop, NeurIPS Conference (2016), Barcelona, Spain. Poster Title: Recurrent computations for pattern completion.

VI Latin American School on Computational Neuroscience, LASCON (2016) - University of Sao Paulo. Sao Paulo, Brazil. I presented a project titled: "Synchronization differences in a network memory model of CA3 with progressive neuronal removal"

Society for Neuroscience, 2014, Washington D.C., USA

TEACHING

Department of Computer Sciences, Rice University, US

Graduate Teaching Assistant

2017-2018

Introduction to Deep Learning

- Module: *Graduate*
- Designed course material (slides and exercises).
- Taught a lecture on recurrent convolutional networks.

Department of Exact Sciences, Universidad Peruana Cayetano Heredia, PE

Teaching Assistant

2015-2016

- Classes Taught: *Univariate Calculus, Multivariate Calculus, Differential Equations*

VOLUNTEERING

Research Experience for Peruvian Undergraduates (REPU)

Mentor and Research supervisor

2024-

LatinX in AI

Organizer - LatinX in AI @ NeurIPS 2020

2020

NeuroMatch Academy

Development of Mentor-Project Matching Algorithm

2020

Serendipity

Head of the Department of Data Analytics

2020-

Head of the Department of Partnerships

2018-2020

One-on-one mentoring and lectures for the students in the program

2017-