

CARLOS AREVALO RIVAS

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CURRENT RESEARCH INTERESTS

Mathematical Physics, Algebraic Topology, Geometric Topology, Dynamical Systems, Arithmetic Geometry, Complex Analysis, Analytic Number Theory, Quantum Field Theory, Quantum Gravity, Quantum Information and Science, Computational Sciences for the Life Sciences, Molecular Sciences, Functional Genomics, Omics

PROFESSIONAL APPOINTMENTS

Career Break

Self-Employed

📅 12/2023 📍 Remotely, CA

Computational Life Science Research Professional

Stanford University

📅 09/2023 - 11/2023 📍 Stanford, CA

Resigned to research appointment early due to unethical and unmoral practices in and outside the research group.

Computational Research Specialist

University of California

📅 02/2023 - 06/2023 📍 Santa Cruz, CA

Resigned to research appointment to take on more complex scientific responsibilities, novel scientific challenges, and professional growth.

Computational Biologist

Dana-Farber Cancer Institute, Harvard Medical School (HMS)

📅 07/2022 - 01/2023 📍 Boston, MA

Resigned to research appointment early due to unethical and unmoral practices in and outside of the research group.

Visiting Computational Biologist

Broad Institute of MIT and Harvard

📅 06/2022 - 07/2023 📍 Cambridge, MA

Associate Computational Biologist

Broad Institute of MIT and Harvard

📅 07/2021 - 05/2022 📍 Cambridge, MA

Resigned to research appointment early to take on more complex scientific responsibilities on theoretical and computational sciences.

EDUCATION

Bachelor of Science in Molecular, Cellular, and Developmental Biology

University of California, Santa Cruz

📅 2019 - 2021 📍 Santa Cruz, CA

Associate of Arts in Mathematics and Sciences

Contra Costa College

📅 2016 - 2019 📍 San Pablo, CA

Certificate of Achievement in Science, Technology, Engineering, and Mathematics

Contra Costa College

📅 2016 - 2019 📍 San Pablo, CA

TEACHING EXPERIENCE

Undergraduate Research Mentor

Broad Institute of MIT and Harvard

📅 07/2021 - 05/2022

RESEARCH EXPERIENCE

Computational Associate

Broad Institute of MIT and Harvard

📅 07/2020 - 06/2021 📍 Cambridge, MA

BSRP Fellow

Broad Institute of MIT and Harvard

📅 06/2020 - 07/2020 📍 Cambridge, MA

Undergraduate Researcher

University of California, Santa Cruz

📅 09/2019 - 06/2021 📍 Santa Cruz, CA

Neuroscience Summer Research Assistant

Massachusetts General Hospital, HMS

📅 05/2019 - 08/2019 📍 Boston, MA

Research Assistant

Contra Costa College

📅 08/2018 - 05/2019 📍 San Pablo, CA

SELECTED HONORS & AWARDS

Dean's Undergraduate Award

University of California, Santa Cruz

📅 06/2021

NIH-NHGRI Research Institute Fellow

University of California, Santa Cruz Genomics Institute

📅 09/2019 - 2021

BSRP Fellow

Broad Institute of MIT and Harvard

📅 06/2020 - 07/2020

Summer Research Fellow

Center for Science Excellence, Contra Costa College

📅 05/2019

Academic Excellence Scholarship

Center for Science Excellence, Contra Costa College

📅 09/2017 - 05/2019

Dean's Undergraduate Honors

Contra Costa College

📅 2017 - 2019

COMPUTATIONAL SKILLS

Programming Languages

Python, C++, R, Rust, Go, Julia

Scripting Programming Languages

Bash/Shell, SQL, JavaScript, CSS, HTML

Selected Frameworks

Python and C++: Numpy, SciPy, Pandas, Polars, TensorFlow, Torch, Scikit-Learn, Keras, Jax, Matplotlib, CV. R: tidyverse, tidyr, dplyr, plyr, ggplot2, ggpubr, stats, matrix.

TEACHING EXPERIENCE

Biological Sciences Tutor

Contra Costa College

10/2018 - 05/2019

Middle-School Tutor and Mentor

Contra Costa College

09/2017 - 05/2019

EXPERIMENTAL SKILLS

Molecular Biology and Biochemistry

Next-generation sequencing (NGS) assay development and optimization from sample collection, handling, and processing to nucleic acids (DNA, RNA) and protein extraction, purification, synthesis, sequencing, and computational data analysis. Protein Affinity Chromatography. Enzyme-Linked Immunosorbent Assay (ELISA). Genotyping. Wester Blotting and Gel Electrophoresis. Real-time quantitative PCR (RT-qPCR) and Digital Droplet PCR (ddPCR). Immunoprecipitation, Flow Cytometry, and Mass-Spectrometry (MS). Gene-editing, screening, perturbation, and knockdown with CRISPR/Cas systems. Vector constructs design and cloning.

Cellular Biology

Cell culture for human and mouse cell lineages and tissue. Immunofluorescence and Immunohistochemistry (IHC) assays and staining for mouse and human tissues including organelle and molecular staining and visualization.

Microscopy & Imaging

Light, fluorescence, and con-focal microscopy of mouse and human tissues. Sample, and mouse tissue handling and sectioning for staining, microscopy, analysis, and visualization (including cellular and organelle 3D-reconstruction).

End-to-end pipeline, protocol, and technical reporting, development, and optimization for quality assurance. Protocol, techniques, and experimental data analysis instruction.

PROFESSIONAL INTERESTS

IAIFI Virtual School AI + Physics

08/2026

Virtual attendee, University of Massachusetts-Boston

The Future of Mathematics Symposium

05/2026

Virtual attendee, Stanford University

COMPUTATIONAL SKILLS

Full-Stack Software Engineering & Software Development

Research pipelines, infrastructure, methods, HPC systems, software and systems design, development operations and data visualization tools, and software development across the full-stack. Continuous integration (CI) and continuous deployment (CD). Benchmarking, testing, and software containerization (i.e., Docker, Nextflow, Singularity).

Bioinformatics & Computational Biology

Genomics: Long-read sequencing (LRS), whole-genome sequencing (WGS), and whole-exome sequencing (WES) analysis, variant and mutation calling, cancer driver gene and mutation discovery. Genome-wide association study (GWAS), and statistical modeling and analysis. Transcriptomics: single-cell and single-nuclei RNA sequencing, and bulk-RNA sequencing analysis. Proteomics: single-cell and bulk mass-spectrometry-based proteomics and phosphoproteomics analysis. Epigenomics and metabolomics analysis.

Artificial Intelligence & Machine Learning

Language models (LLMs) and transformer-based architectures for autoregressive, multi-modal and generalist, diffusion, vision, and sequence-to-sequence artificial intelligence and machine learning systems. Convolutional neural networks (CNN), Feed-forward networks (FFN), and Recurrent neural networks (RNN) models and architectures. Vision transformer (ViT), Residual neural networks (ResNet), Denoising diffusion probabilistic (DDPMs), Variational auto-encoders (VAEs), Multi-layer perceptrons (MLPs), and Diffusion transformers (DiTs) models and architectures. Data modalities: Vision-language (i.e., text, image), control environments (i.e., image, observations, actions, proprioceptions), audio and video. Data tokenization (i.e., multimodal, patching, image, and sequence), embedding, and positional encoding. Deep neural network architectures, models, and systems for regression, classification and prediction inference.

Data Science & Data Analytics

Data processing, analysis and visualization. Regression models (i.e., linear regression, logistic regression, regression models for survival analysis, generalized linear models). Statistical learning, modeling, and testing. Dimensionality reduction and clustering: principal component analysis (PCA), t-distributed stochastic neighbor embedding (t-SNE), uniform manifold approximation and projection (UMAP). Remote server, high-performance computing (HPC), cloud-based computational environments (i.e., Google-cloud platform (GPC), Gradient) and notebooks. Bash and Shell (Unix and Linux) scripting, virtual environments and machines, and notebooks.