

Gabriel Miranda de Araujo

Computational Postgraduate Associate – Yale School of Medicine

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EDUCATION

2022 - 2024 MSc in Computer Science at **University of California, Irvine** - GPA: 3.96/4.0 Irvine, CA
2017 - 2021 BSc in Computer Science at **University of São Paulo** - GPA: 8.0/10.0 São Paulo, Brazil
Awarded Undergraduate Research Fellowship from Brazilian National Council for Scientific and Technological Development (CNPq)

SUMMARY

Computer scientist specializing in geometric and generative machine learning for spatial and single-cell biology. Developed graph neural network methods to infer metabolic cooperation from spatial transcriptomics (1M+ cells). Experienced in multi-modal histopathology, metabolic modeling, and ML systems.

RESEARCH EXPERIENCE

Computational Postgraduate Associate

July 2024 - Present

PI: Hattie Chung, PhD

Yale School of Medicine

- Developed a novel algorithm, **MIND**, a geometric deep learning framework that infers single-cell metabolic rates and spatial metabolic “divisions of labor” using transcriptomics and spatial coordinates; incorporates Kirchhoff’s law to enforce energy-balanced reaction constraints. *First author paper in preparation.*
- Trained MIND on **>1 million spatial spots** across human and mouse tissues (brain, liver, heart, ovary), achieving **>1000×** speedup over existing methods (Compass).
- Developed a novel graph-based metric for quantifying cell-cell metabolic cooperation, identifying spatially organized tasks shared across cells.
- Co-developing a multi-instance learning (MIL) framework to integrate MOVAT, Sirius Red, and H&E whole-slide images (150 patients). Aligning **>5M** patches across stains using graph optimal transport and pathology foundation models (CONCH, UNI)
- Contributed to lab projects through analysis of bulk, single-cell RNA-seq and spatial transcriptomics (10X Visium, Slide-seqV2, Stereo-seq) datasets
- Led bi-weekly single-cell machine learning methods subgroup. Discussions involved methods for trajectory inference, tissue motif detection and multi-omics integration architectures
- Mentored 5 undergraduate lab members on single-cell analysis techniques, Pytorch-based neural networks, Bash, HPC and SLURM basic usage

Master’s Graduate Student Researcher

Apr 2023 - June 2024

PI: Xiaohui Xie, PhD

Donald Bren School of Information & Computer Science

- Co-first author of *CoMA*, a multi-modal generative model integrating masked transformers, VQ-VAEs, and language agents for controllable 3D human motion generation. **Accepted at AAAI 2026.**
- Developed a deep learning method for registering 576 T1-weighted 3D volumetric brain MRI scans using vision transformers and gradient-based optimization.
- Mentored 4 undergraduate exchange students in multi-modal agent integration, VQ-VAEs, bash usage, and masked-transformer models

Undergraduate Researcher - Senior thesis

Mar 2020 - Jan 2021

PI: Paulo Miranda, PhD

Institute of Mathematics and Statistics (IME) - USP

- Developed a graph-based computer vision algorithm for medical image segmentation from MRIs, e.g. anatomical features in cross sections of the wrist, implemented in C/C++ with OpenMP parallelization.
- Applied graph-based Unsupervised Oriented Image Foresting Transform and Min-tree data structure to create and modify super-pixel hierarchy graphs in images.

Undergraduate Researcher

Apr 2019 - Aug 2020

PI: Hae Yong Kim, PhD

Signal Processing Laboratory (LPS) - USP

- Evaluated the transfer learning performance of breast cancer detection CNN model from mammogram images trained older patients to 135 orthogonal younger patients (< 40 y.o) from our partner hospital (ICESP)
- Led weekly discussion with oncologists and radiologists for qualitative model performance evaluation

Undergraduate Researcher

Jun 2018 - Mar 2019

PI: Roberto Hirata, PhD

Institute of Mathematics and Statistics (IME) - USP

- Developed CNN and custom dataset (1.6K images) for urban electrical wiring detection using GeoPandas, Django, Keras and TensorFlow.

PUBLICATIONS AND CONFERENCE PROCEEDINGS

* denotes equal contribution

Gabriel De Araujo, David van Dijk, Purushottam Dixit, Hattie Chung. MIND: Metabolic Inference of Niches through graph Diffusion *In preparation*

Shanlin Sun*, Jiaqi Xu*, **Gabriel De Araujo***, Shenghan Zhou*, Hanwen Zhang, Ziheng Huang, Chenyu You, Xiaohui Xie. *CoMA: Compositional Human Motion Generation with Multi-modal Agents*. [AAAI 2026](#)

Gabriel De Araujo, Shanlin Sun, Xiaohui Xie. *Adaptive Image Registration: A Hybrid Approach Integrating Deep Learning and Optimization Functions for Enhanced Precision*. [arXiv:2311.15497 \(2023\)](#)

Daniel Gustavo Pellacani Petrini, Gabriel Vansuita Valente, Carlos Shimizu, Rosimeire Aparecida Roela, **Gabriel Miranda de Araújo**, Tatiana Cardoso de Mello Tucunduva, Maria A. A. Koike Folgueira, and Hae Yong Kim. *Evaluation of an AI system for breast cancer screening in mammograms of young women* [Journal of Clinical Oncology \(2020\)](#).

SELECTED TALKS AND POSTER PRESENTATIONS

Quantiative Biology/Physics, Engineering and Biology Symposium Poster presentation on MIND . Hosted by the Program in Physics, Engineering and Biology (PEB).	May 2026
Yale Cardiovascular Research Center - Research In Progress Talks Series Oral presentation on MIND to the Internal Medicine Department. Hosted by the YCVRC.	April 2026
Yale Research Synergy Forum on Cardiovascular Disease and Inflammation Oral presentation on MIND to 50 PIs. Hosted by the Yale School of Medicine Dean’s Office.	August 2025
Program in Physics, Engineering and Biology (PEB) Seminar Oral presentation on MIND to graduate students, postdocs, and faculty.	February 2025
InterSCity Workshop, USP Oral presentation on wire detection CNN model to graduate students, postdocs, and faculty.	February 2019

SKILLS

Technical Skills	Machine Learning, Computational Biology, Computer Vision, PyTorch, JAX, Linux, CLI, SLURM, TensorFlow, Keras
Programming Languages	Python, Rust, Bash, C, C++, Java, R
Languages	Portuguese (Native), English (Fluent), Spanish (Fluent)