Samuel Morabito
Genomics Postdoctoral Researcher

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EDUCATION

PhD, Mathematical Computational and Systems Biology
Dissertation: *Investigating the molecular landscape of neurodegeneration with cellular and spatial genomics*
University of California, Irvine   **Aug 2018 — Jan 2024**

BS, Bioengineering: Bioinformatics
University of California, San Diego   **Sept 2013 — Dec 2017**

RESEARCH EXPERIENCE

Postdoctoral Researcher in Genomics and Cancer Immunology   **April 2024 — Present**
Centro Nacional de Análisis Genómico (CNAG)   *Barcelona, Spain*

- As part of the CNAG Single-cell Genomics Group, I am analyzing the tumor microenvironment in cancer patients using single-cell and spatial -omics to deeply characterize the molecular signatures defining response or non-response to immunotherapies.

Postdoctoral Researcher   **Feb 2024 — Apr 2024**
Advisor: Vivek Swarup, PhD   *Irvine, CA, USA*

- Continuation of my PhD research projects in the Swarup Lab in the areas of bioinformatics and neurogenomics.

Graduate Student Researcher in Bioinformatics and Neurobiology   **Jan 2019 — Jan 2024**
Advisor: Vivek Swarup, PhD   *Irvine, CA, USA*

- Primary research focus leveraged single-cell and spatial -omics technologies to decipher the molecular, genetic, and neuroimmunological underpinnings of Alzheimer's disease. These research experiences have culminated in several publications, cross-disciplinary collaborations, and a national research service award (NRSA) funded by the National Institute on Aging (NIA).

Rotation Student in Cancer Genomics   **Aug 2018 — Dec 2018**
Advisor: Kai Kessenbrock, PhD   *Irvine, CA, USA*

- Graduate rotation student research project involved learning the fundamentals of single-cell RNA-seq data analysis using the lab's datasets from the breast epithelium of human breast cancer patients, and setting up new data analysis pipelines for the lab.

Undergraduate Researcher in Bioinformatics and Human Genetics   **Jul 2016 — Aug 2018**
Advisor: Kyle Gaulton, PhD   *San Diego, CA, USA*

- Undergraduate research experience focused on learning epigenomic data analysis with ATAC-seq and ChIP-seq, and using these data with genome wide association studies (GWAS) to further our understanding of diabetes genetics.

PUBLICATIONS

* These authors contributed equally
First-author publications

5. JE Childs*, **S Morabito***, S Das, C Santelli, V Pham, K Kusche, V Alizo Vera, F Reese, RR Campbell, DP Matheos, V Swarup, and MA Wood. Relapse to cocaine-seeking is regulated by medial habenula Nr4a2 in mice. *Cell Reports* (2024). doi: 10.1016/j.celrep.2024.113956

4. **S Morabito**, F Reese, E Miyoshi, N Rahimzadeh, and V Swarup. hdWGCNA identifies co-expression networks in high dimensional transcriptomics data. *Cell Reports Methods* (2023). doi: 10.1016/j.crmeth.2023.100498

3. E Miyoshi*, **S Morabito***, and V Swarup. Systems biology approaches to unravel the molecular and genetic architecture of Alzheimer's disease and related tauopathies. *Neurobiology of Disease* (2021). doi: 10.1016/j.nbd.2021.105530 PMID: 34634459

2. **S Morabito***, E Miyoshi*, N Michael*, S Shahin, A Cadete Martini, E Head, J Silva, K Leavy, M Perez-Rosendahl, and V Swarup. Single-nucleus chromatin accessibility and transcriptomic characterization of Alzheimer's disease. *Nature Genetics* (2021). doi: 10.1038/s41588-021-00894-z PMID: 34239132

1. **S Morabito**, E Miyoshi, N Michael and V Swarup. Integrative genomics approach identifies conserved transcriptomic networks in Alzheimer's disease. *Human Molecular Genetics* (2020). doi: 10.1093/hmg/ddaa182 PMID: 32803238

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Co-author publications

7. L Fernandez Garcia-Agudo, Z Shi, IF Smith, EA Kramár, K Tran, S Kawuchi, S Wang, S Collins, A Walker, K Shi, J Neumann, HY Liang, CD Cunha, G Milinkeviciute, **S Morabito**, E Miyoshi, N Rezaie, A Gomez-Arboledas, A Mendoza-Arvilla, DI Ghaemi, AJ Tenner, FM LaFerla, MA Wood, A Mortazavi, V Swarup, GR MacGregor, KN Green. BIN1 ^{K358R} suppresses glial response to plaques in mouse model of Alzheimer's disease. *Alzheimer's & Dementia* (2024) doi: 10.1002/alz.13767

6. M Costanzo, M von Grotthuss, J Massung, D Jang, L Caulkins, R Koesterer, C Gilbert, RP Welch, P Kudtarkar, Q Hoang, *et al.* The Type 2 Diabetes Knowledge Portal: An open access genetic resource dedicated to type 2 diabetes and related traits. *Cell Metabolism* (2023) doi: 10.1016/j.cmet.2023.03.001 PMID: 36963395

5. M Otero-Garcia, SU Mahajani, D Wakhloo, W Tang, Y Xue, **S Morabito**, J Pan, J Oberhauser, AE Madira, T Shakouri, Y Deng, T Allison, Z He, WE Lowry, R Kawaguchi, V Swarup, I Cobos. Molecular signatures underlying neurofibrillary tangle susceptibility in Alzheimer's disease. *Neuron* (2022) doi: 10.1016/j.neuron.2022.06.021

4. SK Shabestari, **S Morabito**, EP Danhash, A McQuade, J Ramirez Sanchez, E Miyoshi, JP Chadarevian, C Claes, MA Coburn, J Hasselmann, J Silva, KN Tran, AC Martini, WC Rothermich, J Pascual, E Head, DA Hume, C Pridans, H Davtyan, V Swarup, and M Blurton-Jones. Absence of microglia promotes diverse pathologies and early lethality in Alzheimer's disease mice. *Cell Reports* (2022). doi: 10.1016/j.celrep.2022.110961

3. Z Shi*, S Das*, **S Morabito**, E Miyoshi, and V Swarup. Protocol for single-nucleus ATAC sequencing and bioinformatic analysis in frozen human brain tissue. *STAR Protocols* (2022). doi: 10.1016/j.xpro.2022.101491

2. RA Barahona, **S Morabito**, V Swarup, and KN Green. Cortical diurnal rhythms remain intact with microglial depletion. *Scientific Reports* (2022). doi: 10.1038/s41598-021-04079-w

1. W Chen, **S Morabito**, K Kessenbrock, T Enver, KB Meyer, and AE Teschendorff. Single-cell landscape in mammary epithelium reveals bipotent-like cells associated with breast cancer risk and outcome. *Communications Biology* (2019). doi: 10.1038/s42003-019-0554-8 PMID: 31925137

Works in progress

3. Z Shi*, S Das*, **S Morabito***, E Miyoshi, J Stocksdale, N Emerson, SS Srinivasan, A Shahin, Z Cao, J Silva, AA Castaneda, E Head, L Thompson, and V Swarup. Single-nucleus multi-omics identifies shared and distinct pathways in Pick's and Alzheimer's disease. *Manuscript in review* (2024)

2. E Miyoshi*, **S Morabito***, CM Henningfield, N Rahimzadeh, SK Shabestari, S Das, N Michael, F Reese, Z Shi, Z Cao, V Scarfone, MA Arreola, J Lu, S Wright, J Silva, K Leavy, IT Lott, E Doran, WH Yong, S Shahin, M Perez-Rosendahl, E Head, K Green, and V Swarup. Spatial and single-cell transcriptomic analysis of genetic and sporadic forms of Alzheimer's disease. *bioRχiv* (2023). doi: 10.1101/2023.07.24.550282

1. F Reese, BA Williams, G Balderrama-Gutierrez, D Wyman, MH Çelik, E Rebboah, N Rezaie, D Trout, M Razavi-Mohseni, Y Jiang, B Borsari, **S Morabito**, H Liang, C McGill, S Rahmanian, J Sakr, S Jiang, W Zeng, K Carvalho, A Weimer, LA Dionne, A McShane, K Bedi, S Elhajjajy, J Jou, I Youngworth, I Gabdank, P Sud, O Jolanki, JS Strattan, M Kagda, MP Snyder, BC Hitz, JE Moore, Z Weng, D Bennet, L Reinholdt, M Ljungman, MA Beer, MB Gerstein, L Pachter, R Guigó, BJ Wold, and A Mortazavi. The ENCODE4 long-read RNA-seq collection reveals distinct classes of transcript structure diversity. *bioRχiv* (2023) doi: 10.1101/2023.05.15.540865

Awards

Ruth L. Kirschstein Predoctoral Individual National Research Service Award (NIH F31)   2022 — 2024
I received two years of funding from the National Institute on Aging as a predoctoral NRSA to facilitate the training and research for my proposal titled *"Single-cell epigenomic roadmap of Alzheimer's disease"*. Award number: 1F31AG076308-01

American Society for Human Genetics (ASHG) Reviewer's Choice Abstract Award   2022
This award recognizes high-scoring poster abstracts for posters at the ASHG conference. I received this award for my abstract titled "*High dimensional co-expression networks enable discovery of transcriptomic drivers in complex biological systems*".

NSF-Simons Center for Multiscale Cell Fate Interdisciplinary Opportunity Award   2021
I received a $10,000 interdisciplinary research opportunity award for my proposal titled "*Data-driven mathematical modeling of single-cell gene-regulatory dynamics in Alzheimer's disease*".

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Ledell Family Research Scholarship for Science and Engineering   **2017**

I received a $5,000 undergraduate summer research scholarship to pursue my research proposal titled "*Uncovering genome-wide diabetes risk variants in regulatory regions of pancreatic islet cells*" in the Gaulton lab.

UC San Diego Provost's Honors   **2016 — 2017**

Provost's Honors recognizes students who earn a grade point average of 3.5 or above in a given term.

SERVICE AND OUTREACH

Genomics Practical Applications and Learning Seminar (GenPALS)   **December 2020 — Present**

GenPALS is a trainee-oriented community of genomics researchers across different departments at UC Irvine. Myself and three others founded this group in the midst of the COVID-19 pandemic when there was a critical need for community, with the goal of establishing institutional knowledge of the best practices in genomics across UC Irvine. GenPALS operates a bi-weekly seminar series to discuss cutting-edge tools, an informal bi-weekly "bioinformatics support group" as a forum where researchers can meet with others to discuss research problems, and a yearly symposium/workshop to cover the foundations of genomic data analysis. GenPALS is funded by the UCI Center for Multiscale Cell Fate Research. My roles within GenPALS are the following:

- Co-founder of UCI GenPALS.
- Creator and maintainer of the GenPALS website.
- Set up the GenPALS Slack, an online group where GenPALS members can ask question and share research insights outside of the bi-weekly events. This slack community has gained over 80 members across 10 departments at UC Irvine.
- Organized the 2021 GenPALS single-cell genomics workshop, a student-led in-person event which included lectures and hands-on activities, and had over 30 attendants.
- Developed curriculum and led workshop sections for the UC Irvine Systems Biology short courses.
- To support the longevity of GenPALS, along with the other leaders I helped write a section of a grant renewal for the NIH U54 funded UC Irvine Center for Cancer Systems Biology for GenPALS to serve as an outreach component.

Mathematical Computational and Systems Biology (MCSB) Graduate Program

- Tutor for the MCSB incoming student bootcamp.   2023
- Served on the MCSB diversity, equity, and inclusion (DEI) task force as a student committee member.   2021
- One-on-one mentor for first-year MCSB students through the Peer Mentorship Program.   2019 — 2021
- Tutor for first-year students' research presentations in the UCI systems biology journal club.   2019 — Present

TEACHING

Teaching assistant, Bioinformatics and Systems Biology (NBB 227)   **Winter 2022**

NBB 227 is a graduate-level course with the objective of teaching neurobiology students the fundamentals of bioinformatics through RNA-seq data analysis. My role as a TA involved assisting with developing curriculum (quizzes, assignments, and exams), providing office hours, helping students with programming assignments, and occasionally lecturing to the class as needed.

Instructor, GenPALS Single-cell Genomics Workshop   **Fall 2021**

Along with other members of UCI GenPALS, I organized a single-cell genomics workshop open to graduate students and postdoctoral scholars at UC Irvine. I gave lectures about the current best practices in scRNA-seq data analysis, in-depth discussion of quality control in single-cell data, and I co-developed curriculum for the hands-on portion of the workshop.

Instructor, California State Summer School for Mathematics and Science (COSMOS)   **Summer 2021**

COSMOS at UC Irvine is a summer program for high school students. I was an instructor for the Tissue and Tumor Biology and Mathematical/Computational Modeling student cluster, where I led a module about molecular biology and DNA sequencing.

Instructor, Foundations in Systems Biology and Cancer Systems Biology (CASB) Short Courses   **2019 - 2023**

The Foundations in Systems Biology short course and the Cancer Systems Biology short course are three week intensive training programs at UC Irvine to provide researchers from other institutes with a high-level exploration of systems biology with a series of lectures and hands-on workshops, with some overlapping content between the two courses. I have participated as a *primary instructor** and as a teaching assistant in several iterations of these courses for the following topics.

- *Introduction to single-cell RNA-seq data analysis **   2022, 2023
- *Best practices in single-cell RNA-seq quality control **   2022, 2023
- Introduction to Biophysical modeling with PhysiCell   2020
- Bioinformatics and RNA-seq data analysis   2020
- Machine learning in biological sequence data   2020

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- Mutation detection in cancer genomics data   2019
- Single-cell RNA-seq data analysis with Seurat   2019

PRESENTATIONS

Talks

- **Spatial and single-nucleus transcriptomic analysis of DSAD and sporadic AD**
  DSAD-ADAD Conference Barcelona (2024)

- **Spatial and single-nucleus transcriptomic analysis of genetic and sporadic forms of Alzheimer's disease**
  University of California Los Angeles (2023)

- **Spatial and single-nucleus transcriptomic analysis of genetic and sporadic forms of Alzheimer's disease**
  Barcelona Supercomputing Center (2023)

- **Pseudotime and trajectory inference analysis in snapshot scRNA-seq data**
  UC Irvine Genomics Practical Applications and Learning Seminar (2023), YouTube link

- **High dimensional co-expression networks enable discovery of transcriptomic drivers in complex biological systems**
  Imperial College London Neurogenomics Seminar (2022), YouTube link

- **Single-cell co-expression network analysis**
  UC Irvine Genomics Practical Applications and Learning Seminar (2022), YouTube link

- **Data driven mathematical modeling of single-cell gene-regulatory dynamics in Alzheimer's disease**
  NSF-Simons Center for Multiscale Cell Fate (CMCF) Symposium (2021)

- **Single-nucleus chromatin accessibility and transcriptomic characterization of Alzheimer's disease**
  Gladstone Institute of Neurological Disease (2021)

- **Single-nucleus chromatin accessibility and transcriptomic characterization of Alzheimer's disease**
  University of California Los Angeles (2020)

- **Single-nucleus chromatin accessibility and transcriptomic characterization of Alzheimer's disease**
  UC Irvine Biophysics and Systems Biology Seminar (2020)

Posters

- **Integrated spatial and single-nucleus transcriptomic analysis of genetic and sporadic forms of Alzheimer's disease**
  Alzheimer's Association International Conference (2023)

- **Spatially resolved transcriptomic characterization of Trisomy 21 in Alzheimer's disease**
  Society for Neuroscience (2022)

- **High dimensional co-expression networks enable discovery of transcriptomic drivers in complex biological systems**
  American Society for Human Genetics (2022) poster award winner

- **Single-nucleus chromatin accessibility and transcriptomic characterization of Alzheimer's disease**
  Society for Neuroscience (2021)

- **Single-nucleus chromatin accessibility and transcriptomic characterization of Alzheimer's disease**
  UC Irvine REMIND Emerging Scientists Symposium (2021)

- **Single-nucleus chromatin accessibility and transcriptomic characterization of Alzheimer's disease**
  Southern California Regional Systems Biology Conference (2020)

- **Integrative genomics approach identifies conserved transcriptomic networks in Alzheimer's disease**
  Southern California Alzheimer's Disease Centers Research Symposium (2019)

PEER REVIEW

I have served as a peer reviewer alongside my PhD advisor Dr. Swarup and as the *primary reviewer** for numerous academic journals in the areas of neurogenomics and bioinformatics.

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Journal	Research topics	Year
Nature Neuroscience	scRNA-seq, Neuroimmunology	2024
Brain*	scRNA-seq, Neurodegeneration	2023
Neuron	RNA-seq, Alzheimer's disease	2023
Nature Neuroscience	scRNA-seq, Alzheimer's disease	2023
Science	scRNA-seq, Human development	2022
Cell Genomics	scATAC-seq, Neurogenomics	2022
Briefings in Bioinformatics	scATAC-seq, Machine learning	2022
Molecular Neurodegeneration	scRNA-seq, Alzheimer's disease	2021
Biological Psychiatry	micro RNAs, Alzheimer's disease	2021
Nature Aging	scRNA-seq, Alzheimer's disease	2020
BMC Genomics	Zebrafish, RNA-seq, Alzheimer's disease	2020
Biological Psychiatry	Gene regulatory networks, Neurodegeneration	2020