Salwan Butrus

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EDUCATION

University of California, Berkeley, CA **August 2019-August 2024 (Expected)**
Ph.D. Chemical and Biomolecular Engineering
Designated Emphasis in Computational and Genomic Biology
Thesis: *Single-cell molecular profiling of cell type development in mouse visual and somatosensory cortex*

University of Michigan, Ann Arbor, MI **September 2015-May 2019**
B.S.E. Chemical Engineering, *Summa Cum Laude*

AWARDS AND HONORS

- NIH Ruth L. Kirschstein NRSA Predoctoral Fellowship (F31) (2023)
- INSPIRE Symposium Awardee. Washington University School of Medicine (2023)
- NIH Outstanding Scholars in Neuroscience Award (2022)
- Society for Neuroscience Trainee Professional Development Award (2022)
- Best Talk Award at the 2021 Computational Biology Retreat. UC Berkeley (2021)
- NSF Graduate Research Fellowship (2019)
- 1st place, ChE UG Research Poster Competition. Ann Arbor, MI (2019)
- Sinnott Prize, Outstanding ChE Senior for academics and leadership. Ann Arbor, MI (2019)
- Instructor of the Year, Organic Chemistry II, Science Learning Center. Ann Arbor, MI (2018) (Student testimonials)
- 1st place, UROP Summer Symposium Poster Competition. Ann Arbor, MI (2016)
- 1st Place Award, The Landes Contest in Technical Communication, Best Senior Design Final Report, Poster, and Presentation. Ann Arbor, MI (2019)

INDUSTRY WORK EXPERIENCE

BEVC Venture Capital **November 2023-Present**
AI/ML in Pharmaceutical R&D Innovation Intern
- Identify emerging trends, map inventors, academic institutes, and emerging startups in AI/ML
- Develop investment themes and thesis based on the latest scientific findings and market trends
- Conduct scientific and technical assessment, including evaluating validity and differentiation

Genentech Research and Early Development (gRED) **May-August 2022**
Data Science and Statistical Computing Intern
- Collaborated with researchers from the Data Science, Cellular and Tissue Genomics, and Neuroscience divisions on interdisciplinary projects
- Developed a transfer learning pipeline to investigate cell type-specific effects of genetic perturbations using single-cell RNA-seq and ATAC-seq datasets
- Generated results that informed development of cellular platforms for high-throughput drug discovery

ACADEMIC WORK EXPERIENCE

University of California, Berkeley | Shekhar Lab **October 2019-Present**
Graduate Student Researcher
- Assembled and managed multi-institutional efforts combining experimental and computational researchers at the nexus of neuroscience, molecular biology, and computational biology

- Developed a suite of unsupervised and supervised ML tools that enabled the assembly of the first developmental scRNA-seq atlas of mouse visual (V1) and somatosensory (S1) cortex
- Mined scRNA-seq using a transfer learning pipeline that revealed most cell types in V1 and S1 are genetically hardwired apart from a few that mature gradually in a vision-dependent fashion
- Developed a time-series analysis pipeline for inferring gene regulatory mechanisms of V1 development from snapshot scRNA/ATAC-seq measurements

University of California, Berkeley | Landry Lab **May-August 2018**
Amgen Scholar
- Conceived and executed a project to systematically probe the influence of gold nanoparticle physicochemical properties on bio-cargo loading efficiency
- Developed two separate nanoplatforms for the delivery of siRNA and pDNA to intact leaves

Massachusetts Institute of Technology | Hammond Lab **June-August 2017**
EBICS REU Intern
- Synthesized and characterized a library of polymers to identify candidates with maximum uptake to cytotoxicity ratios in cartilage for applications in osteoarthritis drug delivery
- Elucidated relationships between the physicochemical properties of polymers and their transport properties and toxicity in cartilage.

University of Michigan Biointerfaces Institute | Lahann Lab **September 2016-Ocrober 2018**
Undergraduate Researcher
- Harnessed nanoindentation to probe the interfacial properties that govern how synthetic polymer brushes support human embryonic stem cells (hESCs)
- Through a statistical DOE, developed a relationship between bulk and nanomechanical properties that explained the behavior of hESCs on polymer brush surfaces

TEACHING EXPERIENCE

Lumiere Education | *Research Mentor* **June 2023-Present**
- Design and manage projects that guide high schools students through research papers focused on the use of machine learning in science

Berkeley Bioinformatics Bootcamp | *Lecturer and TA* **January 2022-Present**
- Lead Python programming sessions on various bioinformatics concepts

InspiritAI | *AI Scholars Instructor* **December 2021-Present**
- Immerse high school students in machine learning through lectures, assignments, and projects

UC Berkeley Chemical and Biomolecular Engineering Department | *Graduate Student Instructor*
ChemEng 142: Chemical Kinetics and Reaction Engineering **August 2019-December 2019**
ChemEng 150A: Transport Processes (4.7/5 rating, 93 students, testimonials) **January 2021-May 2021**

University of Michigan Chemical Engineering Department | *Teaching Assistant*
ChE 496: Introduction to Experimental and Computational Research in ChE **March 2018-May 2019**
- Assembled a group of 10 undergraduate and graduate peers in collaboration with faculty members and researchers to design a research-focused course in our ChemE department
    - Guided efforts in organizing meetings, developing content, and securing resources and instructors; Secured a $15,000 departmental grant to support course launch
- Developed and tested laboratory modules, held weekly office hours, and graded assignments

ChE 344: Reactor Design and Engineering **September 2018-May 2019**

University of Michigan Science Learning Center **January 2017-May 2019**
Organic Chemistry II Course Leader

Organic Chemistry II Study Group Facilitator (4.9/5 rating, 86 students, testimonials)

SERVICE EXPERIENCE

College of Chemistry Transfer Student Mentorship Program | *Mentor* **August 2022-May 2023**
- Meet monthly with transfer student mentees to support their academic transition to UC Berkeley

College of Chemistry Undergraduate Research Incubator | *Supervisor* **September 2021-May 2022**
- Supervised experiments carried out by students and maintained the safety and cleanliness of the laboratory working environment

Be A Scientist! and **GOLD Science Fair** | *Mentor* **January 2021-May 2022**
- Support and mentor middle school and high school students on the design, execution, and communication of science projects

Undergraduate Research Symposium Committee | *Founder* **November 2018-May 2019**
- Assembled a team of 8 undergraduate peers to organize the first campus-wide undergraduate research symposium at the University of Michigan
- Fundraised over $12,000 from 16 entities to support an event of 150 presenters and 100 judges

Camp Kesem | *Camp Counselor and Unit Leader* **July 2016-August 2019**
- Fundraised $500 annually to send children whose families are affected by cancer to a free summer camp; supported the well-being of several children and counselors throughout camp activities

ChemE Undergraduate Program Committee | *Member* **October 2017-May 2019**
- Addressed improvements to the ChemE program and funding requests for students and organizations

University of Michigan Student Life Housing **August 2017-May 2018**
Residential Advisor, First Generation Student Theme Community
- Support residents academically, personally, and professionally

SELECTED PUBLICATIONS (*equal contribution)

1) ***Butrus, S**., Jain, S., Yoo, J., Shekhar, K., Zipursky, L. Gene regulatory mechanisms of experience-dependent cell type development in visual cortex. *Submitting in 2024.*
2) ***Butrus, S**., *Monday, H., Feldman, D., Shekhar, K. Molecular dissection of development and plasticity in mouse barrel cortex. *Submitting in 2024.*
3) **Butrus, S**., Sagireddy, S., Shekhar, K. Defining selective neuronal resilience and identifying targets of neuroprotection and axon regeneration using single-cell RNA sequencing – computational approaches. *Methods in Molecular Biology* (2023), vol 2636. Humana, New York, NY. https://doi.org/10.1007/978-1-0716-3012-9_2
4) *Whitney, I., ***Butrus, S**., Sanes, J.R., Shekhar, K. Vision-dependent and -independent molecular maturation of mouse retinal ganglion cells. *European Journal of Neuroscience* (2022) 508; pp. 153-173.
5) Shekhar, K., Whitney, I., **Butrus, S**., Peng, Y., Sanes, J.R. Diversification of multipotential postmitotic mouse retinal ganglion cell precursors into discrete types. *eLife* (2022) 11; e73809.
6) *Cheng, S., ***Butrus, S**., *Tan, L., Sagireddy, S., Trachtenberg, J.T., Shekhar, K., Zipursky, L. Vision-dependent specification of cell types and function in the developing cortex. *Cell* (2022) 185, 2: pp. 311-327.
    - Highlighted in *Nature* by Puiggros and Jabaudon (2022).
    - Highlighted in *UC Berkeley, College of Chemistry Press Release* (2022).
    - Highlighted in *EurekAlert* (2022).
7) Zhang, H.* Goh, N.S.*, Wang, J., Demirer, G.S., **Butrus, S**., Park, S-J, Landry, M.P. Nanoparticle Cellular Internalization is Not Required for RNA Delivery to Mature Plant Leaves. *Nature Nanotechnology* (2021)

- Conceived and generated preliminary data for this project as part of the 2018 summer I spent in Prof. Landry's group
- Submitted and received funding for the NSF GRFP grant based on this work

8) Kölsch, Y., Hahn, J., Sappington, A., Stemmer, M., Fernandes, A.M., Helmbrecht, T.O., Lele, S., **Butrus, S.,** Laurell, E., Arnold, I., Shekhar, K., Sanes, J.R., Baier, H. Molecular classification of zebrafish retinal ganglion cells links genes to cell types to behavior. *Neuron* (2020) 109, 4: pp. 645-662.
9) **Butrus, S.**, Greenman, K., Kopyeva, I., Khera, Eshita., Nishii, A. An Undergraduate-Led, Research-Based Course that Complements a Traditional Chemical Engineering Curriculum. *Chemical Engineering Education* (2020) 54, 2; pp. 97-106.

SELECTED PRESENTATIONS

1) ***Butrus, S**., *Jain, S., *Yoo, K., Shekhar, K., Zipursky, L. *Gene regulatory mechanisms of experience-dependent cell type development in visual cortex.* Visual System Development GRS/GRC. Italy (2024).
2) **Butrus, S**., *Monday, H., Feldman, D., Shekhar, K. *Single-cell transcriptomic analysis of experience-dependent plasticity in whisker somatosensory cortex*. Society for Neuroscience. Washington, DC (2023)
3) ***Butrus, S**., *Cheng, S., *Tan, L., Sagireddy, S., Trachtenberg, J.T., Shekhar, K., Zipursky, L. *Vision-dependent specification of cell types and function in the developing cortex.* Visual System Development GRS/GRC. Southbridge, MA (2022).
4) **Butrus, S.,** Shekhar, K. *Vision mediates molecular patterning in the developing visual cortex*. UC Berkeley Center for Computational Biology Retreat (2021).
5) **Butrus, S.,** Shekhar, K. *Single-Cell Transcriptional Dynamics of Retinal Ganglion Cell Diversification*. 2020 AIChE Meeting.

SKILLS

Programming: Python | R | C++
Research and coursework: single-cell genomics experiment design and optimization| cloud computing (HPC, GCP, AWS)| management of large datasets (>1M samples) | GitLab/GitHub| data visualization | PyTorch/TensorFlow/scikit-learn ecosystem| time-series analysis | deep learning | probabilistic/generative models | NLP | computer vision

PERSONAL

Languages: English (fluent) | Arabic (fluent) | Neo-Aramaic (fluent) | Spanish (intermediate)
Hobbies: Cycling | Piano | Soccer| Hiking | Camping | Skiing