

Salwan Butrus

salwan@berkeley.edu · (248) 778-8740

<https://salwanbutrus.github.io/>

EDUCATION

University of California, Berkeley, CA

August 2019-Present

Ph.D. Chemical and Biomolecular Engineering

Designated Emphasis in Computational and Genomic Biology

University of Michigan, Ann Arbor, MI

September 2015-April 2019

B.S.E. Chemical Engineering, *Summa Cum Laude*

AWARDS AND HONORS

Individual

- 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](#))
- 1st place, Oral Presentation in Biomaterials. GCURS. Houston, TX (2018)
- 2nd place, AIChE Undergraduate Poster Competition. Pittsburgh, PA (2018)
- Instructor of the Year, Organic Chemistry II, Science Learning Center. Ann Arbor, MI (2018) ([Student testimonials](#))
- 2nd Place, EBICS Conference Poster Competition. Atlanta, GA (2017)
- 1st place, UROP Summer Symposium Poster Competition. Ann Arbor, MI (2016)

Team

- 1st Place Award, The Landes Contest in Technical Communication, Best ChE 488/489 Final Report, Poster, and Presentation. Ann Arbor, MI ([2019](#))
- 1st Place Award, Best All-Around ChE 342 Project. Ann Arbor, MI (2018)
- 1st Place Award, Best All-Around ChE 230 Project. Ann Arbor, MI (2016)

RESEARCH AND WORK EXPERIENCE

Genentech Research and Early Development (gRED)

May-August 2022

Data Science and Statistical Computing Intern

- Developed unsupervised and supervised machine learning approaches to analyze high-dimensional genomics datasets and discover therapeutic targets for neurodegenerative diseases

University of California, Berkeley | Shekhar Lab

October 2019-Present

Graduate Student Researcher

- Developing machine learning models and leveraging single-cell genomics data to explore the molecular underpinnings of cellular diversity in the brain
 - Undergraduate mentees: Srikant Sagireddy, Jason Hou, Xiaoqi Sun

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 nanoplatfroms for the delivery of siRNA and pDNA to intact leaves

- 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.

- 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

SELECTED PUBLICATIONS (*equal contribution)

- 1) **Butrus, S.**, Hou, J., Sagireddy, S., Shekhar, K. A decision tree-based graph on single-cell sequencing data. *Under preparation.*
- 2) **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). *In press.*
- 3) *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). *In press.*
- 4) 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.
- 5) *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).
- 6) 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)
- 7) 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.
- 8) **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.
- 9) Wang, J.W., Grandio, E.G., Newkirk, G.M., Demirer, G.S., **Butrus, S.**, Giraldo, J.P., Landry, M.P. Nanoparticle-mediated genetic engineering of plants. *Molecular Plant* (2019) 12; pp. 1037-1040.

SELECTED PRESENTATIONS

- 1) ***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).
- 2) **Butrus, S.**, Shekhar, K. Vision mediates molecular patterning in the developing visual cortex. UC Berkeley Center for Computational Biology Retreat (2021).
- 3) **Butrus, S.**, Shekhar, K. Single-Cell Transcriptional Dynamics of Retinal Ganglion Cell Diversification. 2020 AIChE Meeting.

- 4) **Butrus, S.**, Demirer, G., Goh, N., Zhang, H., Cunningham, F., Landry, M. *Development and Characterization of Gold Nanoparticles for Plant Genetic Engineering*
 - **Oral:** UC Berkeley Amgen Scholars Program Symposium, Berkeley, CA (2018); ABRCMS Annual Meeting, Indianapolis, IN (2018); GCURS Rice University, Houston, TX (2018)
 - **Poster:** UC Berkeley Amgen Scholars Program Symposium, Berkeley, CA (2018); BMES Annual Meeting, Atlanta, GA (2018); AIChE Annual Meeting, Pittsburgh, PA (2018)
- 5) **Butrus, S.**, Geiger, B., Grodzinsky, A.J., Hammond, P.T., *Tuning Size and Charge of a Multivalent Polymer Library for Enhanced Drug Delivery to Cartilage*
 - **Oral:** AIChE Annual Conference, Minneapolis, MN (2017)
 - **Poster:** MIT Summer Research Programs Annual Poster Session, Cambridge, MA (2017); EBICS Annual Conference, Atlanta, GA (2017); BMES Annual Conference, Phoenix, AZ (2017); NanoDDS Annual Meeting, Ann Arbor, MI (2017)

TEACHING EXPERIENCE

Berkeley Bioinformatics Bootcamp | *Lecturer and TA* **January 2022-Present**

- Lead Python programming sessions on introductory bioinformatics concepts

InspiritAI | *AI Scholars Instructor* **December 2021-Present**

- Immerse high school students in Artificial Intelligence 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**

- Prepared and taught weekly discussion sessions to support student understanding of course material
- Developed homework solutions, held weekly office hours, and proctored and graded exams

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
- Led the conceptualization and ultimate realization of course objectives and structure
- Led the design and organization of laboratory and lecture assignments
- Developed and tested laboratory modules, held weekly office hours, and graded assignments

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

- Prepared and taught weekly review sessions to improve student understanding of course material
- Developed homework solutions, held weekly office hours, and proctored and graded exams

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](#))

- Held weekly sessions supplementing lecture by reinforcing and reviewing course concepts
- Led collaborative course meetings to provide resources, support, and mentorship for study group facilitators
- Developed and presented topic workshops and designed study materials for facilitators' use

SERVICE EXPERIENCE

College of Chemistry Transfer Student Mentorship Program | *Mentor* **August 2022-Present**

- Meet monthly with transfer student mentees to support their academic transition to UC Berkeley
- Assist students with acquiring research and internship opportunities by advising them on resumé building and applying to positions

College of Chemistry Undergraduate Research Incubator | Supervisor **September 2021-May 2022**

- Mentored undergraduate students seeking an independent research experience
- 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 on campus 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, one-week summer camp; maintained the health and well-being of several children and counselors throughout a week of camp activities

ChemE Undergraduate Program Committee | Member **October 2017-May 2019**

- Discussed and voted on 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

- Designed weekly social and educational activities to foster an inclusive and cohesive community of residents; advised residents on academic, personal, and professional matters

SKILLS

Software: Python | R | COMOSL | ASPEN Plus

Research Areas and Interests: sensory neuroscience | single-cell genomics | cloud computing | management of large datasets (>1M samples) | supervised and unsupervised machine learning | time-series analysis | pattern recognition | NLP | data visualization | computer vision | deep learning | generative models | neural networks

PERSONAL

Languages: English (fluent) | Arabic (fluent) | Chaldean (fluent) | Spanish (intermediate)

Hobbies: Cycling | Piano | Soccer | Running | Hiking | Camping | Skiing | Ultimate Frisbee | Basketball