Charles Comiter

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Contact Information
Email: ccomiter@mit.edu
Linkedin: linkedin.com/in/charles-comiter/
Website: ccomiter1.github.io

Research Interests
Areas: Machine Learning for Biomedicine, Computational Biology
Topics: Multimodal Learning, -omics, Medical Imaging, Natural Language
Applications: Pathology, Cardiology, Clinical Decision Support

Education

Massachusetts Institute of Technology, Cambridge, Massachusetts, USA
Department of Electrical Engineering and Computer Science
Ph.D., Computer Science, September 2021 – September 2026
Received S.M. in Computer Science in May 2024
Advisors: Collin M. Stultz and Jian Shu
Collaborators: Aviv Regev, Charles M. Rudin, K. Kobayashi, and J. Klughammer
Affiliations: MGH, Broad Institute, Human Cell Atlas, RLE, CSAIL
Thesis Topic: Developing models that generate clinically useful information—such as radiology reports or molecular profiles—from more accessible sources, such as histology images and EKGs

Yale University, New Haven, Connecticut, USA
B.S., Computer Science, with Distinction, August 2016 – May 2020
Significant coursework in Music and Statistics
Senior Thesis: "Special Norms of the Laplacian Matrix and their Approximation", advised by Dan Spielman

Publications

Charles Comiter, Xingjian Chen, Eeshit Dhaval Vaishnav, Koseki J. Kobayashi-Kirschvink, Metamia Ciampricotti, Ke Zhang, Jason Murray, Francesco Monticolo, Jianhuan Qi, Ryota Tanaka, Sonia E. Brodowska, Bo Li, Yiming Yang, Scott J. Rodig, Angeliki Karatza, Alvaro Quintanal Villalonga, Madison Turner, Kathleen L. Pfaff, Judit Jane-Valbuena, Michal Slyper, Julia Waldman, Sebastian Vigneau, Jingyi Wu, Timothy R. Blosser, Asa Segerstolpe, Daniel L. Abravanel, Nikhil Wagle, Shadmehr Demehri, Xiaowei Zhuang, Charles M. Rudin, Johanna Klughammer, Orit Rozenblatt-Rosen, Collin M. Stultz, Jian Shu, Aviv Regev. Inference of single cell profiles from histology stains with the Single Cell omics from Histology Analysis Framework (SCHAF). *In Revision/Submission to Nature.* 2025.

Koseki J. Kobayashi-Kirschvink, Charles Comiter, Shreya Gaddam, Taylor Joren, Emanuelle I Grody, Johain R Ounadjela, Ke Zhang, Baoliang Ge, Jeon Woong Kang, Ramnik J Xavier, Peter T.C. So, Tommaso Biancalani, Jian Shu, Aviv Regev. Prediction of single-cell RNA expression profiles in live cells by Raman microscopy with Raman2RNA. *Nature Biotechnology.* 2024.

Yun Zhang, Jeremy A Miller, Jeongbin Park, Boudewijn P Lelieveldt, Brian Long, Tamim Abdelaal, Brian D Aevermann, Tommaso Biancalani, Charles Comiter, Oleh Dzyubachyk, Jeroen Eggermont, Christoffer Mattsson Langseth, Viktor Petukhov, Gabriele Scalia, Eeshit Dhaval Vaishnav, Yilin Zhao, Ed S Lein, Richard H Scheuermann. Reference-based cell type matching of in situ image-based spatial transcriptomics data on primary visual cortex of mouse brain. *Nature Scientific Reports.* 2023.

Brian Long, Jeremy Miller, The SpaceTx Consortium (including Charles Comiter). SpaceTx: a roadmap for benchmarking spatial transcriptomics exploration of the brain. *arXiv.* 2023.

Professional Experience

Broad Institute of MIT and Harvard, Cambridge, Massachusetts, USA
Research Intern, Regev Lab **June 2020 – September 2021**
Development of deep learning models for modality transfer and domain integration in biological imaging and single-cell omics. Collaborations include the Human Tumor Atlas Pilot Project, Human Cell Atlas, and Memorial Sloan Kettering Cancer Center.

Facebook, New York, New York, USA
Software Engineer **September 2020 – September 2021**
Member of the Responsible Artificial Intelligence / Fairness in AI team. Wrote statistical and infrastructure software to evaluate the fairness of Facebook's AI systems.

Facebook, New York, New York, USA
Software Engineer Intern **August – November 2019**
ML Infrastructure for Messenger team. Designed and implemented a domain-specific language and companion compiler for AI feature engineering. Received highest possible performance review.

Dropbox, San Francisco, California, USA
Software Engineer Intern **May – August 2019**
Filesystem Infrastructure team. Engineered cache implementations for file access/permissions metadata for major latency improvements.

Accenture, Chicago, Illinois, USA
Technology Analyst Intern **June – August 2018**
Fullstack development and rapid prototyping of web applications for clients.

Patents

Live-cell label-free prediction of single-cell omics profiles by microscopy. U.S. Patent Application US20240371184A1; International Publication WO2023091970A1 (PCT/US2022/079989). Charles Comiter, Koseki J. Kobayashi-Kirschvink, Tommaso Biancalani, Peter T.C. So, Jian Shu, Aviv Regev. Filed November 16, 2022. Published May 25, 2023 (WO); November 21, 2024 (US).

Honors and Awards

Siebel Scholar Fellowship, November 2023
EECS Departmental Fellowship, September 2021.

Invited Talks

Inference of Single Cell Profiles from Histology Stains with SCHAF, University of Hong Kong Blood Engineering Lab, April 2023

Inference of Single Cell Profiles from Histology Stains with SCHAF, La Jolla Institute for Immunology, April 2023

Inference of Single Cell Profiles from Histology Stains with SCHAF, Models, Inference, and Algorithms, Broad Institute of MIT and Harvard, March 2023

Inference of Single Cell Profiles from Histology Stains with SCHAF, Klarman Cell Observatory Scientific Advisory Board, Broad Institute of MIT and Harvard, June 2021

Poster Presentations

Xingjian Chen, Charles Comiter, Collin M. Stultz, Jian Shu. Generation of cellular images from single-cell gene expression with GenVinci, MIT-MGB AI Cures Conference, Cambridge, MA, April 2024

Charles Comiter, Koseki J. Kobayashi-Kirschvink, Aviv Regev, Jian Shu. ImageOmicsNet: Linking Images and Genomics with Machine Learning, MIT-MGB AI Cures Conference, Cambridge, MA, April 2023

Teaching

Graduate Teaching Assistant: AI and Decision Making in Medicine: From Disease to Therapy, MIT, Fall 2025

Graduate Teaching Assistant: Computational Tools for MD/PhD Students, MIT, January 2025

Graduate Teaching Assistant: Quantitative Methods for Natural Language Processing, MIT, Fall 2022

Undergraduate Learning Assistant: Introductions to Systems Programming and Computer Organization, Yale, Spring 2020

Undergraduate Learning Assistant: Mathematical Tools for Computer Science, Yale, Fall 2018

Mentorship: Mentoring Undergraduate and Early Graduate Students in the Stultz and Shu Laboratories at MIT.

Skills and Miscellany

Technical: Python, PyTorch, NumPy, Scanpy, Pandas, C, GoLang, Bash, LaTeX

Other: Spanish Language (Working Proficiency); Yiddish Language (Extremely Elementary); Classical Percussion (Specialty in Four Mallet Marimba, First Prize in 2014 Great Plains International Marimba Competition and 2015 New World Symphony Side by Side Masterclass Competition), Musical Ear Training, Niche History

Miscellany: Creator of *Yale Memes for Special Snowflake Teens* (featured on NPR); National Merit Scholarship Semi-Finalist (2016); Dreyfoos Arts High School Salutatorian.