

Justin M. Swaney

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EDUCATION

Massachusetts Institute of Technology, Cambridge, MA

December 2019 (*expected*)

PhD in Chemical Engineering, Minor in Computer Science

Thesis title: Scaling Up 3D Imaging, Analysis, and Culture of Complex Brain Models

University of Wisconsin-Madison, Madison, WI

May 2014

Bachelor of Science in Chemical Engineering, Certificate in Mathematics

GPA: 3.99/4.0

RESEARCH EXPERIENCE

Samply LLC, Walworth, WI

May 2019 – Present

Founder and CEO

- Led development of a visual sample library explorer for music producers based on a novel deep audio embedding network trained by semi-supervised sample classification in Tensorflow.
- Performed demonstrations and poster presentations of Samply at the MIT Computing Exposition.

Kwanghun Chung Lab, MIT, Cambridge, MA

September 2014 – Present

Graduate Researcher

- Designed a distributed CEPH object storage system and developed a computational pipeline for petabyte-scale image processing and visualization of 3D whole-brain light-sheet microscopy images with Python.
- Developed algorithms for 3D whole-brain image co-registration at single-cell resolution, image destriping, and GPU-accelerated nuclei segmentation using Python and Pytorch.
- Performed 3D imaging of intact human cerebral organoids and created a statistical framework for high-content analysis of multiscale phenotypic factors to study Zika virus and Rett Syndrome.
- Built a two-photon stereolithographic 3D printer for nanofabrication using LabVIEW and MATLAB and designed near-infrared excitable, biocompatible, and porous polyethylene glycol-based photoresists.
- Collaborated with a clinical team at MGH on a low-cost blood diagnostic to measure monocyte turnover rate for HIV detection using magnetic separation of ferumoxylol nanoparticles.

Regina Murphy Lab, UW-Madison, Madison, WI

June 2013 – May 2014

Undergraduate Researcher

- Applied Gustafson-Kessel Fuzzy clustering to the tracking analysis of amyloid beta nanoparticles to quantify aggregation dynamics in Alzheimer's disease.

TEACHING EXPERIENCE

Academy for Advanced Research and Development, Cambridge, MA

March 2017 – Present

Assistant Professor (Part-time)

- Supervised STEM-oriented high-school and undergraduate students in individual research projects in data science and machine learning.
- Directed summer courses on self-driving cars using Raspberry Pi's and on applications of data science in healthcare including tumor segmentation in MRI images using Python.
- Provided editorial assistance for student publications and recommendations for college applications.

UW-Madison Chemical Engineering Department, Madison, WI

December 2013 – June 2014

Teaching Assistant (Part-time)

- Taught MATLAB by live coding solutions to example problems in the context of chemical engineering.
- Demonstrated and explained the algorithms behind algebraic and differential equation solvers as well as non-linear optimization tools in MATLAB.

SKILLS and TECHNIQUES

Python	Git	Docker	Flask / Django
MATLAB	Linux / Unix	TDD / Travis CI	iPSC & organoid culture
LabVIEW / DAQmx	Tensorflow / Pytorch	SLURM	Immunohistochemistry
Javascript	Clojure(script)	Accumulo / MySQL	Light-sheet microscopy
C / C++	AWS / Google Cloud	Spark	CLARITY

PUBLICATIONS

- Swaney, J.***, Pujari, S.*, Albanese, A.*, Yun, D.H., Evans, N.B., Chung, K. "Vascularization of neural organoids using two-photon stereolithography", (*in preparation*).
- Albanese, A.*, **Swaney, J.***, Yun, D.H., Evans, N.B., Antonucci-Johnson, J., Gehrke, L., Chung, K. "3D Imaging and High Content Morphological Analysis of Intact Human Cerebral Organoids", (*in preparation*).
- Yun, D.H.*, Park, Y.G.*, Cho, J.H.*, Kamensky, L., Evans, N.B., Albanese, A., Xie, K., **Swaney, J.**, Sohn, C.H., Tian, Y., Zhang, Q., Drummond, G., Guan, W., DiNapoli, N., Choi, H., Jung, H.Y., Ruelas, L., Feng, G., Chung, K. "Ultrafast immunostaining of organ-scale tissues for scalable proteomic phenotyping", *bioRxiv* (submitted to *Nature Biotechnology*), 2019, doi:10.1101/660373.
- Swaney, J.***, Kamensky, L.*, Evans, N.B., Xie, K., Park, Y.G., Drummond, G., Yun, D.H., Chung, K. (2019) "Scalable image processing techniques for quantitative analysis of volumetric biological images from light-sheet microscopy", *bioRxiv*, doi:10.1101/576595.
- Ku, T.*, **Swaney, J.***, Park, J.Y.*, Albanese, A., Murray, E., Cho, J.H., Park, Y.G., Mangena, V., Chen, J., Chung, K. (2016) "Multiplexed and scalable super-resolution imaging of three-dimensional protein localization in size-adjustable tissues", *Nature Biotechnology*, doi:10.1038/nbt.3641.
- Murray, E.*, Cho, J.H.*, Goodwin, D.*, Ku, T.*, **Swaney, J.***, Kim, S.Y., Choi, H., Park, Y.G., Park, J.Y., Hubbert, A., McCue, M., Vassallo, S., Bakh, N., Frosch, M.P., Wedeeng, V.J., Seung, H.S., Chung, K. (2015) "Simple, scalable proteomic imaging for high-dimensional profiling of intact systems", *Cell*, 163, 6, 1500–1514. doi:10.1016/j.cell.2015.11.025
- (* indicates co-first author)

POSTERS and PRESENTATIONS

- Poster** "Non-Parametric Hyperdimensional Analysis of Multiscale Phenotypic Factors in Intact Human Cerebral Organoids", Society for Neuroscience, October, 2019, Chicago, IL.
- Poster** "Non-Parametric Hyperdimensional Analysis of Multiscale Phenotypic Factors in Intact Human Cerebral Organoids", Cell Symposia: Engineering Organoids and Organoids, August, 2019, San Diego, CA.
- Presenter** "Simple, scalable proteomic imaging for high-dimensional profiling of intact systems", Korea Advanced Institute of Science and Technology, January, 2018, Daejeon, South Korea.
- Presenter** "Vascularization of neural organoids using two-photon stereolithography", Massachusetts Institute of Technology, October, 2016, Cambridge, MA.
- Poster** "Simple, scalable proteomic imaging for high-dimensional profiling of intact systems", Society for Neuroscience, November, 2016, San Diego, CA.
- Poster** "Kinetic modeling of amyloid beta aggregation using nanoparticle tracking analysis", Undergraduate Research Symposium, December, 2013, Madison, WI.

HONORS and AWARDS

- 1st Place – Machine Learning Across Disciplines Challenge, MIT College of Computing. 2019
- Outstanding Seminar Award, MIT Chemical Engineering Department. 2018
- Individual Accomplishment Award, MIT Chemical Engineering Department. 2018
- Barbara J. Weedon Fellowship, MIT Picower Institute 2016-2017
- Lemelson Engineering Presidential Fellowship, MIT 2015
- Chancellor's Scholarship, UW-Madison 2010-2014 (Class Co-chair: 2010)
- Dean's Honor List, UW-Madison 2010-2014