BRIAN HIE

brianhie@mit.edu | github.com/brianhie | brianhie.com

Interests: Machine learning, statistics, computational biology, systems biology, host-pathogen interactions.

EDUCATION

Massachusetts Institute of Technology, Cambridge, MA

Electrical Engineering and Computer Science, Ph.D. candidate   2017-2021

Electrical Engineering and Computer Science, M.S.

- GPA: 4.9/5.0; Areas of concentration: Computational biology, machine learning, statistics.

Stanford University, Palo Alto, CA

Computer Science, B.S. with Honors and Distinction   2012-2016

Minor in English Literature

- GPA: 3.9/4.0; Areas of concentration: Computational biology, computer systems, machine learning.

PROFESSIONAL EXPERIENCE

Stanford University School of Medicine, Palo Alto, CA

Postdoctoral Fellow, Peter Kim Laboratory, Bioengineering   2021-Present

- Machine learning at the host-pathogen interface.

Massachusetts Institute of Technology, Cambridge, MA

Computer Science and Artificial Intelligence Laboratory (CSAIL)   2017-2021

- Neural language modeling of viral evolution (https://github.com/brianhie/viral-mutation).
- Bayesian machine learning for biological discovery and design under uncertainty (https://github.com/brianhie/uncertainty).
- Insightful and efficient geometric algorithms for single-cell biology (https://github.com/brianhie/scanorama and https://github.com/brianhie/geosketch).
- Cryptographically secure neural network training (https://github.com/brianhie/secure-dti).

Google LLC, Mountain View, CA

Artificial Intelligence/Machine Learning Resident, X – The Moonshot Factory   2019

- Machine learning for early-pipeline moonshots.

Illumina, Inc., San Diego, CA

Machine Learning Intern, Bioinformatics   2018

- Statistical signal processing for genomics-based health monitoring.

Salesforce.com, Inc., San Francisco, CA

Software Engineer, Cloud Infrastructure   2016-2017

- Robust performance monitoring of globally distributed core application infrastructure.

Stanford University, Palo Alto, CA

Undergraduate Researcher, Hunter Fraser Laboratory, Biology   2013-2016

- Statistics and machine learning for computational genomics, including fundamental problems involving transcription factor binding, chromatin accessibility, and circular RNA function.

Stanford University, Palo Alto, CA

Undergraduate Researcher, Digital Humanities, Stanford Humanities Center   2016
- Graph-theoretic analysis of the social network of early modern authors and publishers.

Microsoft Corporation, Redmond, WA

Software Engineering Intern, Azure Compute and Microsoft Research   2015
- Distributed scheduling algorithms and their impact on data center utilization and availability.

Synaptics, Inc., San Jose, CA

Systems Architecture/Algorithms Intern   2014
- Algorithm design and implementation for embedded touchscreen firmware.

PUBLICATIONS

Journal articles

B. Hie, E. Zhong, B. Berger, and B. Bryson.
"Learning the language of viral evolution and escape."
Science, 371:6526.   2021

B. Hie, B. Bryson, and B. Berger.
"Leveraging uncertainty in machine learning accelerates biological discovery and design."
Cell Systems, 11:5.   2020

B. Hie*, J. Peters*, S. Nyquist*, A. Shalek, B. Berger, and B. Bryson. (*Equal contribution.)
"Computational methods for single-cell RNA sequencing."
Annual Review of Biomedical Data Science, 3:1.   2020

B. Hie*, H. Cho*, B. DeMeo, B. Bryson, and B. Berger. (*Equal contribution.)
"Geometric sketching compactly summarizes the single-cell transcriptomic landscape."
Cell Systems, 8:6. (cover article)   2019

B. Hie, B. Bryson, and B. Berger.
"Efficient integration of heterogeneous single-cell transcriptomes using Scanorama."
Nature Biotechnology, 37:6.   2019

A. Tehranchi, **B. Hie**, M. Dacre, I. Kaplow, K. Pettie, P. Combs, and H. Fraser.
"Fine-mapping cis-regulatory variants in diverse human populations."
eLife, 8:e39595.   2019

B. Hie*, H. Cho*, and B. Berger. (*Equal contribution.)
"Realizing private and practical pharmacological collaboration."
Science, 362:6417.   2018

A. Tehranchi, M. Myrthil, T. Martin, **B. Hie**, D. Golan, and H. Fraser.
"Pooled ChIP-seq links variation in transcription factor binding to complex disease risk."
Cell, 165:3.   2016

Conference papers

B. Hie, E. Zhong, B. Bryson, and B. Berger.
"Learning mutational semantics."
Neural Information Processing Systems (NeurIPS).   2020

B. Hie, H. Cho, B. DeMeo, B. Bryson, and B. Berger.
"Geometric sketching of single-cell data preserves transcriptional structure."
Research in Computational Molecular Biology (RECOMB).   2019

Preprints

R. Singh*, **B. Hie***, A. Narayan, and B. Berger. (*Equal contribution.)
"Metric learning enables synthesis of heterogeneous single-cell modalities."
bioRxiv, DOI: 10.1101/834549.   2020

C. Itoh, C. Gunnarson, G. Babunovic, A. Nibasumba, Ngomu A., M. Wadsworth III, T. Hughes II,
S. Solomon, **B. Hie**, B. Berger, A. Shalek, S. Fortune, and B. Bryson.
*"GM-CSF differentiation of human monocytes stabilizes macrophage state via oxidative
signaling."*
bioRxiv, DOI: 10.1101/2020.09.29.318352.   2020

B. Hie, H. Cho, B. Bryson, and B. Berger.
"Coexpression enables multi-study cellular trajectories of development and disease."
bioRxiv, DOI: 10.1101/719088.   2020

PATENTS

B. Hie, B. Bryson, and B. Berger.
"Language modeling for viral escape prediction."
US Patent App. 63/049,676.   2020

H. Ma, **B. Hie**, and B. Ni.
"Quality control in electronic nose sensing."
US Patent App. 16/738,586.   2020

H. Ma, **B. Hie**, and B. Ni.
"Analyte classification using electronic noses."
US Patent App. 16/737,648.   2020

B. Hie, B. Berger, and H. Cho.
"Realizing private and practical pharmacological collaboration."
US Patent App. 16/235,606.   2019

SOFTWARE

Scanorama, Primary Developer
https://github.com/brianhie/scanorama, 35k+ PyPI downloads

Geosketch, Primary Developer
https://github.com/brianhie/geosketch, 16k+ PyPI downloads

TEACHING

Massachusetts Institute of Technology, Cambridge, MA

Teaching Assistant, Algorithms for Inference (6.438)   2019

Graduate-level course on statistical inference with probabilistic graphical models. Responsible for preparing exams/assignments, leading discussion sections, and holding office hours.

ACADEMIC SERVICE

Mentorship

Andy Tso, Massachusetts Institute of Technology, M.Eng. student

Peer Review

Bioinformatics
Cell
Cell Systems
GigaScience
Conference on *Intelligent Systems for Molecular Biology (ISMB)*
Nature
Nature Biotechnology
PLoS Computational Biology
Conference on *Research in Computational Molecular Biology (RECOMB)*

Program Committee Member

NeurIPS 2020 Workshop on Machine Learning in Structural Biology

GRANTS AND FELLOWSHIPS

Department of Defense (DoD) National Defense Science and Engineering Graduate (NDSEG) Fellowship Program

Total Funding: $158,400 (direct costs)   2019-2022

AWARDS

RECOMB/National Science Foundation Travel Fellowship Award	2019
Hoefer Prize for Writing in the Major, Nominated, *Stanford University*	2016
Tau Beta Pi Engineering Honors Society	2015-Present
Lunsford Award for Oral Presentation, Nominated, *Stanford University*	2014
Boothe Prize for Excellence in Writing, Honorable Mention, *Stanford University*	2013
President's Award for Academic Achievement, *Stanford University*	2013
National Merit Scholarship Finalist	2012