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Hyunghoon Cho

Curriculum vitae

Schmidt Fellow
Broad Institute of MIT and Harvard
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Academic Degrees

9/2013 – 6/2019
Ph.D. in Electrical Engineering and Computer Science, advised by Prof. Bonnie Berger
Massachusetts Institute of Technology

3/2012 – 6/2013
M.S. in Computer Science (GPA 4.0/4.0)
Stanford University

9/2009 – 6/2013
B.S. in Computer Science with Honors (GPA 3.94/4.0), advised by Prof. Daphne Koller
Stanford University

Publications (* co-first, † co-corresponding, {} alphabetical)

Privacy-Preserving Genotype Imputation in a Trusted Execution Environment
Natnatee Dokmai, Can Kockan, Kaiyuan Zhu, XiaoFeng Wang, S. Cenk Sahinalp†, Hyunghoon Cho†
RECOMB, 2021

Mechanisms for Hiding Sensitive Genotypes with Information-Theoretic Privacy
Fangwei Ye, Hyunghoon Cho, Salim El Rouayheb
IEEE International Symposium on Information Theory (ISIT), 2020

Density-Preserving Data Visualization Unveils Dynamic Patterns of Single-Cell Transcriptomic Variability
Ashwin Narayan, Bonnie Berger†, Hyunghoon Cho†
Nature Biotechnology, 2020

Contact Tracing Mobile Apps for COVID-19: Privacy Considerations and Related Trade-offs
{Hyunghoon Cho, Daphne Ippolito, Yun William Yu}
arXiv, 2020

Privacy-Preserving Biomedical Database Queries with Optimal Privacy-Utility Trade-offs
Hyunghoon Cho*, Sean Simmons*, Ryan Kim, Bonnie Berger
Cell Systems 10(5), 2020
RECOMB, 2020

Emerging Technologies Towards Enhancing Privacy in Genomic Data Sharing
Bonnie Berger*, Hyunghoon Cho*
Genome Biology 20, Editorial, 2019

Geometric Sketching Compactly Summarizes the Single-Cell Transcriptomic Landscape
Brian Hie*, Hyunghoon Cho*, Benjamin DeMeo, Bryan Bryson, Bonnie Berger
Cell Systems 8(6), 2019, **Featured cover article**
RECOMB, 2019

Coexpression Uncovers a Unified Single-Cell Transcriptomic Landscape
Brian Hie, Hyunghoon Cho, Bryan Bryson, Bonnie Berger
bioRxiv, 2019

Realizing Private and Practical Pharmacological Collaboration
Brian Hie*, Hyunghoon Cho*, Bonnie Berger
Science 362(6412), 2018

Large-Margin Classification in Hyperbolic Space
Hyunghoon Cho, Benjamin DeMeo, Jian Peng, Bonnie Berger
AISTATS, 2019

Generalizable and Scalable Visualization of Single-Cell Data Using Neural Networks
Hyunghoon Cho, Bonnie Berger, Jian Peng
Cell Systems 7(2), 2018
RECOMB, 2018

Secure Genome-wide Association Analysis using Multiparty Computation
Hyunghoon Cho, David J. Wu, Bonnie Berger
Nature Biotechnology 36, 2018
Featured in Editors' Choice, Science 360(6393) and MIT News

Compact Integration of Multi-Network Topology for Functional Analysis of Genes
Hyunghoon Cho, Bonnie Berger, Jian Peng
Cell Systems 3(6), 2016
F1000Prime Recommended Article

Reconstructing Causal Biological Networks through Active Learning
Hyunghoon Cho, Bonnie Berger, Jian Peng
PLOS One 11(3), 2016

Exploiting Ontology Graph for Predicting Sparsely Annotated Gene Function
Sheng Wang*, Hyunghoon Cho*, ChengXiang Zhai, Bonnie Berger, Jian Peng
Bioinformatics 31(12), 2015
ISMB/ECCB, 2015

Diffusion Component Analysis: Unraveling Functional Topology in Biological Networks
Hyunghoon Cho, Bonnie Berger, Jian Peng
RECOMB, 2015

High-resolution Transcriptome Analysis with Long-read RNA Sequencing
Hyunghoon Cho, Joe Davis, Kevin S. Smith, Alexis Battle, Stephen B. Montgomery
PLOS One 9(9), 2014

Unraveling the Genetics of Human Diseases by Integrating Patterns for Epistasis Detection
Hyunghoon Cho, Alexis Battle, Daphne Koller
Undergraduate Honors Thesis, 2012

Talks

Intro to privacy-enhancing technologies and their potential to broaden genomic data sharing
Broad Institute, Medical and Population Genetics Program Meeting, February 2021

Density-aware visualization and sampling of single-cell transcriptomic datasets
Broad Institute, Single-Cell Working Group Meeting, November 2020

Application of multi-party computation to biomedical data sharing
Theory and Practice of Multi-Party Computation (TPMPC), June 2020

Privacy-preserving biomedical database queries with optimal privacy-utility trade-offs RECOMB Conference, June 2020

Collaborative analysis of federated datasets using cryptography
NHGRI/NHLBI GSP-TOPMed Analysis Workshop, February 2020

Biomedical data sharing and analysis with privacy
EPFL, Security and Privacy Seminar, February 2020

Biomedical data sharing and analysis with privacy
Harvard Medical School Dept. of Biomedical Informatics, B3D Seminar, September 2019

Biomedical data sharing and analysis with privacy
Shannon Channel (Information Theory seminar), May 2019

Realizing private and practical pharmacological collaboration
RECOMB Conference, **Highlight Talk**, April 2019

Biomedical data sharing and analysis with privacy
CMU Computational Biology Department Seminar, February 2019

Biomedical data sharing and analysis with privacy
MIT Applied Mathematics Colloquium, February 2019

Biomedical data sharing and analysis with privacy
Stanford Electrical Engineering Colloquium, February 2019

Biomedical data sharing and analysis with privacy
National Center for Biotechnology Information (NCBI), November 2018

Secure genome crowdsourcing for million-individual association studies
ASHG Annual Meeting, Workshop on Genomic Privacy, October 2018

Biomedical data sharing and analysis with privacy
iDASH Privacy and Security Workshop, **Plenary Talk**, October 2018

Biomedical data sharing and analysis with privacy
Broad Institute, Models, Inference and Algorithms (MIA) Seminar, October 2018

Secure genome crowdsourcing for million-individual association studies
ISMB Translational Medicine, July 2018
Best oral presentation award

Generalizable visualization of mega-scale single-cell data
RECOMB Conference, April 2018

Diffusion Component Analysis: unraveling functional topology in biological networks
RECOMB Conference, April 2015

Homomorphic encryption for genomic analysis
iDASH Privacy and Security Workshop, March 2015

Identifying context-dependent community structure across multiple networks
ISMB Network Biology, July 2014

Work Experience

Schmidt Fellow, **Broad Institute of MIT and Harvard,** 2019–current
Currently leading a research group working on problems in a range of topics in computational biology, including genomic privacy, single-cell genomics, and network biology.

Research Intern, **Microsoft Research New England**, Summer 2014
Worked with Jennifer Listgarten (now Professor at UC Berkeley) on using probabilistic topic models to understand biological processes underlying cancer mutations.

Business Development Intern, **Palantir Technologies**, Summer 2012

Developed a web-based genomic analysis platform with a focus on seamlessly integrating different data sources and publicly available analytical tools.

Teaching Experience

9/2017 – 12/2017
Teaching Assistant, **6.867: Machine Learning**, taught by Prof. Devavrat Shah, Prof. Suvrit Sra, and Prof. David Sontag, MIT

2/2016 – 5/2016
Teaching Assistant, **18.418: Topics in Computational Molecular Biology**, taught by Prof. Bonnie Berger, MIT

3/2013 – 6/2013
Teaching Assistant, **CS228: Probabilistic Graphical Models**, taught by Prof. Daphne Koller, Stanford University

1/2011 – 12/2011
Section Leader, **CS106A: Programming Methodology** and **CS106X: Programming Abstractions**, Stanford University

Advising Experience

Fangwei Ye (Broad Institute), Postdoc Associate, 2021–current
Natnatee Dokmai (Indiana University Bloomington), Visiting PhD student, 2021–current
Daniel Fridman (Broad Institute), Associate Computational Biologist, 2020–current
Manaswitha Edupalli (Broad Institute), Associate Computational Biologist, 2020–current
Jeffrey Chen (MIT), Undergrad researcher*, 2021–current
Shuvom Sadhuka (Harvard), Undergrad researcher*, 2021–current
Wonsuk Kim (Korea University), Visiting PhD student, 2019–2020
Ryan Kim (Harvard), Undergrad researcher*, 2019–current
Shreyan Jain (MIT), Masters student*, 2018–2019
*co-advised with Bonnie Berger (MIT)

Other Experience and Professional Memberships

Member, RECOMB Program Committee, 2021–current
Member, ISMB/ECCB Proceedings Program Committee, 2020–current
Full Member, Sigma Xi Scientific Research Honor Society, 2020–current
Member, Association for Computing Machinery, 2019–current
Member, International Society for Computational Biology, 2014–current
Member, American Society of Human Genetics, 2013–current
Member, Stanford Tau Beta Pi Engineering Honor Society, 2012–current

Awards and Honors

NIH Director’s Early Independence Award, 2020
Schmidt Fellowship, Broad Institute of MIT and Harvard, 2019
Dimitris N. Chorafas Award, 2019 (MIT winner; two per institution)
Best Oral Presentation Award at ISMB TransMed, 2018
MIT EECS Great Educators Fellowship, 2013
Kwanjeong Educational Foundation Scholarship for Graduate Studies, 2013
Frederick Emmons Terman Engineering Scholastic Award, 2013
Stanford Tau Beta Pi Engineering Honor Society, 2012
Stanford University President's Award for Academic Excellence, 2011
Kwanjeong Educational Foundation Scholarship for Undergraduate Studies, 2009
Second Award in Intel ISEF, 2008

Patents

Secure pharmacological collaboration for drug discovery (US 20190311813 A1, 2019)
Brian Hie, Bonnie Berger Leighton, Hyunghoon Cho

Secure genome crowdsourcing for large-scale association studies (US 20180373834 A1, 2018)
Hyunghoon Cho, David J. Wu, Bonnie Berger Leighton

Computer graphical user interface with genomic workflow (US 20140282177 A1, 2013)
Lekan Wang, Hyunghoon Cho, Abimanyu Raja, Elizabeth Caudill, Palantir Technologies, Inc.