

# JOSHUA D. WELCH, PH.D.

Palmer Commons 2044E  
100 Washtenaw Ave. ♦ Ann Arbor, MI 48109  
(734) 615-0618 ♦ welchjd@umich.edu

## PROFESSIONAL EXPERIENCE

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### **Assistant Professor** (2018-present)

Department of Computational Medicine and Bioinformatics  
Department of Computer Science and Engineering  
University of Michigan, Ann Arbor, MI

### **Visiting Scholar** (2018-present)

Stanley Center for Psychiatric Research  
Broad Institute of MIT and Harvard, Cambridge, MA

### **Postdoctoral Associate** (2017-2018)

Stanley Center for Psychiatric Research  
Broad Institute of MIT and Harvard, Cambridge, MA  
Advisor: Evan Z. Macosko

## EDUCATION

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### **Ph.D. in Computer Science** (2012-2017)

The University of North Carolina at Chapel Hill  
Advisor: Jan F. Prins

### **M.S. in Computer Science** (2012-2016)

The University of North Carolina at Chapel Hill  
Advisor: Jan F. Prins

### **B.S. in Computer Science** (2007-2012)

Specialization in Bioinformatics  
Ohio University  
Overall GPA: 3.99

### **B.Mus. in Piano Performance** (2007-2012)

Ohio University  
Overall GPA: 3.99

## PUBLICATIONS

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1. Lu L, **Welch JD**. PyLiger: Scalable single-cell multi-omic data integration in Python. bioRxiv. <https://doi.org/10.1101/2021.12.24.474131>. (in revision)
2. Li C, Virgilio MC, Collins KL, **Welch JD**. Single-cell multi-omic velocity infers dynamic and decoupled gene regulation. bioRxiv. <https://doi.org/10.1101/2021.12.13.472472>. (in revision)  
Accepted at RECOMB 2022.
3. Kriebel AR, **Welch JD**. UINMF performs mosaic integration of single-cell multi-omic datasets using nonnegative matrix factorization. Nature Communications 13:780 (2022).
4. BRAIN Initiative Cell Census Network (BICCN), ..., **Welch JD**, White O, Williams E, Xie F, Xie P, Xiong F, Yang XW, Yanny AM, Yao Z, Yin L, Yu Y, Yuan J, Zeng H, Zhang K, Zhang M, Zhang Z, Zhao S, Zhao X, Zhou J, Zhuang X, Zingg B. A multimodal cell census and atlas of the mammalian primary motor cortex. Nature 598, 86102 (2021).

5. Yao Z, Liu H, Xie F, Fischer S, Booeslaghi AS, Adkins RS, Aldridge AI, Ament SA, Pinto-Duarte A, Bartlett A, Behrens MM, Van den Berge K, Bertagnolli D, Biancalani T, Corrada Bravo H, Casper T, Colantuoni C, Creasy H, Crichton K, Crow M, Dee N, Dougherty EL, Doyle WI, Dudoit S, Fang R, Felix V, Fong O, Giglio M, Gillis J, Goldy J, Hawrylycz M, Roux de Bzieux H, Herb BR, Hertzano R, Hou X, Hu Q, Crabtree J, Kancherla J, Kroll M, Lathia K, Li YE, Lucero JD, Luo C, Mahurkar A, McMillen D, Nadaf N, Nery JR, Niu S, Orvis J, Osteen JK, Pham T, Poirion O, Preissl S, Purdom E, Rimorin C, Risso D, Rivkin AC, Smith K, Street K, Sulc J, Nguyen TN, Tieu M, Torkelson A, Tung H, Vaishnav ED, Svensson V, Vanderburg CR, Ntranos V, van Velthoven C, Wang X, White OR, Huang ZJ, Kharchenko PV, Pachter L, Ngai J, Regev A, Tasic B, **Welch JD**, Ecker JR, Macosko EZ, Ren B, BRAIN Initiative Cell Census Network (BICCN), Zeng H, Mukamel EA. An integrated transcriptomic and epigenomic atlas of mouse primary motor cortex cell types. *Nature* 598, 103110 (2021).
6. Ma H, Liu Z, Yang Y, Feng D, Dong Y, Garbutt T, Hu Z, Wang L, Luan C, Cooper C, Li Y, **Welch JD\***, Qian L\*, Liu J\*. Functional coordination of non-myocytes plays a key role in adult zebrafish heart regeneration. *EMBO Reports* e52901 (2021). Co-corresponding
7. Bao Y, Wadden J, Erb-Downward JR, Ranjan P, Zhou W, McDonald TL, Mills RE, Boyle AP, Dickson RP, Blaauw D, **Welch JD**. SquiggleNet: Real-Time, Direct Classification of Nanopore Signals. *Genome Biology* 22:298 (2021).
8. Alghamri MS, Avvari RP, Thalla R, Kamran N, Zhang L, Ventosa M, Taher A, Faisal SM, Nez FJ, Fabiani MBG, Haase S, Carney S, Orringer D, Hervey-Jumper S, Heth J, Patil PG, Al-Holou WN, Eddy K, Merajver S, Ulintz PJ, **Welch JD**, Gao C, Liu J, Nez G, Hambardzumyan D, Lowenstein PR, Castro M. G-CSF Secreted by Epigenetically Reprogrammed Mutant IDH1 Glioma Stem Cells Reverses the Meloid Cells-Mediated Immunosuppressive Tumor Microenvironment. *Science Advances* Vol 7, Issue 40 (2021).
9. Braeuer R, Misumi K, Walker N, Mazzoni-Putman S, Aoki Y, Vittal R, Kleer G, Liao R, Wheeler D, Farver C, **Welch JD**, Lama V. Transcription factor Foxf1 identifies compartmentally distinct mesenchymal cells with a role in lung allograft fibrogenesis. *Journal of Clinical Investigation*. doi:10.1172/JCI147343.
10. Nagata M, Ka Yan Chu A, Ono N, **Welch JD**, Ono W. Single-cell transcriptomic analysis reveals developmental relationships and specific markers of mouse periodontium cellular subsets. *Frontiers in Dental Medicine*. 12 August 2021. <https://doi.org/10.3389/fdmed.2021.679937>
11. Le Cao KA, Abadi AJ, Davis-Marcisak EF, Hsu L, Arora A, Coullomb A, Deshpande A, Feng Y, Jegannathan P, Loth M, Meng C, Mu W, Pancaldi V, Sankaran K, Singh A, Sodicoff JS, Stein-O'Brien GL, Subramanian A, **Welch JD**, You Y, Argelaguet R, Carey VJ, Dries R, Greene CS, Holmes S, Love MI, Ritchie ME, Yuan GC, Culhane AC, Fertig E. Community-wide hackathons to identify central themes in single-cell multi-omics. *Genome Biol* 22, 220 (2021). <https://doi.org/10.1186/s13059-021-02433-9>.
12. Matsushita Y, Ka Yan Chu A, Ono W, **Welch JD**, Ono N. Intercellular interactions of an adipogenic CXCL12-expressing stromal cell subset in murine bone marrow. *Journal of Bone and Mineral Research* 2021. <https://doi.org/10.1002/jbmr.4282>
13. Yu H, **Welch JD**. Sampling from disentangled representations of single-cell data using generative adversarial networks. *Genome Biology* 22, 158 (2021). <https://doi.org/10.1186/s13059-021-02373-4>. Also presented at Learning Meaningful Representations of Life (LMRL 2020), Workshop at NeurIPS 2020.
14. Gao C, Liu J, Kriebel AR, Preissl S, Luo C, Castanon R, Sandoval J, Rivkin A, Nery JR, Behrens MM, Ecker JR, Ren B, **Welch JD**. Iterative Refinement of Cellular Identity from Single-Cell Data Using Online Learning. *Nature Biotechnology* 2021. <https://doi.org/10.1038/s41587-021-00867-x>

15. Liu J\*, Gao C\*, Sodicoff J, Kozareva V, Macosko EZ, **Welch JD**. Jointly Defining Cell Types from Multiple Single-Cell Datasets Using LIGER. *Nature Protocols*. 15, 36323662 (2020). \*Equal contribution
16. Matsushita Y, Nagata M, Kozloff K, **Welch J**, Mizuhashi K, Tokavanich N, Hallett S, Link D, Nagasawa T, Ono W, and Ono N. A Wnt-mediated transformation of the bone marrow stromal cell identity orchestrates skeletal regeneration. *Nature Communications*. 11, 332 (2020).
17. Zhou Y, Liu Z, **Welch JD**, Gao X, Wang L, Garbutt T, Keepers B, Ma H, Prins JF, Shen W, Liu J, Qian L. Single-Cell Transcriptomic Analyses of Cell Fate Transitions during Human Cardiac Reprogramming. *Cell Stem Cell*. 2019 Jun 12. pii: S1934-5909(19)30224-3. doi: 10.1016/j.stem.2019.05.020.
18. **Welch JD\***, Kozareva V, Ferreira A, Vanderburg C, Martin C, Macosko EZ\*. Single-cell multi-omic integration compares and contrasts features of brain cell identity. *Cell* 2019. <https://doi.org/10.1016/j.cell.2019.05.006>.  
\*Co-corresponding
19. Rodriques SG\*, Stickels RR\*, Goeva A Martin CA, Murray E, Vanderburg CR, **Welch JD**, Chen LM, Chen F+, Macosko EZ+. Slide-seq: A Scalable Technology for Measuring Genome-Wide Expression at High Spatial Resolution. *Science* 29 Mar 2019: Vol. 363, Issue 6434, pp. 1463-1467 DOI: 10.1126/science.aaw1219
20. Liu Z\*, Wang L\*, **Welch JD\***, Ma H, Zhou Y, Vaseghi HR, Yu S, Wall JB, Alimohamadi S, Zheng M, Yin C, Shen W, Prins JF, Liu J, Qian L. Single-cell transcriptomics reconstructs fate conversion from fibroblast to cardiomyocyte. *Nature* (02 November 2017). 551, 100104 doi:10.1038/nature24454  
\*Equal contribution
21. **Welch JD**, Hartemink AJ, Prins JF. MATCHER: Manifold alignment reveals correspondence between single cell transcriptome and epigenome dynamics. *Genome Biology* 2017, 18:138. doi:10.1186/s13059-017-1269-0
22. Lackey P, **Welch JD**, Marzluff WM. TUT7 Catalyzes the Uridylation of the 3' End of Histone mRNA for Rapid Degradation. *RNA* 2016. doi:10.1261/rna.058107.116
23. **Welch JD\***, Williams LA\*, DiSalvo M\*, Brandt AT, Marayati R, Sims CE, Allbritton NL, Prins JF, Yeh JJ, Jones CD. Selective Single Cell Isolation for Genomics Using Micrafluid Arrays. *Nucleic Acids Research* 2016. doi: 10.1093/nar/gkw700  
\*Equal contribution
24. Lyons SM, Cunningham CH, **Welch JD**, Groh B, Guo AY, Wei B, Whitfield ML, Xiong Y, Marzluff WF. A subset of replication-dependent histone mRNAs are expressed as polyadenylated RNAs in terminally differentiated tissues. *Nucleic Acids Research* 2016. doi: 10.1093/nar/gkw620
25. **Welch JD**, Hartemink AJ, Prins JF. SLICER: Inferring branched, nonlinear cellular trajectories from single cell RNA-seq data. *Genome Biology* 2016, 17:106 doi:10.1186/s13059-016-0975-3
26. **Welch JD**, Hu Y, Prins JF. Robust Detection of Alternative Splicing in a Population of Single Cells. *Nucleic Acids Research* 2016. doi: 10.1093/nar/gkv1525  
\*Also accepted as a highlight at ISMB 2016
27. Brooks L, Lyons SM, Mahoney JM, **Welch JD**, Liu Z, Marzluff WM, Whitfield ML. A multi-protein occupancy map of the mRNP on the 3 end of histone mRNAs. *RNA* 2015.
28. **Welch JD\***, Slevin MK\*, Tatomer D, Duronio RJ, Prins JF, Marzluff WF. EnD-Seq and AppEnD: Sequencing 3 ends to identify nontemplated tails and degradation intermediates. *RNA* 2015.  
\*Equal contribution

29. **Welch JD**, Baran-Gale J, Perou C, Sethupathy P, Prins JF. Pseudogenes Transcribed in Breast Invasive Carcinoma Show Subtype-Specific Expression and ceRNA Potential. *BMC Genomics* 2015.
30. Slevin MK, Meaux S, **Welch JD**, Bigler R, Miliani de Marval PL, Su W, Rhoads RE, Prins JF, Marzluff WF Deep Sequencing Shows Multiple Oligouridylations Are Required for 3' to 5' Degradation of Histone mRNAs on Polyribosomes. *Molecular cell* 53 (6), 1020-1030. March 2014.
31. Lichtenberg J, Kurz K, Liang X, Al-ouran R, Neiman L, Nau LJ, **Welch JD**, Jacox E, Bitterman T, Ecker K, Elnitski L, Drews F, Lee SS, Welch LR. WordSeeker: concurrent bioinformatics software for discovering genome-wide patterns and word-based genomic signatures. *BMC Bioinformatics*. 2010 Dec 21;11 Suppl 12:S6.
32. Lichtenberg J, Yilmaz A, **Welch JD**, Kurz K, Liang X, Drews F, Ecker K, Lee SS, Geisler M, Grotewold E, Welch LR. The word landscape of the non-coding segments of the Arabidopsis thaliana genome. *BMC Genomics*. 2009 Oct 8;10:463.
33. Lichtenberg J, Jacox E, **Welch JD**, Kurz K, Liang X, Yang MQ, Drews F, Ecker K, Lee SS, Elnitski L, Welch LR. Word-based characterization of promoters involved in human DNA repair pathways. *BMC Genomics*. 2009 Jul 7;10 Suppl 1:S18.

## PREPRINTS

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Lu L, **Welch JD**. PyLiger: Scalable single-cell multi-omic data integration in Python. *bioRxiv*. <https://doi.org/10.1101/2021.12.24.474131>. (in revision)

Li C, Virgilio MC, Collins KL, **Welch JD**. Single-cell multi-omic velocity infers dynamic and decoupled gene regulation. *bioRxiv*. <https://doi.org/10.1101/2021.12.13.472472>. (in revision) Accepted at RECOMB 2022.

## HONORS AND AWARDS

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Horizon Award, The UNC Graduate School (2017)

NIH Predoctoral Fellowship (F31) (2016).

Proposal title: "Computational Modeling of Heterogeneous Gene Expression in Single Cells"

Big Data to Knowledge Fellowship (BD2K T32) (2015)

Elected President of the Computer Science Student Association (2014)

Selected to attend Heidelberg Laureate Forum (200 students selected) (2014)

Graduate Student Mentoring Award, UNC Office of Undergraduate Research (2013)

NSF Graduate Research Fellowship (2012)

Outstanding Senior in Computer Science, Ohio University Russ College of Engineering (2011)

Ohio University Concerto Competition Winner (2011)

Outstanding Junior in Computer Science, Ohio University Russ College of Engineering (2009)

## GRANTS

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Divergence of RAS and BOS Phenotypes of CLAD

Cystic Fibrosis Foundation (LAMA21AB0)

Lama, Vibha; Welch, Joshua, Co-PI

02/2022-01/2024.

Total: \$336,000

*Uncover the role of H3.3-G343R mutation in shaping the DNA damage response, anti-tumor immunity and mechanisms of resistance in glioma*  
NIH/NINDS (R01NS12216501A1)  
Co-I with Effort (Principal Investigator: Castro, Maria)  
01/2022-08/2026.  
Total: \$3,228,160

*Adipose tissue diversity in infants, children, and adolescents*  
Chan Zuckerberg Initiative (CZI PN-0000000075)  
Lumeng, Carey Nien-Kai;Gadepalli, Samir Kumar;Ohye, Richard G;Singer, Kanakadurga VNL;Welch, Joshua; Woolford, Susan Jennifer, Co-PI  
10/2021-09/2024.  
Total: \$1,962,705

*Craniofacial Skeletal Cell Lineage Plasticity for Reconstituting Stem Cells and Their Niches*  
NIH/NIDCR (R01)  
Noriaki Ono (PI), Wanida Ono (PI), Joshua D. Welch (PI)  
04/01/2021-02/28/2026.  
Total: \$2,651,873

*Dental Follicle: A Central Regulator of Tooth Root Formation and Regeneration*  
NIH/NIDCR (R01DE029181-01A1)  
Noriaki Ono (PI), Wanida Ono (PI), Joshua D. Welch (co-I)  
02/01/2021-01/31/2026.  
Total: \$1,950,000

*Linking Molecular and Anatomical Features of Brain Cell Identity through Computational Data Integration*  
NIH/NIMH (1R01MH123199-01)  
Joshua D. Welch (PI)  
09/01/2020-08/31/2023.  
Total: \$1,275,913

*Integrative Single-Cell Analysis of Transcriptome, Epigenome, and Lineage in HIV Latency and Activation*  
NIH/NIAID (1R01AI149669-01)  
Kathleen Collins (PI), Joshua D. Welch (PI)  
12/19/2019-12/31/2024.  
Total: \$3,360,219

*Quantitative Definition of Cell Identity by Integrating Transcriptomic, Epigenomic, and Spatial Features of Individual Cells*  
NIH/NHGRI (1R01HG010883-01)  
Joshua D. Welch (PI), Noriaki Ono (co-I)  
09/03/2019-06/30/2024.  
Total: \$1,508,385

*Dynamics and Regulations of Bone Stem Cells In Vivo (Supplement)*  
NIH/NIDCR (3R01DE026666-02S1)  
Noriaki Ono (PI), Joshua D. Welch (Co-I)  
06/2019-05/2020.  
Total: \$228,690

*Integrative Single Cell Genomic Analysis of Mesenchymal Stem Cells*  
MCubed, University of Michigan  
Noriaki Ono, Wanida Ono, Joshua D. Welch (Co-PI)

01/2019-04/2020.

Total: \$20,000

*Integrating Single Cell Profiles across Modalities Using Manifold Alignment*

Chan Zuckerberg Initiative (2018-183155)

Joshua Welch (PI)

04/2018-08/2019.

Total: \$171,000

## ABSTRACTS

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Bao Y, Welch JD. Real-Time, Direct Classification of Nanopore Signals Using SquiggleNet. RECOMB-Seq 2021 (virtual meeting).

Kriebel AR, Welch JD. Nonnegative matrix factorization integrates single-cell multi-omic datasets with partially overlapping features. Machine learning methods for single-cell genomics, workshop at ACM-BCB 2021 (virtual meeting). August 2021.

Chao Gao, **Joshua D. Welch**: Iterative Single-Cell Multi-Omic Integration Using Online Learning, Intelligent Systems for Molecular Biology, July 2021 (virtual meeting).

Lu L, Welch JD. PyLiger: Scalable single-cell data integration in Python. Great Lakes Bioinformatics Conference (virtual meeting). April 2021.

Kriebel AR, Welch JD. Nonnegative matrix factorization integrates single-cell multi-omic datasets with partially overlapping features. Great Lakes Bioinformatics Conference (virtual meeting). April 2021.

Bao Y, Welch JD. Real-Time, Direct Classification of Nanopore Signals Using SquiggleNet. Machine Learning in Computational Biology (MCLB 2020).

Yu H, Welch JD. Predicting unobserved cell states from disentangled representations of single-cell data using generative adversarial networks. Learning Meaningful Representations of Life (LMRL 2020), Workshop at NeurIPS 2020.

Chao Gao, **Joshua D. Welch**: Iterative Refinement of Cell Identity from Single-Cell Data Using Online Learning, Research in Computational Molecular Biology, 2020.

**Joshua D. Welch**: Validating Joint Analysis of Single-Cell Transcriptome and Epigenome Data Using scNMT-seq and SNARE-seq, BIRSBioIntegration, 2020.

Joshua Sodicoff, **Joshua D. Welch**: Application of LIGER to integration of seqFISH and scRNA-seq, BIRSBioIntegration, 2020.

Maria C. Virgilio, Jay Lubow, **Joshua D Welch**, Kathleen L Collins: The impact of HIV-1 Vpr on host transcription in macrophages, Cold Spring Harbor Laboratory meeting: Retroviruses, 2020.

Yutong Wang, Clay Scott, Laura Balzano, **Joshua D. Welch**: Domain adaptation for spatial and dissociated gene expression data integration, Learning Meaningful Representations of Life, Workshop at NeurIPS, Vancouver, Canada, 2019.

Maria C. Virgilio, Mark M. Painter, Valeri H. Terry, Francisco Gomez-Rivera, **Joshua D. Welch**, Kathleen L. Collins: Single-cell RNA sequencing analysis of HSPCs harboring latent and active HIV infections, Midwest Virology Symposium, 2019.

**Joshua D. Welch**, Evan Z. Macosko: Single-Cell Multi-omic Integration Compares and Contrasts Features of Brain Cell Identity, Intelligent Systems for Molecular Biology, Basel, Switzerland, 2019.

**Joshua D. Welch**, Evan Z. Macosko: Single-Cell Multi-omic Integration Compares and Contrasts Features of Brain Cell Identity, Algorithms and Models for Single-Cell Genomics, Irvine, CA, USA, 2019.

**Joshua D. Welch**, Velina Kozareva, Ashley Ferreira, Carly Martin, Evan Macosko: Comparing and contrasting heterogeneous single-cell datasets, Single Cell Genomics, Cambridge, MA, 2018.

**Joshua D. Welch**, Alexander J. Hartemink, Jan F. Prins: MATCHER: Manifold Alignment Reveals Correspondence between Single Cell Transcriptome and Epigenome Dynamics, Intelligent Systems for Molecular Biology (ISMB), Chicago, IL, 2018.

**Joshua D. Welch**, Alexander J. Hartemink, Jan F. Prins: E Pluribus Unum: United States of Single Cells, Research in Computational Molecular Biology, Hong Kong, 2017.

**Joshua D. Welch**, Yin Hu, Jan F. Prins: Robust Detection of Alternative Splicing in a Population of Single Cells, Intelligent Systems for Molecular Biology, Orlando, FL, 2016.

**Joshua D. Welch**, Alexander J. Hartemink, Jan F. Prins. SLICER: Inferring Branched, Nonlinear Cellular Trajectories from Single Cell RNA-seq Data, Research in Computational Molecular Biology (RECOMB), Santa Monica, CA, 2016.

**Joshua D. Welch**, Jan F. Prins: Finding Life in High-Dimensional Space: Identifying Cell Types from Single Cell Gene Expression Data, NSF Data Science Workshop, Seattle, WA, 2015.

**Joshua D. Welch**, Lindsay Williams, Matthew DiSalvo, Jan F. Prins, Nancy Allbritton, Christopher Sims, Jen Jen Yeh, Corbin D. Jones: Selective Single Cell Isolation and RNA Sequencing Using Magnetic Micrafts, RNA Conference, Madison, WI, 2015.

**Joshua D. Welch**. Decoding the Symbols of Life: Learning Cell Types and Properties from RNA Sequencing Data, Dagstuhl Seminar 14381, "Neural-Symbolic Learning and Reasoning", 2014.

**Joshua D. Welch**, Michael K. Slevin, Jan F. Prins, William Marzluff: EnD-seq: A method for finding the 3 ends of RNA molecules using next-generation sequencing with application to mRNA exonuclease degradation, Symposium on RNA Biology X, North Carolina RNA Society Meeting, Chapel Hill, NC, 2013.

**Joshua D. Welch**, Charles Perou, Praveen Sethupathy, Jan F. Prins: Investigating the Role of Transcribed Pseudogenes in Breast Cancer, Intelligent Systems for Molecular Biology (ISMB), Berlin, Germany, 2013.

## INVITED TALKS

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Sampling from disentangled representations of single-cell data using generative adversarial networks. Hosted by Martin Treppner, Institute of Medical Biometry and Statistics, University of Freiburg, March 2022, Freiburg, Germany (by zoom)

Single-cell multi-omic velocity infers dynamic and decoupled gene regulation. Hosted by Youping Deng, University of Hawaii - Manoa, February 2022, Honolulu, Hawaii, USA (by zoom)

Iterative Single-Cell Multi-Omic Integration Using Online Learning. Hosted by Jonah Cool, Chan Zuckerberg Biohub, December 2021, Palo Alto, CA (by zoom)

Jointly defining cell states from Single-Cell Multiomic and Spatial Transcriptomic datasets. Hosted by Steven Hoffman., Illumina/10X Genomics, November 2021 (by zoom)

Single-cell multi-omic velocity infers dynamic and decoupled gene regulation. Hosted by Mingyao Li, University of Pennsylvania, November 2021, Philadelphia, PA (by zoom)

University of Memphis Biological Sciences Seminar Series. November 2021. Hosted by Bernie Daigle.

Stanley Center Symposium, Broad Institute. September 2021. Hosted by Steve Hyman.

Jointly Defining Cell States from Single-Cell Multi-Omic and Spatial Transcriptomic Datasets. International Chinese Statistical Association meeting. September 2021 (virtual meeting). Hosted by Yun Li.

Learning Representations of Cell Identity by Single-Cell Multi-Omic Integration, MIT 6.874,6.802,20.390,20.490: Deep Learning in the Life Sciences (via zoom). March 2021. Hosted by Manolis Kellis.

Quantitative Definition of Cellular Identity by Single-Cell Multi-Omic Integration, George O'Brien Kidney Center Research Seminar, University of Michigan, March 2020, Ann Arbor, MI. Hosted by Markus Bitzer.

United States of Single Cells (Taubman Tech Talk), University of Michigan, February 2020, Ann Arbor, MI

Quantitative Definition of Cellular Identity by Single-Cell Multi-Omic Integration, Biogen, February 2020, Cambridge, MA. Hosted by Eugenia Lyashenko.

Quantitative Definition of Cellular Identity by Single-Cell Multi-Omic Integration (MIT Bioinformatics Seminar), Massachusetts Institute of Technology, February 2020, Cambridge, MA. Hosted by Bonnie Berger.

Quantitative definition of cell identity by integrating transcriptomic, epigenomic, and spatial features, Broad Institute of MIT and Harvard, March 2019, Cambridge, MA. Hosted by

Quantitative definition of cell identity through single-cell data integration (Science at the Edge Seminar Series), Michigan State University, September 2019, Lansing, MI. Hosted by David Arnosti.

Life in High-Dimensional Space: Modeling Sequential Changes in Gene Expression, Penn State University, March 2017, State College, PA.

Life in High-Dimensional Space: Modeling Sequential Changes in Gene Expression, University of Michigan, February 2017, Ann Arbor, MI. Hosted by Jun Li.

Life in High-Dimensional Space: Modeling Sequential Changes in Gene Expression, Virginia Tech, February 2017, Blacksburg, VA. Hosted by T.M. Murali.

Life in High-Dimensional Space: Modeling Sequential Changes in Gene Expression, University of Kentucky, February 2017, Lexington, KY. Hosted by Jinze Liu.

## **PEER-REVIEW SERVICE**

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### **Program Committee Member**

ISMB 2021 RegSys and General Bioinformatics Program Committees

11th ACM Conference on Bioinformatics, Computational Biology, and Health Informatics (ACM-BCB) Program Committee (2020)

10th ACM Conference on Bioinformatics, Computational Biology, and Health Informatics (ACM-BCB) Program Committee (2019)

High Performance Computational Biology (HICOMB) 2019

### **Ad Hoc Reviewer**

Bioinformatics

Genome Biology

Genome Research

IEEE/ACM Transactions on Computational Biology

Nature

Nature Biotechnology



Nature Communications

Nature Methods

Nature Reviews Genetics

PLoS Computational Biology

### **Temporary Member**

GNOM-G Study Section, National Human Genome Research Institute, June 2020

ETTN-B(55) Study Section, National Institute of Mental Health, February 2021

INCLUDE Down Syndrome Study Section, NIH Common Fund, March 2021

GCAT Study Section, National Human Genome Research Institute, June 2021

ZDE1 JK(07) Study Section, National Institute of Dental and Craniofacial Research, November 2021

## **GRADUATE STUDENT ADVISING**

---

Yuwei Bao, MS, DCMB/CSE, University of Michigan (08/2018-08/2019)

Hengshi Yu, PhD, Biostatistics, University of Michigan (08/2018-present)

Hojae Lee, PhD, Electrical and Computer Engineering, University of Michigan (10/2018-present) - **NSF Graduate Research Fellowship**

Jialin Liu, MS, DCMB, University of Michigan (01/2019-present)

Chao Gao, PhD, DCMB, University of Michigan (06/2019-present)

Yuwei Bao, PhD (joint with Satish Narayanasamy), Computer Science and Engineering, University of Michigan (08/2019-12/2020)

April Kriebel, PhD, DCMB, University of Michigan (06/2020-present) - **University of Michigan Genomic Science Training Grant**

Chen Li, PhD, DCMB, University of Michigan (06/2020-present) - **University of Michigan Bioinformatics Training Grant**

Yichen Gu, PhD (joint with David Blaauw), Computer Science and Engineering, University of Michigan (07/2020-present)

Lu Lu, PhD, DCMB, University of Michigan (01/2022-present)

## **TEACHING**

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BIOINF 500, Fall 2019 (Co-Instructor)

BIOINF 602/603, Fall 2019 (Co-Instructor)

BIOINF 590, Fall 2019 (Co-Instructor)

BIOINF 602/603, Winter 2020 (Co-Instructor)

BIOINF 602/603, Fall 2020 (Co-Instructor)

BIOINF 593/EECS 598, Fall 2021 (Co-Instructor)

The University of Michigan, Ann Arbor, MI

COMP 790-201: Predictive Models for High-Dimensional Data Analysis (Co-Instructor)

The University of North Carolina at Chapel Hill (01/2016-05/2016)

Single-Cell Sequencing Nanocourse (Co-Instructor)

Harvard Medical School (03/2018)

## **DISSERTATION COMMITTEES**

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Marcus Sherman, Open-source Python library for processing SAM files, University of Michigan, Computational Medicine and Bioinformatics

Nanxiang Zhao, Genome-wide Interrogation of Human Positive Regulatory Elements, University of Michigan, Computational Medicine and Bioinformatics

Renee Conway, Organoid models and development of human lung mesenchymal stem cells, University of Michigan, Cell and Developmental Biology

Maria Virgilio, Single-cell analysis of HIV latency, University of Michigan, Molecular and Cellular Biology

Jacqueline Larouche, Single-cell analysis of volumetric muscle loss, University of Michigan, Biomedical Engineering

Jiaqiang Zhu, Statistical methods for spatial transcriptomics, University of Michigan, Biostatistics

Chen Sun, Algorithms for somatic variant detection in single neurons, University of Michigan, Computational Medicine and Bioinformatics

## OPEN-SOURCE SOFTWARE PACKAGES

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**AppEnD:** Mapping 3' additions from RNA-seq data

<https://github.com/jw156605/append>

**SingleSplice:** Detection of alternative splicing in single cells

<https://github.com/jw156605/SingleSplice>

**SLICER:** Single cell trajectory inference

<https://github.com/jw156605/SLICER>

**MATCHER:** Single cell multi-modal integration

<https://github.com/jw156605/MATCHER>

**LIGER:** Linked inference of genomic experimental relationships

<https://github.com/MacoskoLab/LIGER>

**MichiGAN:** Sampling from Disentangled Representations of Cell Identity using Generative Adversarial Networks

<https://github.com/welch-lab/MichiGAN>

**SquiggleNet:** Real-Time, Direct Classification of Nanopore Signals

<https://github.com/welch-lab/SquiggleNet>

**PyLiger:** Scalable single-cell multi-omic data integration in Python

<https://github.com/welch-lab/pyliger>

**MultiVelo:** Single-cell multi-omic velocity inference

<https://github.com/welch-lab/MultiVelo>