Nuo "Ivy" Liu

39 Porter St, Apt 3, Somerville, MA, 02143
+1 (714)2646071 | ivliu@mit.edu

Education

Harvey Mudd College — *Claremont, CA, USA*
B.S. in Mathematical and Computational Biology, GPA: 3.95/4.0 — *September 2016-May 2020*
- Graduated with High Distinction, Honors in Biology, Honors in Computer Science
- Humanities concentration in *Economics*
- Dean's List for all previous applicable semesters

Massachusetts Institute of Technology (MIT) — *Cambridge, MA, USA*
Ph.D. candidate in Computational and systems biology, GPA: 5.0/5.0 — *Fall 2020-Present*
Advisor: Prof. Alex K. Shalek (Chemistry)

Awards and Honors

2020	Computer Science Class of '94 Award,	*CS Department, Harvey Mudd College*
2020	Finalist for the *CRA Outstanding Undergraduate Researcher Awards*,	*Computing Research Association*
2019	*W.A. Brandenburger Biology Prize*,	*Biology Department, Harvey Mudd College*
2019	*First-Tier Traveling Fellowship*,	*17th Asia Pacific Bioinformatics Conference*
2017	*CRC Handbook Prize*,	*Chemistry Department, Harvey Mudd College*

Research Experience

Massachusetts Institute of Technology — *Cambridge, MA*
Graduate Researcher advised by Prof. Alex K. Shalek — *Jun 2021- present*
- Use single-cell technologies to understand extrinsic and intrinsic factors driving cell state changes in different cancer systems, including glioblastoma and pancreatic cancer
- Develop computational workflow for deciphering heterogeneous RNA cell states from pan-cancer single-cell transcriptomic data
- Comparative studies on different deep learning models on their efficiency in predictive modeling of single-cell perturbation responses

Westlake University — *Hangzhou, China*
Summer research intern advised by Dr. Tiannan Guo — *Jul-Aug 2020*
- Built and trained a LSTM-based deep learning model on pan-human tissues using fragment sequence and charge state to predict ion mobility value (Pearson's r>0.98)
- Predicted ion mobility values for mouse liver proteomics data generated using two non-timsTOF equipments (Thermo Orbitrap, tripleTOF), compared library search results using ion mobility-supplemented libraries and timsTOF library

Harvey Mudd College — *Claremont, CA*
Senior thesis researcher advised by Prof. Eliot Bush — *Sep 2019-May 2020*
- Year-long thesis research under the Biology Department titled *Reconstructing Gene Family Evolution in Microbes Using DTLOR Algorithm*
- Explored ways to break down a family of genes into distinct groups with similar syntenic information
- Extend the Duplication Transfer Loss model to include new events to reconstruct the evolutionary history of prokaryotic organisms more comprehensively

Baylor College of Medicine — *Houston, TX*
Summer Research Intern Advised by Dr. Pavel Sumazin — *Summer 2019*
- Researched on phylogeny Inference from Gene Expression Profiles of Multiple Sections per Tumor at the Department of Pediatrics
- Designed a method that estimates cell-type specific expression from bulk tumor profiles using a hierarchical approach that exploits a Linear Programming solution to reconstruct the transcriptional evolution of tumors

Baylor College of Medicine — *Houston, TX*
Summer Research Intern Advised by Dr. Cristian Coarfa — *Summer 2018*
- Worked on RNA-Seq, microarray and gene enrichment analysis
- Built and trained a Convolutional Neural Network to predict epigenetic remarking events in rat liver genome under environmental influence
- Extracted *de novo* DNA motifs related to epigenetic reprogramming using trained model

Harvey Mudd College *Claremont, CA*

Summer research intern Advised by Prof. Ran Libeskind-Hadas, Prof. Yi-Chieh Wu *Summer 2017*

- Extended the dynamic programming algorithm for phylogenetic tree reconciliation under Duplication-Loss-Coalescence(DLC) evolution model to optimize Pareto-optimal solutions
- Tested the correctness of the algorithm and built tool to visualize the event cost landscape
- Showed the reconciliation algorithm is robust to event costs and inferred event support across optimal reconciliations

Harvey Mudd College *Claremont, CA*

Summer research intern Advised by Prof. Catherine McFadden *Spring 2017*

- Investigated feasibility of using 28S rDNA for genetic barcoding to differentiate species within coral genus Sinularia
- Utilized computational tools to edit sequencing results and built gene tree
- Research resulted in promise for using 28S rDNA barcoding to the less economical whole-genome sequencing in coral species identification

Publication

- Mead, B. E., Kummerlowe, C., **Liu, N.**, Kattan, W. E., Cheng, T., Cheah, J. H., Soule, C. K., Peters, J., Lowder, K. E., Blainey, P. C., Hahn, W. C., Cleary, B., Bryson, B., Winter, P. S., Raghavan, S., & Shalek, A. K. (2023). Compressed phenotypic screens for complex multicellular models and high-content assays. BioRxiv. https://doi.org/10.1101/2023.01.23.525189
- Raghavan, S., Winter, P. S., Navia, A. W., Williams, H. L., DenAdel, A., Lowder, K. E., Galvez-Reyes, J., Kalekar, R. L., Mulugeta, N., Kapner, K. S., Raghavan, M. S., Borah, A. A., **Liu, N.**, Väyrynen, S. A., Costa, A. D., Ng, R. W. S., Wang, J., Hill, E. K., Ragon, D. Y., … Shalek, A. K. (2021). Microenvironment drives cell state, plasticity, and drug response in pancreatic cancer. Cell, 184(25), 6119-6137.e26. https://doi.org/10.1016/j.cell.2021.11.017
- H. Du, Y. S. Ong, M. Knittel, R. Mawhorter, **Liu, N.**, G. Gross, R. Tojo, R. Libeskind-Hadas, & Y. -C. Wu. (2021). Multiple Optimal Reconciliations Under the Duplication-Loss-Coalescence Model. IEEE/ACM Transactions on Computational Biology and Bioinformatics, 18(6), 2144–2156. https://doi.org/10.1109/TCBB.2019.2922337
- Liu, J., Mawhorter, R., **Liu, N.**, Santichaivekin, S., Bush, E., & Libeskind-Hadas, R. (2021). Maximum parsimony reconciliation in the DTLOR model. BMC Bioinformatics, 22(10), 394. https://doi.org/10.1186/s12859-021-04290-6
- Carothers, M., Gardi, J., Gross, G., Kuze, T., **Liu, N.**, Plunkett, F., Qian, J., & Wu, Y.-C. (2020). An Integer Linear Programming Solution for the Most Parsimonious Reconciliation Problem under the Duplication-Loss-Coalescence Model. Proceedings of the 11th ACM International Conference on Bioinformatics, Computational Biology and Health Informatics. https://doi.org/10.1145/3388440.3412474
- Mawhorter, R.,**Liu, N.**, Libeskind-Hadas, R., & Wu, Y.-C. (2019). Inferring Pareto-optimal reconciliations across multiple event costs under the duplication-loss-coalescence model. BMC Bioinformatics, 20(20), 639. https://doi.org/10.1186/s12859-019-3206-6

Presentations

Jul. 2022	Presentation on research project ***Putative drivers of cellular plasticity in glioblastoma***, NCI Human Tumor Atlas Network (HTAN) internal meeting	*Cambridge, MA, USA*
Nov. 2019	Presented on thesis proposal "***Reconstructing Gene Family Evolution in Microbes Using DTLOR Algorithm***", Senior thesis proposal presentation	*Claremont, CA, USA*
Jul. 2019	Presented on summer project "***Tumor Phylogeny Inference from Gene Expression Profiles of Multiple Tumor Mixture Samples***", Baylor College of Medicine SMART program final symposium	*Houston, TX, USA*
Jan. 2019	Presenter for paper "***Multiple Optimal Reconciliations under the Duplication-Loss-Coalescence Model***", *17th Asia and Pacific Bioinformatics Conference*	*Wuhan, China*
Jul. 2018	Presented on summer project "***Predicting de novo Motifs Using Convolutional Neural Network***", Baylor College of Medicine SMART program final symposium	*Houston, TX, USA*

Additional Experience

MIT-China Innovation and Entrepreneurship Forum *Cambridge, MA, USA*

Co-President, Director of Planning Team *May 2020 - Present*

- Worked on planning online fireside chats, invited talks and day-long annual forum during pandemic
- Build a consistent program of events for MIT and local students and young professionals to learn about technology and innovation and identify entrepreneurial potentials
- Establish relationships and invite speakers from US-based and China-based venture capitals to share their knowledge on building startups and investments

CSB Application Assistance Program — *Cambridge, MA, USA*

Executive Board, Secretary, Fund Manager — *Oct 2021 - Present*

- Helped establish the application assistance program for the Computational and Systems Biology PhD program at MIT
- Worked on a team to set up mentor training session, recruiting mentees and pairing mentor-mentees
- Secured Grad Student Experience Grant from Office of Graduate Education at MIT to kick-start the first year of the program

Massachusetts Institute of Technology — *Cambridge, MA, USA*

Mentoring

- Have served mentors to one master-level visiting student, a summer UROP, a rotation student through their stay in the Shalek Lab, provided guidance on research projects
- Helped run training on computational analysis for single-cell data for the Human Cell Atlas consortium (remote) and for collaborators from Child Health Research Foundation, Bangladesh

Massachusetts Institute of Technology — *Cambridge, MA, USA*

Teaching Assistant — *Spring 2022*

- Served as TA for Modern Biostatistics (7.093) and Modern Computational Biology (7.094)
- Designed and led weekly recitations and office hours
- Worked with instructors to design course materials and graded problem sets and exams

MIT Spark 2022 — *Cambridge, MA, USA*

Teacher — *March 2022*

- Worked with two other graduate students to devised a two-part course on immunology for 30+ local 7th and 8th grade students

APISPAM-Asian Pacific Islander(API) Sponsor Program at Harvey Mudd College — *Claremont, CA, USA*

Head Mentor, Mentor — *Fall 2017-May 2020*

- Responsible for recruiting mentors and mentees, designing training program for 20+ mentors, organizing off-campus retreat and year-long series of workshops and cultural events
- Mentor incoming students who identify as API to help them adapt to college life and explore identity
- Help organize events to raise awareness about social justice and diversity

Harvey Mudd College — *Claremont, CA, USA*

Tutor, grader — *Spring 2017-May 2020*

- Served as grader for *Discrete Math*, *Intro to Biology*
- Served as both grader and tutor for *Intro to Computational Biology*, *Principles of Computer Science*, *Intro to Computer Science*,*Databases*, *Machine Learning*

Harvey Mudd College — *Claremont, CA, USA*

Academic Excellence Program Facilitator — *Fall 2019-Spring 2020*

- Recommended by the biology department to facilitate weekly workshops that helps students to improve their understanding of the biology core curriculum
- Stay in close touch with class instructors and provide feedback to instructors on student progress
- Develop a repertoire of pedagogical and collaborative learning strategies
- Plan staff development presentations at a staff meeting

Texas Children's Hospital — *Houston, TX, USA*

Volunteer — *Summer 2018*

Volunteered at the urgent care unit of Texas Children's Hospital in the Texas Medical Center