Uthsav Chitra

Eric and Wendy Schmidt Center, Broad Institute of MIT and Harvard

https://uthsavc.github.io

Education/Academic Training

Broad Institute of MIT and Harvard   *July 2024 - present*
  Postdoctoral fellow, Eric and Wendy Schmidt Center

Princeton University, Princeton, New Jersey   *Sept 2018 - June 2024*
  Ph.D., Computer Science

Brown University, Providence, Rhode Island   *Sept 2013 - May 2017*
  Sc.B. Mathematics, A.B. Computer Science, A.B. Applied Math   GPA: 4.0/4.0

Research Interests

Computational genomics, machine learning, spatial biology, graphs and networks, genetic interactions.

Publications

* denotes joint first authorship

GASTON-Mix: a unified model of spatial gradients and domains using spatial mixture-of-experts.
Uthsav Chitra, Shu Dan, Fenna Krienen, Benjamin J. Raphael.
In submission to *RECOMB 2025*.

Mapping the topography of spatial gene expression with interpretable deep learning.
Uthsav Chitra, Brian J. Arnold, Hirak Sarkar, Cong Ma, Sereno Lopez-Darwin, Kohei Sanno, Benjamin J. Raphael.
Nature Methods, in press. Accepted to *RECOMB 2024*.

Quantifying higher-order epistasis: beware the chimera.
Uthsav Chitra*, Brian J. Arnold*, Benjamin J. Raphael.
In review at *Nature Communications*.

A latent variable model for evaluating mutual exclusivity between driver mutations in cancer.
Ahmed Shuaibi*, **Uthsav Chitra***, Benjamin J. Raphael.
RECOMB Satellite Workshop on Computational Cancer Biology (RECOMB-CCB), 2024. **Best Paper Award**.

A count-based model for delineating cell-cell interactions in spatial transcriptomics data.
Hirak Sarkar*, **Uthsav Chitra***, Julian Gold, Benjamin J. Raphael.
Bioinformatics (2024). Accepted to *ISMB 2024*.

Belayer: Modeling discrete and continuous spatial variation in gene expression from spatially resolved transcriptomics.
Cong Ma*, **Uthsav Chitra***, Shirley Zhang, Benjamin J. Raphael.
Cell Systems (2022). Accepted to *RECOMB 2022*.

NetMix2: Unifying network propagation and altered subnetworks.
Uthsav Chitra*, Tae Yoon Park*, Benjamin J. Raphael.
Journal of Computational Biology (2022). Accepted to *RECOMB 2022*.

Quantifying and Reducing Bias in Maximum Likelihood Estimation of Structured Anomalies.
Uthsav Chitra, Kimberly Ding, Jasper C. H. Lee, Benjamin J. Raphael.
International Conference on Machine Learning (ICML) 2021.

NetMix: A network-structured mixture model for reduced-bias estimation of altered subnetworks.
Matthew A Reyna*, **Uthsav Chitra***, Rebecca Elyanow, Benjamin J. Raphael.
Journal of Computational Biology (2021). Accepted to *RECOMB 2020*.

[Analyzing the Impact of Filter Bubbles on Social Network Polarization](#).
Uthsav Chitra and Christopher Musco.
ACM International Web Search and Data Mining Conference (WSDM) 2020.
Also appeared at KDD WISDOM 2019 workshop.

[Random Walks on Hypergraphs with Edge-Dependent Vertex Weights](#).
Uthsav Chitra and Benjamin J. Raphael.
International Conference on Machine Learning (ICML) 2019.

[Committee Selection is More Similar Than You Think: Evidence from Avalanche and Stellar](#).
Tarun Chitra and **Uthsav Chitra**.
Manuscript, 2019.

Honors and Awards

Rising Stars in Data Science, UChicago/UC San Diego/Stanford Data Science Institutes	*2024*
Best Paper Award, RECOMB Satellite Workshop on Computational Cancer Biology	*2024*
Siebel Scholarship	*2022*
• Award of \$35,000 given annually to 85 top graduate students worldwide in computer science, bioengineering, and business.	
Best Reviewer Award, International Conference on Machine Learning (ICML)	*2021, 2022*
NSF Graduate Research Fellowship	*2020*
Jerome Stein Memorial Award, Brown University Applied Math Department	*2017*
• Given to the top two students who "show outstanding potential in an interdisciplinary area that involves applied mathematics."	
Phi Beta Kappa, Brown University (elected junior year, top 2% of class)	*2016*
Top 200, William Lowell Putnam Math Competition	*2015*
First Place, Brown University Hartshorn-Hypatia Math Examination	*2013*
Semi-finalist, Siemens Competition (research project in number theory)	*2012*

Teaching

Instructor/Curriculum Developer, Princeton Prison Teaching Initiative — *2019-2023*
- Taught college-accredited math classes at NJ state prisons.
- Developed and taught first-ever Java programming course for NJ state prisons.

Teaching Assistant/Grader, Brown University
- **MATH 1560:** Number Theory — *Spring 2016, Spring 2017*
- **CSCI 1570:** Design and Analysis of Algorithms — *Fall 2015, Fall 2016*
- **CSCI 1450:** Probability in Computing — *Spring 2015*
- **CSCI 0530:** Linear Algebra for CS — *Fall 2014*
- **MATH 1530:** Abstract Algebra — *Spring 2014*

Counselor, Program in Mathematics for Young Scientists (PROMYS) — *Summer 2014*
- Guided students through daily number theory problem sets, mentored a group project, and aided seminars in abstract algebra.

Teaching Assistant, Art of Problem Solving — *2012-2016*
- Assisted online, real-time math classes in algebra, number theory, combinatorics, and geometry.

Talks

Mapping the topography of spatial gene expression with interpretable deep learning.
Eric and Wendy Schmidt Center meeting, Broad Institute	*October 2024*
Chen lab meeting, Broad Institute	*July 2024*

Conference on Research in Computational Molecular Biology (RECOMB)	*May 2024*
Campbell Lab Meeting, UToronto	*April 2024*
Single Cell Analyses, Cold Spring Harbor Laboratory (poster)	*November 2023*
Rutgers-Princeton Cancer Research Symposium (poster)	*October 2023*
NCI Junior Investigator (JI) Annual Meeting	*August 2023*
Wang Lab Meeting, Broad Institute	*July 2023*

Belayer: Modeling discrete and continuous spatial variation in gene expression from spatially resolved transcriptomics

Chen lab meeting, Broad Institute	*July 2024*
Campbell Lab Meeting, UToronto	*April 2024*
Knowles/Azizi Lab Meeting, Columbia	*September 2023*
Pe'er Lab Meeting, MSKCC	*August 2023*
Wang Lab Meeting, Broad Institute	*July 2023*
Sankararaman/Pimentel Lab Meeting, UCLA	*April 2023*
Pe'er Lab Group Meeting, Columbia	*April 2023*
Rutgers-Princeton Cancer Research Symposium (poster)	*October 2023*
NCI Junior Investigator (JI) Annual Meeting	*August 2023*
Brigham Women's Hospital Advanced Biomedical Computation Series	*March 2023*
NCI Spring School on Algorithmic Cancer Biology	*March 2023*

NetMix2: Unifying network propagation and altered subnetworks

Conference on Research in Computational Molecular Biology (RECOMB)	*May 2022*

NetMix: A network-structured mixture model for reduced-bias estimation of altered subnetworks

Knowles/Azizi Lab Meeting, Columbia	*September 2023*
Pe'er Lab Meeting, MSKCC	*August 2023*
Conference on Research in Computational Molecular Biology (RECOMB)	*June 2020*
Princeton University Generals Exam	*May 2020*

Analyzing the Impact of Filter Bubbles on Social Network Polarization

ACM International Web Search and Data Mining Conference (WSDM)	*February 2020*
KDD WISDOM Workshop	*August 2019*

Random Walks on Hypergraphs with Edge-Dependent Vertex Weights

SIAM Conference on Discrete Mathematics	*June 2022*
Princeton University Generals Exam	*May 2020*
International Conference of Machine Learning (ICML)	*June 2019*

Students Mentored

Claire Wu, MIT undergraduate	*Fall 2024*
Tanvi Haldiya, Princeton CS undergraduate	*Fall 2023*
Jairam Hathwar, Princeton CS undergraduate	*Fall 2023*
Kohei Sanno, Princeton CS undergraduate	*2023-present*
Clover Zheng, Princeton CS PhD student	*2022-present*
Sunay Joshi, Princeton Math undergraduate	*2022-2024*
Ahmed Shuaibi, Princeton QCB PhD student	*2020-present*

- Won **Best Paper Award** at RECOMB-CCB workshop.

Madelyne Xiao, Princeton CS PhD student	*2022*
Kimberly Ding, Princeton CS undergrad	*2019-2021*

- Fall 2019: *Recommender Systems with Hypergraph Random Walks*
- Spring 2020: *Maximum Likelihood Estimation of Structured Anomalies*
- Senior Thesis 2020-2021: *Spatial-NetMix: Less Biased and More Flexible Anomaly Detection*
    - Received the "**Outstanding Computer Science Senior Thesis Prize**"

- Received an **NSF Graduate Research Fellowship**

Service/Outreach

Conference Reviewing
Computational biology: RECOMB 2020 poster session, RECOMB 2023, ISMB 2023, RECOMB 2024, ISMB 2024

Machine learning: ICML 2021 (**Top 10% Reviewer**), NeurIPS 2021, ICML 2022 (**Top 10% Reviewer**), ICML 2023, TMLR, ICML 2024 AccMLBio workshop.

Journal Reviewing
Bioinformatics, Bioinformatics Advances, Frontiers in Big Data, Computational and Structural Biotechnology Journal.

Member, Princeton COS Graduate Student Committee	*2022-2023*
Member, Princeton Graduate Engineering Council	*2021-2023*
Member, Princeton COS Ad Hoc Committee	*2021*
Officer, Brown Math Departmental Undergraduate Group	*2015-2017*
Mentor, Brown Matched Advising Program for Sophomores	*2016-2017*

Work Experience

Software Engineer, Facebook *2017-2018*
- Built infrastructure, machine learning models, and data pipelines for improving ad quality.

Software Engineering Intern, Facebook *Summer 2016*
- Reduced upload time for video ads by 20%.

Hobbies/interests: Bouldering, biking, crosswords and other puzzles.