Jesse M. Zhang

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Research Interests: Machine Learning, Optimization, Genomics, and Statistics

Education

MS/PhD **Stanford University,** Electrical Engineering — anticipated 2016/2019
Research advisor: David Tse

BS **Tufts University,** Electrical Engineering — 05/2014
GPA: 3.96/4.00

Ongoing Research

Single-cell RNA-seq clustering using transcript compatibility counts
Working with V. Ntranos, G. Kamath, L. Pachter, and D. Tse

As single-cell RNA-Seq experiments involve more cells and overall greater numbers of reads, the need for a universal and fast method of analysis becomes more apparent. This project focuses on the novel concept of clustering cells based on transcript compatibility counts, or the number of reads that align to a certain set of overlapping transcripts, rather than gene abundances, which is computationally expensive to obtain due to the read alignment step.

- Accepted for Genome Biology's Single Cell Omics Special Issue (in press)

Single-cell RNA-seq analysis using deep autoencoders, rPCA, and gene similarity networks
Working with B. Wang, J. Zhu, and S. Batzoglou

Single-cell RNA-Seq experiments suffer from technical noise in addition to variation caused by culture conditions and biological effects. This project attempts to clean the #cells-by-#genes design matrix by solving a modified rPCA objective. The objective is augmented with a Laplacian regularization term, ensuring that the solution conforms to a gene similarity network obtained using a deep autoencoder to nonlinearly map each gene to a low-dimensional space.

Professional/research experience

Stanford Molecular Imaging Instrumentation Laboratory — 09/2014-12/2014
EE PhD rotation student

- Simulated small animal CZT PET system with variable aperture using GATE software
- Created MATLAB algorithms for testing normalization methods on simulated data

MC10, Inc., Cambridge, MA

R&D Intern 05/2014-08/2014

- Implemented machine learning and signal processing MATLAB algorithms to facilitate real-time and offline accelerometer data analysis
- Collaboratively optimized hardware-software interface

MIT Lincoln Laboratory, Lexington, MA
Electrical Engineering Intern/Co-op for Group 33 06/2013-05/2014

- Developed MATLAB algorithms to intelligently extract trace from HF ionogram images
- Created graphical user interface in MATLAB to facilitate ionogram image processing

Tufts Biomedical Engineering Department, Medford, MA
Researcher under supervision of David Kaplan, Ph.D. 09/2011-08/2012

- Designed and constructed gold circuits on silk scaffolds using soldering, gold sputter coating, and AutoCAD to control and detect neuronal signals
- Processed and analyzed neuronal signals using MATLAB and pCLAMP software

Dana Farber Cancer Institute, Boston, MA
Intern under supervision of Myles Brown, M.D. 05/2011-08/2011

- Conducted experiments to define role of lysine-specific demethylase 1 in human hormone dependent and independent prostate cancer
- Performed computational analysis of results using MS Excel, python and cistrome.org

Teaching experience

Tufts Academic Resource Center, Medford, MA
Head Tutor 08/2012-05/2014

- Tutored introductory physics, introductory chemistry, calculus III, differential equations, and linear algebra
- Held large-scale review sessions, weekly office hours, 1-on-1 sessions

Honors and Awards

Tufts University
Summa Cum Laude 05/2014

- Given to graduates of the Tufts School of Engineering with a GPA of at least 3.8

The Amos Emerson Dolbear Scholarship ($1355.25) 04/2014

- One of two seniors chosen
- Given to seniors who have shown promise in the field of ECE

The Class of 1898 Prize ($1983.91) 04/2014

- Awarded to one undergraduate from the school of engineering
- Given to students who, having completed at least two years at Tufts, have best demonstrated high scholarly ability and a wide range of intellectual competence

Tau Beta Pi 11/2012

- Inducted into the national engineering honor society

Eta Kappa Nu 10/2012

- Inducted into the international electrical and computer engineering honor society

Howard Sample Prize Scholarship in Physics ($566.33) 04/2012

- One of six undergraduates chosen
- Given for outstanding performance in the introductory physics courses

Chinese Consolidated Benevolent Association of New England

CCBA Scholarship ($2500.00) 12/2010

- One of five freshman from the class of 2014 chosen
- Given to applicants who demonstrate academic achievement, a history of commitment to their community, leadership potential, and financial need. Applicants must have a permanent home address in MA and be of Chinese descent.

Junior Achievement of Northern New England

Stephen G. Sullivan Scholarship ($1000.00) 06/2010

- One of three Junior Achievement participants chosen

Publications

Ntranos, V.*, Kamath, G.*, **Zhang, J.***, Pachter, L., Tse, D. (submitted 2016). Fast and accurate single-cell RNA-Seq analysis by clustering of transcript-compatibility counts. Accepted for Genome Biology's Single Cell Omics Special Issue.
*Equal contributors

Cai, C., He, H. H., Gao, S., Chen, S., Yu, Z., Gao, Y., Chen, S., Chen, M.W., **Zhang, J.**, Ahmed, M., Wang, Y., Metzger, E., Schüle, R., Liu, X. S., Brown, M., & Balk, S. P. (2014). Lysine-specific demethylase 1 has dual functions as a major regulator of androgen receptor transcriptional activity. Cell reports, 9(5), 1618-1627.

Skills

Software	MATLAB, C++, Python, Bash, R, Git, LaTeX, Hadoop, SQL, Photoshop
Laboratory	Soldering, western blot, ChIP-Seq, cell culture, PCR, qPCR, SDS-PAGE

Activities

Tau Beta Pi	Joined 11/2012
Eta Kappa Nu	Joined 10/2012
IEEE	Joined 08/2012
Tufts Asian American Center	08/2011-05/2012
Compass Fellowship	09/2010-05/2011