

Thouis R. Jones

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Summary

Computational biologist with 20+ years' experience, including software engineering, algorithm development, image analysis, and solving challenging biomedical research problems.

Research Experience

Connectomics and Dense Reconstruction of Neural Connectivity

Harvard University School of Engineering and Applied Sciences (2012-Present)

My research is on software for automatic dense reconstruction of neural connectivity. Using using high-resolution serial sectioning and electron microscopy, biologists are able to image nanometer-scale details of neural structure. This data is extremely large (1 petabyte / cubic mm). The tools I develop in collaboration with the members of the Connectomics project allow biologists to analyze and explore this data.

Image analysis, high-throughput screening, & large-scale data analysis

Curie Institute, Department of Translational Research (2010 - 2012)

Broad Institute of MIT and Harvard, Imaging Platform (2007 - 2010)

My research focused on image and data analysis for high-content screening (HCS) and large-scale machine learning applied to HCS data. My work emphasized making powerful analysis methods available to the biological community in user-friendly tools. As part of this effort, I cofounded the open-source CellProfiler project with Dr. Anne Carpenter (director of the Imaging Platform at the Broad Institute).

PhD Research: High-throughput microscopy and RNAi to reveal gene function.

My doctoral research focused on methods for determining gene function using high-throughput microscopy, living cell microarrays, and RNA interference. To accomplish this goal, my collaborators and I designed and released the first open-source high-throughput cell image analysis software, CellProfiler (www.cellprofiler.org). We also developed advanced data mining methods for high-content screens. (In the Laboratories of Dr. Golland at the MIT Computer Science and Artificial Intelligence Laboratory and Dr. Sabatini at the Whitehead Institute for Biomedical Research.)

Master's degree & Professional Research: Representation of shape for computer graphics. Mesh filtering. Sampling and Antialiasing.

In the Laboratories of Frédo Durand and Leonard McMillan at the MIT Computer Graphics Group in the Computer Science and Artificial Intelligence Laboratory, and at Mitsubishi Electric Research Laboratory (MERL), in collaborations with Ron Perry, Sarah Frisken, Hanspeter Pfister, and William Freeman.

Teaching and Mentoring Experience

Harvard University. I manage a group of 3-6 CS researchers and SW engineers in developing software for the Connectomics project, in close collaboration with biologists and neuroscientists.

Lecturer CS205 & CS207 (Spring & Fall 2016), TF for CS109 (Fall 2013) and CS205 (Spring 2013).

Broad Insittute Imaging Platform. Mentored other computational biologists and software engineers.

CellProfiler project. I have mentored several undergraduates contributing to the CellProfiler project over its lifetime.

Research Science Institute. I was a volunteer mentor for high school students in 4-week internships for the Research Science Institute in several years from 1999-2013.

Refereed Publications

Automatic Neural Reconstruction from Petavoxel of Electron Microscopy Data

Microscopy and Microanalysis 22.S3 (2016): 536-537

Adi Suissa-Peleg, Daniel Haehn, Seymour Knowles-Barley, Verena Kaynig, Thouis R. Jones, Alyssa Wilson, Richard Schalek, Jeffery W. Lichtman, Hanspeter Pfister

Saturated reconstruction of a volume of neocortex

Cell, 2015, 162(3): 648-661

N Kasthuri, KJ Hayworth, D Berger, R Schalek, J Conchello, S Knowles-Barley, D Lee, A Vázquez-Reina, V Kaynig, TR Jones, M Roberts, J Morgan, J Tapia, HS Seung, WG Roncal, J Vogelstein, R Burns, D Sussman, C Priebe, H Pfister, JW Lichtman

Large-scale automatic reconstruction of neuronal processes from electron microscopy images

Medical image analysis , 2015, 22 (1): 77-88

Verena Kaynig, Amelio Vazquez-Reina, Seymour Knowles-Barley, Mike Roberts, Thouis R Jones, Narayanan Kasthuri, Eric Miller, Jeff Lichtman, Hanspeter Pfister

A siRNA screen identifies RAD21, EIF3H, CHRAC1 and TANC2 as driver genes within the 8q23, 8q24. 3 and 17q23 amplicons in breast cancer with effects on cell growth, survival and transformation

Carcinogenesis, 2014, 35(3): 670-682

Mahmood SF, Gruel N, Chapeaublanc E, Lescure A, Jones T, Reyal F, Vincent-Salomon A, Raynal V, Pierron G, Perez F, Camonis J, Del Nery E, Delattre O, Radvanyi F, Bernard-Pierrot I

Pipeline for illumination correction of images for high-throughput microscopy

Journal of Microscopy, 2014, 256(3): 231-236

S. Singh, M.-A. Bray, T.R. Jones, A.E. Carpenter

Comparison of methods for image-based profiling of cellular morphological responses

to small-molecule treatment

Journal of Biomolecular Screening, 2013, 18(10), 1321-9

Ljosa V, Caie PD, Ter Horst R, Sokolnicki KL, Jenkins EL, Daya S, Roberts ME, Jones TR, Singh S, Genovesio A, Clemons PA, Carragher NO, Carpenter AE.

Genome-scale RNAi on living-cell microarrays identifies novel regulators of
Drosophila melanogaster TORC1–S6K pathway signaling

Genome Research, 2011, 21: 433-446

Robert A. Lindquist, Kathleen A. Ottina, Douglas B. Wheeler, Peggy P. Hsu, Carson C. Thoreen, David A. Guertin, Siraj M. Ali, Shomit Sengupta, Yoav D. Shaul, Michael R. Lamprecht, Katherine L. Madden, Adam R. Papallo, Thouis R. Jones, David M. Sabatini, Anne E. Carpenter

Dual channel rank-based intensity weighting for quantitative co-localization of
microscopy images

BMC Bioinformatics, 2011, 12:407

Vasanth R. Singan, Thouis R. Jones, Kathleen M. Curran, Jeremy C. Simpson

Improved structure, function and compatibility for CellProfiler: modular high-throughput
image analysis software

Bioinformatics, 2011, 27 (8): 1179-1180.

Lee Kametsky, Thouis R. Jones, Adam Fraser, Mark-Anthony Bray, David J. Logan, Katherine L. Madden, Vebjorn Ljosa, Curtis Rueden, Kevin W. Eliceiri, Anne E. Carpenter

Linear-Time Poisson-Disk Patterns

jgt: journal of graphics, gpu, and game tools, 2011, 15 (3): 177-182

Thouis R. Jones, David R. Karger

Small molecules discovered in a pathway screen target the Rho pathway in
cytokinesis

Nat. Chem. Biol. 2010, 6, 457

Adam B. Castoreno, Yegor Smurnyy, Angelica D. Torres, Martha S. Vokes, Thouis R. Jones, Anne E. Carpenter, Ulrike S Eggert

Scoring diverse cellular morphologies in image-based screens with iterative feedback
and machine learning

PNAS February 10, 2009 vol. 106 no. 6 1826-1831

Thouis R. Jones, Anne E. Carpenter, Jason Moffat, Michael R. Lamprecht, Jason Moffat, Serena J. Silver, Jennifer K. Grenier, Adam B. Castoreno, Ulrike S. Eggert, David E. Root, Polina Golland, David M. Sabatini

CellProfiler Analyst: data exploration and analysis software for complex image-based
screens

BMC Bioinformatics 2008, 9:482

Thouis R. Jones, In Han Kang, Douglas B. Wheeler, Robert A. Lindquist, Adam

Papallo, David M. Sabatini, Polina Golland, Anne E. Carpenter

CellProfiler: Image Analysis for High Throughput Microscopy

Genome Biology 2006, 7:R100

AE Carpenter, TR Jones, M Lamprecht, DB Wheeler, C Clarke, IH Kang, O Friman, DA Guertin, JH Chang, RA Lindquist, J Moffat, P Golland, DM Sabatini

Methods for High-Content, High-Throughput Image-based Cell Screening

Proceedings of MIAAB 2006

Thouis R. Jones, Anne E. Carpenter, Polina Golland, David M. Sabatini

Efficient Generation of Poisson-Disk Sampling Patterns

Journal of Graphics Tools, Vol. 11 No. 2, pp. 27-36, 2006

Thouis R. Jones

Voronoi-Based Segmentation of Cells on Image Manifolds

Proceedings of Computer Vision for Biomedical Image Applications (LNCS Vol. 3765), pp. 535-543, 2005

Thouis R. Jones, Anne E. Carpenter, Polina Golland

Normal Improvement for Point Rendering

IEEE Computer Graphics & Applications, Vol. 24, No. 4, pp. 53-56, 2004

Thouis R. Jones, Fredo Durand, Matthias Zwicker

Interpolation Search for Non-Independent Data

Proceedings of the 15th Symposium on Discrete Algorithms (SODA 2004), pp. 823-832

Erik Demaine, Thouis R. Jones, Mihai Patrascu

Non-Iterative, Feature-Preserving Mesh Smoothing

SIGGRAPH 2003, pp. 943-949

Thouis R. Jones, Fredo Durand, Mathieu Desbrun

Example-Based Super-Resolution

Computer Graphics and Applications, Vol. 22 No. 2, March 2002, pp. 56-65

William T. Freeman, Thouis R. Jones, Egon C. Pasztor

Adaptively Sampled Distance Fields: A General Representation of Shape for
Computer Graphics

SIGGRAPH 2000, pp. 249-254

Sarah F. Frisken, Ronald N. Perry, Alyn P. Rockwood, Thouis R. Jones

Antialiasing with Line Samples

Rendering Techniques '00 (Proc 11th Eurographics Workshop on Rendering), pp. 197-205

Thouis R. Jones, Ronald N. Perry

Talks

Invited Speaker, ICCV Extreme Imaging workshop (Chile, 2016)
Petavoxel Imaging for Neural Connectomics

EuroSciPy 2011 (Ecole Normale Supérieure, Paris, 2011)
CellProfiler - open source image analysis for high-throughput biological experiments

First Swiss Image-Based Screening Conference (EPFL, 2011)
Approaches to analyzing individual cell data in high content screens

ICML-UAI-COLT 2009 Workshop on Automated Interpretation and Modeling of Cell Images (McGill University, 2009)
Relevance feedback and large scale machine learning for phenotype assays

Training Workshop: Image based high-throughput screening methods and tools for pathway modeling (DKFZ, 2008)
Using CellProfiler for quantitative analysis of image-based screens

MitoCheck Symposium on High Throughput Imaging for Systems Biology (EMBL, 2007)
Per-Cell Classification for Exploring High-Throughput Image-Based Screens

Education

Sc.D. in Electrical Engineering and Computer Science, 2007, MIT
Thesis: Predicting Gene Function from Images of Cells
Graduate Courses: Machine Learning, Randomized Algorithms, Advanced Computer Graphics, Computer Architecture, Computer Vision.

Master's Degree in Computer Science, 2003, Massachusetts Institute of Technology
Thesis: Feature Preserving Smoothing of 3D Surface Scans

Bachelor of Science in Computer Science, 1994, University of Utah

Work Experience

Senior Scientist, Pfister (SEAS) and Lichtman (MCB) groups, Harvard University.
September 2012 - present.

Lecturer, Harvard University.
Spring & Fall Semesters, 2015.

Associate researcher, Biophenics Platform, Institut Curie Translational Research Department
September 2010 - September 2012.

Computational Biologist, Imaging Platform, Broad Institute of MIT and Harvard,
June 2007 - August 2010.

Member of the Technical Staff, Mitsubishi Electric Research Laboratory (MERL)

January 1999 - September 2001

Software Quality Assurance Engineer, Harlequin, Inc., Cambridge, MA

October 1997 - December 1998

Software Engineer, Parametric Technology Corporation, Waltham, MA

November 1995 - October 1997

Technical Support Engineer, Advanced Visual Systems, Inc., Waltham, MA

April 1995 - November 1995

Software Engineer, Evans & Sutherland Computer Corp., Salt Lake City, UT

August 1994 - March 1995

Tools Programmer, Sculptured Software, Salt Lake City, UT

January 1994 - August 1994

Software Quality Assurance Programmer, Evans & Sutherland Computer Corp., SLC, UT

June 1989 - January 1994

Service, Professional, and Volunteer Activities

Reviewer, Nature Methods, Bioinformatics, BMC Medical Imaging, ICML, Cytometry: Part A, Trans. on Graphics, IJIG, TMI, SIGGRAPH, EGSR, TVCG, jgt

Member of Town Meeting, Arlington, MA (elected 2009 for a two year term)

Organizing team, MIT IAP Mystery Hunt, 2000, 2002, 2005

Graduate Resident Tutor (i.e., R.A.), MIT East Campus Undergraduate Dormitory, 1999-2003

Issued U.S. Patents

Method and Apparatus for Multi-Phase Rendering, Richard Waters, Ronald Perry, Thouis Jones, and Larry Seiler

Anti-Aliasing with Line Samples, Thouis Jones and Ronald Perry

Continuous Memoization, Ronald Perry and Thouis Jones

Detail-Directed Hierarchical Distance Fields, Sarah Frisken, Ronald Perry, and Thouis Jones

Sculpting Objects Using Detail-Directed Hierarchical Distance Fields, Sarah Frisken, Ronald Perry, and Thouis Jones

Game Playing with Individual Anonymous Laser Pointers, Thouis Jones and Ronald Perry

Customized Model Construction via a Network Interface, Ronald Perry, Sarah Frisken, and Thouis Jones

Representing A Color Gamut with a Hierarchical Distance Field, Ronald Perry, Sarah Frisken, and Thouis Jones

One-pass super-resolution images, William Freeman, Thouis Jones

Skills

Software design and implementation. Open source development principles.

Image processing, machine learning, UI development, cluster processing.

Python, Matlab, C, C++. MySQL, SQLite. OS X, Linux, Unix. git, SVN.

Deep Learning, Machine learning, Bayesian methods, statistics.

References

Dr. Hanspeter Pfister, Professor, Harvard University (hpfister@seas.harvard.edu)

Dr. Anne Carpenter, Director, Imaging Platform, Broad Institute of MIT and Harvard
(anne@broadinstitute.org).

Professor Polina Golland, MIT (golland@csail.mit.edu).