

Eva L. Dyer

CONTACT INFORMATION	Georgia Institute of Technology, 313 Ferst Dr NW, Suite 3108, Atlanta, GA [<i>email</i> : evadyer@gatech.edu] [<i>web</i> : dyerlab.gatech.edu] [<i>office</i> : (404) 894-4738]
RESEARCH INTERESTS	Computational neuroscience, signal processing and machine learning for neural data analysis; low-dimensional signal models, unions of subspaces, sparse signal recovery.
EDUCATION	Rice University , Houston, Texas Ph.D. in Electrical & Computer Engineering, May 2015 M.S. in Electrical & Computer Engineering, October 2011 University of Miami , Coral Gables, Florida B.S. in Electrical & Computer Engineering, May 2007 Double Major in Audio Engineering and Physics
POSITIONS HELD	Georgia Institute of Technology and Emory University , Atlanta, Georgia Sept 2017 – Present Assistant Professor, Coulter Department of Biomedical Engineering Northwestern University, Rehabilitation Institute of Chicago , Chicago, Illinois May 2016 – Aug 2017 Research Scientist, Dept. of Physical Medicine and Rehabilitation Sept 2014 – April 2016 Postdoctoral Fellow, Dept. of Physical Medicine and Rehabilitation Rice University , Houston, Texas Aug 2007 – Aug 2014 Research Assistant, Dept. of Electrical & Computer Engineering Aug 2009 – Dec 2012 Teaching Fellow, Dept. of Electrical & Computer Engineering Jun 2008 – Jun 2010 National Library of Medicine Predoctoral Fellow The Johns Hopkins University , Baltimore, Maryland May 2006 – Jul 2006 Research Assistant, Center for Computer Integrated Surgical Syst.
HONORS AND AWARDS	Allen Institute for Brain Science’s Next Generation Leader, 2017-2020 People’s Choice Award at the Allen Institute for Brain Science’s Summer Workshop on the Dynamic Brain, September 2016 Best PhD Presenter, Dept. of Electrical & Computer Engineering, Rice University, April 2013 National Science Foundation Graduate Research Fellowship, (awarded 2009) 2010–2013 National Library of Medicine Fellowship in Computational Biology & Medicine, 2008–2010 George R. Brown School of Engineering Presidential Fellowship, Rice University, 2007–2013 Texas Instruments Distinguished Graduate Fellowship, Rice University, 2007–2014 Outstanding Student in Electrical Engineering, University of Miami Honors Convocation, 2007 Eliahu Jury Award for Undergraduate Scholarship in EE, University of Miami, 2007 C.V. Starr Scholarship, University of Miami, 2006–2007 John Farina Scholarship, University of Miami’s College of Engineering, 2005–2007 Ann Bachellor Scholarship, University of Miami’s College of Engineering, 2004–2005
IN REVIEW	C. Pandarinath, K.C. Ames, A.A. Russo, A. Farshchian, L.E. Miller, E.L. Dyer , J.C. Kao: <i>Latent factors and dynamics in motor cortex and their application to brain-machine interfaces</i> , submitted to Journal of Neuroscience, August 2018.

T.J. LaGrow, M. Moore, J.A. Prasad, **A. Webber**, M.A. Davenport, **E.L. Dyer**: *Cytoarchitecture and Layer Estimation in High-Resolution Neuroanatomical Images*, submitted to *Frontiers in Neuroinformatics*, July 2018.

D. Rolnick, **E.L. Dyer**: *Generative models and abstractions for large-scale neuroanatomy data*, submitted to *Current Opinion in Neurobiology*, July 2018.

E.C. Johnson, M. Wilt, L. Rodriguez, R. Norman-Tenazas, C. Rivera, N. Drenkow, D. Kleissas, **T.J. LaGrow**, H. Cowley, J. Downs, J. Matelsky, M. Hughes, E. Reilly, B. Wester, **E.L. Dyer**, K.P. Körding, W. Gray-Roncal: *Towards A Framework for Processing Large Neuroimaging Datasets*, submitted to *Winter Conference on Computer Vision (WACV)*, July 2018.

T.J. Lee, A. Kumar, **A.H. Balwani**, D. Brittain, S. Kinn, C.A. Tovey, **E.L. Dyer**, N.M. da Costa, R.C. Reid, C.R. Forest, D.J. Bumbarger: *Large-scale neuroanatomy using LASSO: Loop-based Automated Serial Sectioning Operation*, submitted to *PLOS One*, June 2018.

C. Sübakan, M. Naeemi, J.A. Harris, S. Koyejo, **E.L. Dyer**: *Generative Modeling of Structural Neuroimaging Data*, to be resubmitted, May 2018.

PUBLICATIONS

T.J. LaGrow, M. Moore, J.A. Prasad, M.A. Davenport, **E.L. Dyer**: *Approximating Cellular Densities from High-Resolution Neuroanatomical Imaging Data*, *IEEE Engineering in Medicine and Biology Society Conference (EMBC)*, July 2018.

X. Yang, V. De Andrade, F. De Carlo, **E.L. Dyer**, N. Kasthuri, D. Gürsoy: *Low-dose X-ray tomography through a deep convolutional neural network*, *Nature Scientific Reports*, Volume 8, Article number: 2575, 2018. (<http://dx.doi.org/10.1038/s41598-018-19426-7>)

E.L. Dyer, M. Azar, H.L. Fernandes, M. Perich, S. Naufel, L.E. Miller, K.P. Körding: *A cryptography-based approach for movement decoding*, *Nature Biomedical Engineering*, Volume 1, Pages 967–976, Dec 2017. (<http://dx.doi.org/10.1038/s41551-017-0169-7>)

E.L. Dyer, W. Gray Roncal, J.A. Prasad, H.L. Fernandes, D. Gürsoy, V. De Andrade, K. Fezzaa, X. Xiao, J.T. Vogelstein, C. Jacobsen, K.P. Körding, N. Kasthuri: *Quantifying mesoscale neuroanatomy using X-ray microtomography*, 4 (5) *ENEURO*.0195-17.2017. (<http://doi.org/10.1523/ENEURO.0195-17.2017>)

A. Mirhoseini, **E.L. Dyer**, E.Songhori, R.G. Baraniuk, F. Koushanfar: *RankMap: A platform-aware framework for distributed learning from dense datasets*, *IEEE Trans. on Neural Networks and Learning Systems*, May 2017. (<https://doi.org/10.1109/TNNLS.2016.2631581>)

M. Azar, **E.L. Dyer**, K.P. Körding: *Convex relaxation regression: Black-box optimization of smooth functions by learning their convex envelopes*, *Proc. of the Conference on Uncertainty in Artificial Intelligence (UAI)*, June 2016, accepted for oral presentation (top 10% of submissions). (<http://arxiv.org/abs/1602.02191>)

R.J. Patel, T.A. Goldstein, **E.L. Dyer**, A. Mirhoseini, R.G. Baraniuk: *Deterministic column sampling for low-rank matrix approximation: Nyström vs. incomplete Cholesky decomposition*, *Proc. of SIAM Conference on Data Mining (SDM)*, May 2016. (<http://dx.doi.org/10.1137/1.9781611974348.67>)

E.L. Dyer, C. Studer, J.T. Robinson, R.G. Baraniuk: *A robust and efficient method to recover neural events from noisy and corrupted data*, *IEEE/EMBS Conference on Neural Engineering (NER)*, November 2013. (<http://dx.doi.org/10.1109/NER.2013.6696004>)

E.L. Dyer, A.C. Sankaranarayanan, R.G. Baraniuk: *Greedy feature selection for subspace clustering*, *Journal of Machine Learning Research*, 14(Sep):2487–2517, 2013. (<http://www.jmlr.org/papers/volume14/dyer13a/dyer13a.pdf>)

E.L. Dyer, C. Studer, R.G. Baraniuk: *Subspace clustering with dense representations*, *IEEE Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, May 2013. (<http://dx.doi.org/>)

10.1109/ICASSP.2013.6638260)

E.L. Dyer, M. Majzoobi, F. Koushanfar: *Hybrid modeling of non-stationary process variations*. ACM Design and Automation Conf. (DAC), June 2011. (<http://dx.doi.org/10.1145/2024724.2024768>)

E.L. Dyer, M.F. Duarte, D.H. Johnson, R.G. Baraniuk: *Recovering spikes from noisy neuronal calcium signals via structured sparse approximation*. Lecture Notes in Computer Science, ICA 2010, Volume 6365/2010, 604-611. (http://dx.doi.org/10.1007/978-3-642-15995-4_75)

M. Majzoobi, **E.L. Dyer**, A. Enably, F. Koushanfar: *Rapid FPGA characterization using clock synthesis and signal sparsity*. International Test Conference (ITC) 2010 Proceedings, Nov 2010. (<http://dx.doi.org/10.1109/TEST.2010.5699248>)

G. Fischer, **E.L. Dyer**, C. Csoma, A. Deguet, G. Fichtinger: *Validation system for MR image overlay and other needle insertion techniques*. Medicine Meets Virtual Reality 15- in vivo, in vitro, in silico: Designing the Next in Medicine, IOS Press, 2007.

PEER-REVIEWED
ABSTRACTS

M. Tondravi, W. Scullin, M. Du, R. Vescovi, V. De Andrade, C. Jacobsen, K. Körding, D. Gürsoy, **E.L. Dyer**: *A pipeline for distributed segmentation of teravoxel tomography datasets*. International X-ray Microscopy (XRM) Conference, 2018.

J. Krzyston, S.Y. Lee, E.M. Buckley & **E.L. Dyer**: *Learning Biomarkers of Disease from Non-Invasive Measurements of Cerebral Blood Flow*. Poster Presentation at the Optical Society of America's (OSA) Optics and the Brain Meeting, April 2018.

M. Du, R. Vescovi, R. Chard, N. Kasthuri, C. Jacobsen, **E.L. Dyer**, D. Gürsoy: *An automated pipeline for the collection, transfer, and processing of large-scale tomography data*, Oral Presentation at the Optical Society of America's (OSA) Optics and the Brain Meeting, April 2018.

A. Bleckert, A. Bodor, J. Borseth, D. Brittain, D. Bumbarger, D. Castelli, **E.L. Dyer**, T. Keenan, Y. Li, F. Long, J. Perkins, D. Reid, D. Sullivan, M. Takeno, R. Torres, D. Williams, C. Reid, N. da Costa: *Linking functional and anatomical circuit connectivity using fast parallelized TEM imaging*, Society for Neuroscience Annual Meeting (SFN), November 2016.

R. Vescovi, E. Miqueles, D. Gursoy, V. De Andrade, **E.L. Dyer**, K.P. Körding, M. Cardoso, F. De Carlo, C. Jacobsen, N. Kasthuri: *TOMOSAIC: Towards terabyte tomography*, submitted to the International X-ray microscopy (XRM) Conference, August 2016.

E.L. Dyer, H.L. Fernandes, W. Gray Roncal, D. Gursoy, J.T. Vogelstein, X. Xiao, C. Jacobsen, K.P. Körding & N. Kasthuri: *Quantifying mesoscale neuroanatomy using X-ray microtomography*, presented at the Society for Neuroscience Annual Meeting (SFN), Oct 2015; Statistical Analysis of Neural Data (SAND), April 2015.

E.L. Dyer, T.A. Goldstein, R. Patel, K.P. Körding, R.G. Baraniuk: *Sparse self-expressive decompositions for dimensionality reduction and clustering*. Signal Processing with Adaptive Sparse Structured Representations (SPARS), July, 2015.

M. Azar, **E.L. Dyer**, H.L. Fernandes, L.E. Miller, K.P. Körding: *Training brain machine interfaces without supervised data*, Computational and Systems Neuroscience (Cosyne), March 2015.

E.L. Dyer, D.B. Murphy, R.G. Baraniuk, J.T. Robinson: *Compressive neural circuit reconstruction using patterned optical stimulation*, Society for Neuroscience Annual Meeting (SFN), Nov 2013.

E.L. Dyer, C. Studer, R.G. Baraniuk: *Subspace clustering reloaded: Sparse vs. dense representations*, Signal Processing with Adaptive Sparse Structured Representations (SPARS), July, 2013.

E.L. Dyer, U. Rutishauser, R.G. Baraniuk: *Group sparse coding with a collection of winner-take-all*

networks, Organization of Computational Neurosciences (OCNS), BMC Neuroscience, 13(1):P184, July, 2012.

E.L. Dyer, A.C. Sankaranarayanan, R.G. Baraniuk: *Learning hybrid linear models via sparse recovery*. Signal Processing with Adaptive Sparse Structured Representations (SPARS), June, 2011.

E.L. Dyer, D.H. Johnson, R.G. Baraniuk: *Learning modular representations from global sparse coding networks*. Organization of Computational Neurosciences (OCNS), BMC Neuroscience, 11:P131, 2010.

E.L. Dyer, D.H. Johnson, R.G. Baraniuk: *Sparse coding in modular networks*. Computational and Systems Neuroscience (Cosyne), Feb 2010.

E.L. Dyer, D.H. Johnson, R.G. Baraniuk: *Sparse coding with population sketches*, Organization of Computational Neurosciences (OCNS), BMC Neuroscience, 10(1):P132, 2009.

OTHER PAPERS

W. Gray Roncal, **E.L. Dyer**, D. Gürsoy, K.P. Körding, N. Kasthuri: *From sample to knowledge: Towards an integrated approach for neuroscience discovery*, 2016. (<http://arxiv.org/abs/1604.03199>)

E.L. Dyer, T.A. Goldstein, R.J. Patel, K.P. Körding, R.G. Baraniuk: *Self-expressive decompositions for matrix approximation and clustering*, 2015. (<http://arxiv.org/abs/1505.00824>)

PATENTS

M. Azar, **E.L. Dyer**, K.P. Körding. U.S. Patent App. No. 15/400,941, Non-Convex Function Optimizers (filed January 6, 2017).

TEACHING EXPERIENCE

Georgia Institute of Technology, Atlanta, Georgia

COE 3803: Data Analytics for Engineers

Fall 2018

Co-instructor and developer of a new data science and machine learning course for undergraduates throughout the College of Engineering. In this course, students are introduced to basic machine learning concepts and then apply these methods to a range of real-world engineering datasets.

BMED 2250: Problem-Based Learning for Biomedical Engineers

Spring 2017

Faculty facilitator for problem-based learning course for sophomores in Biomedical Engineering. Students learn to tackle open-ended problem statements, design and evaluate solutions, and program microcontrollers to acquire biosignals.

Rice University, Houston, Texas

Co-Developer of 301x: Discrete-Time Signals & Systems, edX Course

June 2013–April 2014

Assisted in the content development, course organization, evaluation, and implementation of “301x: Discrete-Time Signals & Systems”, a massively open online course (MOOC) on edX.org taught by Richard Baraniuk (18,000 students registered).

Teaching Fellow, Electrical & Computer Engineering Dept.

Aug 2009 – Dec 2012

Duties ranged from holding weekly review/problem solving sessions, weekly office hours, aiding instructor in preparation of tests and homework, and serving as a guest lecturer.

σ ELEC 301: Signals & Systems, Fall 2012

σ ELEC 303: Random Signals & Noise, Fall 2009, Fall 2010, Fall 2011

Teaching Assistant, Electrical & Computer Engineering Dept.

Jan 2012 – May 2012

Aided instructors in the development of course materials, assisted students in course projects, and maintained course websites.

σ ELEC 631: Information Theory and Signal Processing Methods for Neuroengineering

Grading Assistant, Electrical & Computer Engineering Dept.

Aug 2008 – May 2011

Assisted instructor in grading homework and exams.

σ ELEC 241: Fundamentals of Electrical Engineering, Fall 2008

σ ELEC 431: Digital Signal Processing, Spring 2010, 2011

University of Miami, Coral Gables, FL

Grading Assistant, Electrical & Computer Engineering Dept.

Aug 2006 – May 2007

Assisted instructor in grading homework and exams.

- σ EEN 201 Circuit Theory, Fall 2006
- σ EEN 218 Intermediate Computer Programming, Fall 2006
- σ EEN 307 Linear Circuits & Signals, Spring 2006, 2007

Peer tutor, Academic Resource Center

Oct 2004 – May 2007

Tutored students in various courses in physics, math, and electrical engineering. Participated in workshops on tutoring, mentoring, and educational psychology.

**WORKSHOPS
ORGANIZED**

Co-organizer of “BigNeuro 2017: Analyzing brain data from the nano to macroscale” Workshop at NIPS, Long Beach, CA, Dec. 9, 2017.

Co-organizer of “Brains & Bits: Machine learning meets neuroscience” Workshop at NIPS, Barcelona, Spain, Dec. 9-10, 2016.

Co-organizer of “BigNeuro 2015: Making sense of big neural data” Workshop at NIPS, Montreal, Dec. 12, 2015.

Co-organizer of the 1st Annual “Signal Processing at Rice” (SPAR) Workshop at Rice University, Houston, TX, March 27, 2015.

SELECTED TALKS

“Finding low-dimensional structure in large-scale neural recordings”, Organization for Computational Neuroscience (OCNS) Workshop on Information Theory, Allen Institute for Brain Science, Seattle, WA, July 17th, 2018 (*invited*).

“Mapping the Brain with X-ray microtomography”, X-ray Science Highlight presentation at the 2018 Advanced Photon Source User Meeting, Argonne National Laboratory, May 7th, 2018 (*invited*).

“A cryptography-based approach for movement decoding”, Computational Neuroscience Seminar Series, University of Washington, December 20th, 2017 (*invited*).

“Tackling the size and complexity of large-scale neural datasets”, Allen Institute for Brain Science’s Annual Showcase, Dec 13th, 2017 (*invited*).

“Making sense of large-scale neural datasets”, Gulf Coast Consortium 7th Annual Neuroengineering Symposium, October 26, 2017 (*invited keynote presentation*).

“Sub-micrometer X-ray tomography for neuroanatomy”, Symposium of the BRAIN Initiative, Mayo Clinic, Rochester, MN, April 1, 2017 (*invited*).

“Quantifying mesoscale neuroanatomy using X-ray microtomography”, NIPS 2016 Workshop, Brains & Bits: Neuroscience Meets Machine Learning, December 9-10, 2016 (*invited*).

“Convex relaxation regression for non-convex optimization”, Conference on Uncertainty in Artificial Intelligence, June 27, 2016 (*accepted*).

“Finding structure in the brain: From image acquisition to analysis and back again”, Computer Science Department Seminar, Notre Dame University, April 28, 2016 (*invited*).

“X-Brain: Methods for mapping 3D brain structure with X-ray microtomography”, Integrative Imaging Initiative Seminar Series at Argonne National Lab, September 2015 (*invited*).

“From single cells to brain areas: Methods for quantifying 3D brain structure”, Escaping Flatland: Imaging biological architecture and events in three dimensions, Marine Biological Laboratory, Woods Hole, MA, August 7-8, 2015 (*invited*).

**PROFESSIONAL
ACTIVITIES**

Editor for: PLOS Computational Biology (Guest); Neurons, Behavior, Data Analysis and Theory (NBDT)

Program Committee for: International Conference on Machine Learning (ICML), Neural Information Processing Systems (NIPS), International Conference on Brain Informatics (ICBI).

Reviewer for: Journal of Machine Learning Research (JMLR), IEEE Transactions on Signal Processing (TSP), International Symposium on Information Theory (ISIT), Neural Information Processing Systems (NIPS), Sampling Theory and Applications (SAMPTA), Biomedical Optics Express (BOE), PLOS Computational Biology (PLOS CB), IEEE Transactions on Neural Networks and Learning Systems (TNNLS), IEEE Transactions on Biomedical Engineering (TBME), IEEE Transactions on Human-Machine Systems (THMS), International Conference on Machine Learning (ICML).

Member of: Society for Neuroscience (SFN), Institute of Electrical and Electronics Engineers (IEEE), Organization for Computational Neurosciences (OCNS), Society for Industrial & Applied Mathematics (SIAM), and Eta Kappa Nu Honor Society.