Ethan R. Elenberg

CONTACT INFORMATION

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RESEARCH INTERESTS

Discrete Optimization, Interpretable Machine Learning, Graph Algorithms, Coding Theory

EDUCATION

The University of Texas at Austin, Austin, TX
- ◇ Ph.D., Electrical and Computer Engineering, May 2018 (Expected)
- ◇ M.S., Electrical and Computer Engineering, May 2014 GPA: 3.9/4.0
  - – Research Supervisors: Sriram Vishwanath and Alexandros G. Dimakis
  - – Academic Track: Communications, Networks, and Systems (CommNetS)

The Cooper Union for the Advancement of Science and Art, New York, NY
- ◇ B.E., Electrical Engineering, *Summa Cum Laude*, May 2012 GPA: 4.0/4.0
  - – Signal Processing & Communications Track
  - – Minor in Mathematics

Graduate Coursework: Adaptive Filters, Advanced Probability, Classical Coding Theory, Digital Video, Introduction to Compressive Sensing, Introduction to System Theory, Large-Scale Learning, Machine Learning for Large-Scale Data, Optoelectronic Devices, Postmodern Coding Theory, Probability & Random Processes I, Randomized Algorithms, Wavelets & Multiresolution Imaging, Wireless Communications, Wireless System Design

ACADEMIC WORK

Neural Network Interpretability via Streaming Weak Submodularity	2017
Restricted Strong Convexity and Weak Submodularity	2016-2017
Triangle Sparsifier Bounds via Stein's Method	Fall 2015
A Distributed Framework for Estimating k-profiles of Large Graphs	2014-2015
Video Saliency: Algorithms and Architectures	Spring 2014
Locality Sensitive Hashing Families for Large-Scale Image Compression	2013-2014
Multihop Interference Alignment	Spring 2013
Dimensionality Reduction with Expander Graphs	Fall 2012
iSCISM: interference Sensing and Coexistence in the ISM band – *First Place* - IEEE Region 1 Student Paper Competition	2011-2012
Rateless LT Code Simulation for Visible Light Communication Channels	Spring 2012
Performance Evaluation of WiMAX in Urban Fading Channels	Spring 2012
MATLAB Implementation of MPEG-1 Audio Layer 1 Compression	Fall 2010
Development of a Vinyl Playback Simulator	2010
Construction of a Morse Code Decoder	Spring 2009

PUBLICATIONS AND PRESENTATIONS

[1] **E.R. Elenberg**, R. Khanna, A.G. Dimakis, and S. Negahban. "Restricted Strong Convexity Implies Weak Submodularity", to appear in *Annals of Statistics*, 2018. (Preliminary version in *Proc. NIPS Workshop on Learning in High Dimensions with Structure*, December 2016.)

[2] **E.R. Elenberg**, A.G. Dimakis, M. Feldman, and A. Karbasi. "Streaming Weak Submodularity: Interpreting Neural Networks on the Fly", in *Proc. NIPS*, December 2017. **Oral Presentation** (top 6% of accepted papers).

[3] R. Khanna, **E.R. Elenberg**, A.G. Dimakis, and S. Negahban. "On Approximation Guarantees for Greedy Low Rank Approximation", in *Proc. ICML*, August 2017.

[4] R. Khanna, **E.R. Elenberg**, A.G. Dimakis, S. Negahban, and J. Ghosh. "Scalable Greedy Feature Selection via Weak Submodularity", in *Proc. AISTATS*, April 2017.

[5] A. Bonato, D.R. D'Angelo, **E.R. Elenberg**, D.F. Gleich, and Y. Hou. "Mining and Modeling Character Networks", in *Proc. WAW*, December 2016.

PUBLICATIONS AND PRESENTATIONS (CONTINUED)

[6] **E.R. Elenberg**, K. Shanmugam, M. Borokhovich, and A.G. Dimakis. "Distributed Estimation of Graph 4-profiles", in *Proc. WWW*, April 2016.

[7] **E.R. Elenberg**, K. Shanmugam, M. Borokhovich, and A.G. Dimakis. "Beyond Triangles: A Distributed Framework for Estimating 3-profiles of Large Graphs", in *Proc. ACM KDD*, August 2015.

[8] J.I. Tamir, **E.R. Elenberg**, A. Banerjee, and S. Vishwanath. "Wireless Index Coding Through Rank Minimization", in *Proc. IEEE ICC*, June 2014.

[9] J.L. Baylon, **E.R. Elenberg**, and S.G. Massengill. "iSCISM: interference Sensing and Coexistence in the ISM Band", *High Frequency Electronics*, vol. 11 no. 4 pp. 30-46, Apr. 2012.

[10] "Streaming Weak Submodularity: Interpreting Neural Networks on the Fly", *Texas A&M University Information Science and Systems Seminar*, College Station TX, Fall 2017.

[11] "Machine Learning on Graphs: Profiles and Greedy Approximation", *2017 SIAM Conference on Optimization*, Vancouver, BC. Invited Speaker.

[12] "Kaggle Competitions." EE379K: Architectures for (Big) Data Science, UT Austin, Spring 2016. Guest Lecture.

[13] "iSCISM: interference Sensing and Coexistence in the ISM Band," *2012 NEWSDR Workshop*, Boston, MA. Poster.

TECHNICAL SKILLS

Programs: Cygwin, Git, GNU Radio, Gunicorn, IntelliJ, MATLAB, Mercurial, MPLAB, Microsoft Office, Perforce, S-PLUS, Spark, SPICE, Spyder, Visual C#, Xcode, Xilinx ISE, Unix Shell

Languages: C, C++, CUDA C, Motorola DSP 563xx assembly, HTML, LaTeX, Objective C, PIC assembly, Python, R, Scala, VHDL

Frameworks: Flask, GraphLab, Keras, NumbaPro, NumPy, Pandas, Scalding, scikit-learn, TensorFlow, TinyOS

Algorithms: Adaptive filtering, backprojection imaging, correlation clustering, CoSaMP, graph-based visual saliency, greedy forward regression, image interpolation k-means clustering, locality sensitive hashing, Luby transform coding, nonlinear Kalman filtering, 802.11 Physical Layer, sparse PCA, stochastic gradient descent, support vector machines, triangle counting, WiMAX Physical Layer, zig-zag and replacement product

Laboratory: Digital multimeter, oscilloscope, vector network analyzer wideband communication tester

Security Clearance: Last active August 2014, information available upon request

WORK EXPERIENCE

Graduate Research Assistant, The University of Texas *August 2013 - Present*

- ◇ Member of Wireless Networking & Communications Group, LINC group.
- ◇ Design distributed approximation algorithms for subgraph counting and graph analytics.
- ◇ Develop tools to analyze and visualize brain connectivity using task-based fMRI.
- ◇ Establish performance guarantees for nonlinear, large-scale, greedy feature selection.
- ◇ Develop measures for black-box neural network interpretability via streaming combinatorial optimization.
- ◇ Design coded caching architectures for next-generation memory systems.
- ◇ Demonstrate performance benefits of index coding for wireless communications.

Summer Intern, Twitter *May 2017 - August 2017*

- ◇ Designed and evaluated large-scale hashing algorithms to compute approximate, local subgraph features.
- ◇ Improved machine learning pipelines for sending personalized email recommendations.

Work Experience (Continued)

Summer Research Intern, MIT Lincoln Laboratory *May 2014 - August 2014*
- ◇ Formulated and developed novel entropy-based autofocus algorithms for nearfield SAR.
- ◇ Evaluated performance on simulated, emulated, and measured SAR data.

Wireless Intern, Apple *May 2013 - August 2013*
- ◇ Developed an EVM analysis tool for cellular QPSK signals.
- ◇ Provided factory support during an iPhone build.

Summer Research Intern, MIT Lincoln Laboratory *June 2012 - August 2012*
- ◇ Implemented extended and unscented Kalman filters in MATLAB for passive target tracking applications.
- ◇ Developed and tested a proof-of-concept passive RF direction finding circuit.

S*PROCOM ^{2} Research Fellow, The Cooper Union *August 2011 - May 2012*
- ◇ Assisted with Cognitive Communications Gateway Engine software development.
- ◇ Implemented Voice over IP transcoding for software defined radio applications.

Student Engineer, Southwest Research Institute *May 2011 - August 2011*
- ◇ Developed image processing software in C for a 4-slap fingerprint reader.
- ◇ Assisted in mapping high-level algorithms to an embedded FPGA implementation.
- ◇ Implemented adaptive filtering, AR inverse model, and NPR filter bank algorithms in MATLAB for audio processing.

Audio/Visual Technician, The Cooper Union *September 2008 - May 2011*
- ◇ Operated sound for Great Hall events and audio/visual equipment for classes.
- ◇ Supervised movement of equipment to the New Academic Building.

Quantitative Research Intern, The Millburn Corporation *May 2010 - January 2011*
- ◇ Developed financial models and parallel computing clusters in both R and S-PLUS.

Math Tutor, The Cooper Union *October 2009 - February 2010*
- ◇ Assisted individual students with Intro to Linear Algebra concepts and homework.

Honors and Awards

ICML Student Travel Award	2017
Cockrell School Fellowship	2012-2016
Microelectronics & Computer Development Fellowship	2012-2013
Cooper Union Full Tuition Scholarship	2008-2012
Dean's List	2008-2012
Harold S. Goldberg Leadership Prize	May 2012
Irwin L. Lynn Memorial Prize in Mathematics	May 2012
Radio Club of America Scholarship	March 2012
Abdul Azimi Memorial Scholarship	November 2011
C.V. Starr Scholarship	October 2011
Jesse Sherman Book Award in Electrical Engineering	September 2011
Barry Federman SAME Scholarship	October 2010

Memberships

Reviewer, NIPS	2015-2017
Reviewer, AISTATS	2017
Reviewer, IEEE Transactions on Information Theory, Internet Mathematics, IEEE/ACM Transactions on Networking, Knowledge and Information Systems	2017
Reviewer, ISIT	2016
Reviewer, DySPAN	2014
Student Member, IEEE	2011-Present
Member, Tau Beta Pi	2010-Present
Member, Order of the Engineer	2012-Present
President, Eta Kappa Nu	2011-2012
President, Pro Musica	2010-2012
Musical Director, Cooper Dramatic Society	2009-2011