

Eric W. Tramel

Curriculum Vitae

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Areas of Specialization

- Federated Learning
- Privacy-Aware Machine Learning
- Unsupervised Machine Learning
- Message Passing & Belief Propagation

Education

- 2007–2012 **Ph.D. in Computer Engineering**, *Mississippi State University*, Starkville, MS.
Dissertation: *Distance-Weighted Regularization for Compressed-Sensing Video Recovery and Supervised Hyperspectral Classification* (Director: Prof. James E. Fowler).
- 2004–2007 **B.S. in Computer Engineering**, *Mississippi State University*, Starkville, MS.
National Merit Scholar, Mississippi Eminent Scholar.

Full-Time Positions

- 2018 – Present **R&D Team Leader**, *Owkin, Inc.*, Paris, France.
Leader of Owkin Lab’s Federated Learning Research Group. Managed a team of research scientists and engineers conducting algorithmic research, data science, and developing software for federated learning on medical data. Responsible for recruitment, team management, scientific & technical leadership, as well as leading software development (Agile).
- 2017–2018 **Senior Machine Learning Scientist**, *Owkin, Inc.*, Paris, France.
Conducting primary research on privacy-aware machine learning, and federated & distributed machine learning, in particular. Also, representing the company on these topics with partners & investors.
- 2016–2017 **Research Engineer**,
Team DYOGENE, Inria Paris, Paris, France.
“Machine Learning and Mobility Prediction”, (PI: Prof. Marc Lelarge)
- 2013–2016 **Postdoctoral Researcher**,
Laboratoire de Physique Statistique, École Normale Supérieure, Paris, France.
“Statistical Physics Applied to Complex Systems”, (PI: Prof. Florent Krzakala): studied application of statistical physics to problems ranging from compressed sensing to machine learning; co-editor of the book *Statistical Physics, Optimization, Inference, and Message-Passing Algorithms*; collaborated on many papers, including acceptances at both NeurIPS and ICML; presented work at a number of invited talks.
- 2012–2013 **Instructor**,
Electrical & Computer Engineering Dept., Mississippi State University, Starkville, MS.
Teaching undergraduate courses for two semesters: *Signals & Systems* and *Microprocessors I Lab*.
- Summer, 2011 **Research Intern**,
Canon USA, Inc., San Jose, CA.
“Optimization Theory” & “Compressive Sampling of Lightfields”, (Director: Dr. Axel Becker-Lakus)
- 2009–2012 **Research Associate**,
Geosystems Research Institute, Mississippi State University, Starkville, MS.
“Block-based Compressed Sensing for Images and Video”, (Director: Prof. James E. Fowler)
- Summer, 2006 **Research Assistant**,
Institute for Signal and Information Processing, Mississippi State University, Starkville, MS.
Director: Prof. Joseph Picone

Technical Expertise

- Python
- Keras
- L^AT_EX
- Scikit-Learn
- Unix/Linux Development
- C/C++
- Matlab
- BLAS
- Apache Kafka
- Docs (MkDocs, Sphinx, etc.)
- Tensorflow 1.0/2.0
- PyTorch
- Pandas
- Visualization (Matplotlib, Seaborn, etc.)
- Google Cloud Platform
- Git
- Julia
- CI/DevOps (light)
- Redis

Graduate Teaching Roles

- Spring, 2012 **Teaching Assistant**, *Senior Design*, Mississippi State University.
- Fall, 2011 **Teaching Assistant**, *Microprocessors I Lab*, Mississippi State University.
- Fall, 2008 **Teaching Assistant**, *Electronic Circuits I*, Mississippi State University.
- Fall, 2007 **Teaching Assistant**, *Microprocessors I Lab*, Mississippi State University.
- Spring, 2007 **Grader**, *Microprocessors I*, Mississippi State University.

Talks & Presentations

- Apr., 2019 **Invited Talk**: “Federated Learning: Rewards & Challenges of Distributed Private ML”, Qcon.ai, San Francisco, CA.
- Nov., 2018 **Invited Panel Member**: “Federated Learning: ML with Privacy on the Edge,” FastForward Labs Webinar.
- Dec., 2017 **Poster**: “Classification and Disease Localization in Histopathology Using Only Global Labels: A Weakly-Supervised Approach”, NeurIPS Learning with Limited Data (LLD) Workshop.
- Aug., 2016 **Oral**: “Inferring Sparsity: Compressed Sensing Using Generalized Restricted Boltzmann Machines,” International Travelling Workshop on Interactions Between Sparse Models and Technology (iTWIST), Aalborg, Denmark.
- Oct., 2015 **Invited Lecture**: “Introduction to Compressed Sensing,” Biophysics: Measuring and Modelling Biology, École de Physique des Houches, Les Houches, France.
- Aug., 2015 **Invited Talk**: “Discrete Reconstruction for Electron Tomography,” 23rd General Congress, Société Française de Physique (SFP), Strasbourg, France.
- Jul., 2015 **Oral**: “Swept Approximate Message Passing for Sparse Estimation,” International Conference on Machine Learning (ICML), Lille, France.
- Mar., 2015 **Invited Talk**: “Belief Propagation & Approximations: Discrete Tomography,” Workshop on Sparse Tomographic Reconstruction: Theoretical and Numerical Aspects, Heidelberg, Germany.
- August, 2014 **Invited Plenary Talk**: “A Probabilistic Approach to Compressed Sensing: Robust Algorithms,” International Travelling Workshop on Interactions between Sparse Models and Technology (iTWIST), Namur, Belgium.
- April, 2012 **Oral**: “The Nearest Regularized Subspace Classifier,” MSU GSA Research Symposium, Starkville, MS.
- March, 2011 **Oral**: “Video Compressed Sensing with Multihypothesis,” IEEE Data Compression Conference (DCC), Snowbird, UT.

Publications

Preprints

- [1] G. Rochette, A. Manoel, and E. W. Tramel, “Efficient per-example gradient computations in convolutional neural networks,” December 2019, arXiv [cs.LG]: 1912.06015.

Patents

- [2] A. Mohan, S.-K. Tin, and E. W. Tramel, “Systems and methods for compressive light sensing using multiple spatial light modulators,” U.S. Patent US9 160 900 B2, October 13, 2015.

Books

- [3] J. E. Fowler, S. Mun, and E. W. Tramel, *Block-based Compressed Sensing of Images and Video*, ser. Foundations and Trends in Signal Processing. Now Publishers, Inc., 2012, vol. 4, no. 4.
- [4] F. Krzakala, F. Ricci-Tersenghi, L. Zdeborová, R. Zecchina, E. W. Tramel, and L. F. Cugliandolo, *Statistical Physics, Optimization, Inference, and Message-Passing Algorithms*. Oxford University Press, 2015.
- [5] E. W. Tramel, “Distance-weighted regularization for compressed-sensing video recovery and supervised hyperspectral classification,” Ph.D. dissertation, Mississippi State University, Starkville, MS, December 2012.

Book Chapters

- [6] E. W. Tramel, S. Kumar, A. Giurciu, and A. Montanari, “Statistical estimation: From denoising to sparse regression and hidden cliques,” in *Statistical Physics, Optimization, Inference, and Message-Passing Algorithms*, F. Krzakala, F. Ricci-Tersenghi, L. Zdeborová, R. Zecchina, E. W. Tramel, and L. F. Cugliandolo, Eds. Oxford University Press, 2015, pp. 120–177.

Journal Articles

- [7] B. Goujaud, E. W. Tramel, P. Courtiol, M. Zaslavskiy, and G. Wainrib, “Robust detection of covariate-treatment interactions in clinical trials,” *Journal of the American Statistical Association*, 2018, (under revision).
- [8] M. Zaslavskiy, S. Jégou, E. W. Tramel, and G. Wainrib, “ToxicBlend: Virtual screening of toxic compounds with ensemble predictors,” *Computational Toxicology*, vol. 10, pp. 81–88, 2019.
- [9] E. W. Tramel, M. Gabrié, A. Manoel, F. Caltagirone, and F. Krzakala, “Deterministic and generalized framework for unsupervised learning with restricted Boltzmann machines,” *Physical Review X*, vol. 8, no. 4, p. 041006, October 2018.
- [10] E. W. Tramel, A. Drémeau, and F. Krzakala, “Approximate message passing with restricted Boltzmann machine priors,” *Journal of Statistical Mechanics: Theory and Experiment*, no. 7, p. 073401, 2016.
- [11] C. Chen, W. Li, E. W. Tramel, M. Cui, S. Prasad, and J. E. Fowler, “Spectral-spatial preprocessing using multihypothesis prediction for noise-robust hyperspectral image classification,” *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, vol. 7, no. 4, pp. 1047–1059, 2014.
- [12] C. Chen, W. Li, E. W. Tramel, and J. E. Fowler, “Reconstruction of hyperspectral imagery from random projections using multihypothesis prediction,” *IEEE Transactions on Geoscience and Remote Sensing*, vol. 52, no. 1, pp. 365–374, 2014.
- [13] W. Li, E. W. Tramel, S. Prasad, and J. E. Fowler, “Nearest regularized subspace for hyperspectral classification,” *IEEE Transactions on Geoscience and Remote Sensing*, vol. 52, no. 1, pp. 477–489, 2013.
- [14] M. Trocan, E. W. Tramel, J. E. Fowler, and B. Pesquet-Popescu, “Compressed-sensing recovery of multiview image and video sequences using signal prediction,” *Multimedia Tools and Applications*, pp. 1–27, 2013.

Conference & Workshop Papers

- [15] P. Courtiol, E. W. Tramel, M. Sanselme, and G. Wainrib, “Classification and disease localization in histopathology using only global labels: A weakly-supervised approach,” in *NeurIPS Workshop on Learning with Limited Labeled Data*, 2017.
- [16] E. W. Tramel, A. Manoel, F. Caltagirone, M. Gabrié, and F. Krzakala, “Inferring sparsity: Compressed sensing using generalized restricted Boltzmann machines,” in *Proc. IEEE Info. Theory Workshop (ITW)*, Cambridge, UK, September 2016.
- [17] J. Barbier, E. W. Tramel, and F. Krzakala, “Scampi: a robust approximate message-passing framework for compressive imaging,” in *Proc. Int. Mtg. on High-Dimensional Data Driven Science (HD³)*, 2016.
- [18] B. Rajaei, E. W. Tramel, S. Gigan, F. Krzakala, and L. Daudet, “Intensity-only optical compressive imaging using a multiply scattering material: A double phase retrieval system,” in *Proc. IEEE Int. Conf. on Acoustics, Speech and Signal Processing (ICASSP)*, 2016, to appear.
- [19] M. Gabrié, E. W. Tramel, and F. Krzakala, “Training restricted Boltzmann machines via the Thouless-Anderson-Palmer free energy,” in *Proc. Conf. on Neural Info. Processing Sys. (NeurIPS)*, Montreal, Canada, June 2015.
- [20] A. Manoel, E. W. Tramel, F. Krzakala, and L. Zdeborová, “Sparse estimation with the swept approximated message-passing algorithm,” in *Proc. Int. Conf. on Machine Learning (ICML)*, Lille, France, July 2015.
- [21] W. Li, S. Prasad, E. W. Tramel, J. E. Fowler, and Q. Du, “Decision fusion for hyperspectral image classification based on minimum-distance classifiers in the wavelet domain,” in *IEEE China Summit on Signal and Info. Processing*, Xi’an, China, July 2014, pp. 162–15.

- [22] F. Krzakala, A. Manoel, E. W. Tramel, and L. Zdeborová, “Variational free energies for compressed sensing,” in *Proc. IEEE Int. Symp. on Information Theory (ISIT)*, Honolulu, HI, July 2014, pp. 1499–1503.
- [23] J. E. Fowler, S. Mun, and E. W. Tramel, “Multiscale block compressed sensing with smoothed projected Landweber reconstruction,” in *Proc. European Signal Processing Conf. (EUSIPCO)*, Barcelona, Spain, August 2011, pp. 564–568.
- [24] C. Chen, E. W. Tramel, and J. E. Fowler, “Compressed-sensing recovery of images and video using multihypothesis predictions,” in *Asilomar Conf. on Signals, Systems, and Computers*, Pacific Grove, CA, November 2011.
- [25] M. Trocan, T. Maugey, E. W. Tramel, J. E. Fowler, and B. Pesquet-Popescu, “Compressed sensing of multiview images using disparity compensation,” in *Proc. of the IEEE Int. Conf. on Image Processing (ICIP)*, Hong Kong, Sep. 2010, pp. 3345–3348.
- [26] —, “Multistage compressed-sensing reconstruction of multiview images,” in *Proc. of the IEEE Int. Workshop on Multimedia Signal Processing (MMSP)*, Saint-Malo, France, Oct. 2010, pp. 111–115.
- [27] E. W. Tramel and J. E. Fowler, “Video compressed sensing with multihypothesis,” in *Proc. of the IEEE Data Compression Conf. (DCC)*, Snowbird, Utah, 2011, pp. 193–202.