

Frederic Sala

949 Duncan St.
San Francisco, CA 94131

Phone: 248-835-4827

email: fredsala@stanford.edu

url: stanford.edu/~fredsala

Academic positions

- 2017-Present Postdoctoral Scholar
Stanford University CS Department
Advisor: Chris Ré
- 2017 Short-Term Postdoctoral Scholar
UCLA CS & EE Departments
Advisors: Guy Van den Broeck & Lara Dolecek

Education

- 2013-2016 Ph.D. in Electrical Engineering, University of California, Los Angeles (UCLA)
Advisor: Lara Dolecek
Dissertation: “Algorithms and coding techniques for reliable data management and storage”
(Outstanding Ph.D. Dissertation Award - Signals & Systems Track)
- 2011-2013 M.S. in Electrical Engineering, University of California, Los Angeles (UCLA)
Advisor: Lara Dolecek
Thesis: “Novel coding strategies for multi-level non-volatile memories”
(Outstanding M.S. Thesis Award - Signals & Systems Track)
- 2006-2010 B.S. in Electrical Engineering, University of Michigan, Ann Arbor
Summa Cum Laude

Research interests

Intersection of machine learning, information theory, and data science, focusing on analysis and design of data-driven systems and algorithms.

Honors & awards

- 2017 Outstanding Ph.D. Dissertation Award
UCLA Department of Electrical Engineering (Signals & Systems Track)
- 2015-2016 UCLA Dissertation Year Fellowship
- 2015 Qualcomm Innovation Fellowship Finalist
- 2013 Edward K. Rice Outstanding Masters Student Award
UCLA Henry Samueli School of Engineering & Applied Science
- 2013 Outstanding M.S. Thesis Award
UCLA Department of Electrical Engineering (Signals & Systems Track)
- 2012-2015 National Science Foundation Graduate Research Fellowship (NSF GRFP)
- 2011-2012 UCLA Graduate Fellowship

Publications & talks

Journal articles

12. C. Schoeny, **F. Sala**, M. Gottscho, I. Alam, P. Gupta, and L. Dolecek, "Context-aware resiliency: Unequal message protection for random-access memories," *IEEE Transactions on Information Theory*, vol. 65, no. 10, pp. 6146-6159, Oct. 2019.
11. R. Gabrys and **F. Sala**, "Codes correcting two deletions," *IEEE Transactions on Information Theory*, vol. 65, no. 2, pp. 965-974, Feb. 2019.
10. S. S. Garani, L. Dolecek, J. Barry, **F. Sala**, and B. Vasic, "Signal processing and coding techniques for 2-D magnetic recording: An overview," *Proceedings of the IEEE*, vol. 106, no. 2, pp. 286-318, Feb. 2018.
9. **F. Sala**, C. Schoeny, R. Gabrys, and L. Dolecek, "Exact reconstruction from insertions in synchronization codes," *IEEE Transactions on Information Theory*, vol. 63, no. 4, pp. 2428-2445, Apr. 2017.
8. **F. Sala**, C. Schoeny, S. Kabir, D. Divsalar, and L. Dolecek "On nonuniform noisy decoding for LDPC codes with application to radiation-induced errors," *IEEE Transactions on Communications*, vol. 65, no. 4, pp. 1438-1450, Apr. 2017.
7. **F. Sala**, N. Bitouzé, C. Schoeny, and L. Dolecek, "Synchronizing files under a large number of edits," *IEEE Transactions on Communications*, vol. 64, no. 6, pp. 2258-2273, Jun. 2016.
6. R. Gabrys, E. Yaakobi, F. Farnoud, **F. Sala**, S. Bruck, and L. Dolecek, "Codes correcting erasures and deletions for rank modulation," *IEEE Transactions on Information Theory*, vol. 62, no. 1, pp. 136-150, Jan. 2016.
5. L.F. Wanner **et al.**, "NSF expedition on variability-aware software: Recent results and contributions," *Information Technology*, vol. 57, no. 3, pp. 181-198, Jun. 2015.
4. **F. Sala**, K.A.S. Immink, and L. Dolecek, "Error control schemes for modern Flash memories: Solutions for Flash deficiencies," *IEEE Consumer Electronics*, vol. 4, no. 1, pp. 66-73, Jan. 2015.
3. R. Gabrys, **F. Sala**, and L. Dolecek, "Coding for unreliable Flash memory cells," *IEEE Communication Letters*, vol. 18, no. 9, pp. 1491-1494, Jul. 2014.
2. **F. Sala**, R. Gabrys, and L. Dolecek, "Dynamic threshold schemes for multi-level non-volatile memories," *IEEE Transactions on Communications*, vol. 61, no. 7, pp. 2624-2634, Jul. 2013.
1. E. Cheng, L. Liptak, and **F. Sala**, "Linearly many faults in 2-tree generated networks," *Networks*, vol. 55, no. 2, pp. 90-98, Mar. 2010.

Conference publications

- 2020 I. Chami, A. Wolf, D. Juan, **F. Sala**, S. Ravi, and C. Ré, "Low-Dimensional Hyperbolic Knowledge Graph Embeddings," in *Annual Conf. Association for Computational Linguistics (ACL)*, Seattle, Wa, 2020.
- 2020 Z. Kuang, **F. Sala**, N. Sohoni, S. Wu, A. Cordova-Palomera, J. Dunnmon, J. Priest, and C. Ré, "Ivy: Instrumental Variable Synthesis for Causal Inference," in *International Conference on Artificial Intelligence and Statistics (AISTATS)*, Palermo, Italy, 2020.
- 2019 **F. Sala**^{*}, P. Varma^{*}, S. Sagawa, J. Fries, D. Fu, S. Khattar, A. Ramamoorthy, K. Xiao, K. Fatahalian, J. Priest, and C. Ré, "Multi-resolution weak supervision for sequential data," in *Neural Information Processing Systems (NeurIPS)*, Vancouver, Canada, 2019.
- 2019 P. Varma^{*}, **F. Sala**^{*}, A. He, A. J. Ratner, and C. Ré, "Learning dependency structures for weak supervision models," in *International Conference on Machine Learning (ICML)*, Long Beach, CA, 2019.
- 2019 A. Gu, **F. Sala**, B. Gunel, and C. Ré, "Learning mixed-curvature representations in product spaces," in *International Conference on Learning Representations (ICLR)*, New Orleans, LA, 2019.
- 2019 A. J. Ratner, B. Hancock, J. Dunnmon, **F. Sala**, S. Pandey, and C. Ré, "Training complex models with multi-task weak supervision," in *AAAI Conference on Artificial Intelligence*, Honolulu, HI, 2019.
- 2018 **F. Sala**, C. De Sa, A. Gu, and C. Ré, "Representation tradeoffs for hyperbolic embeddings," in *International Conference on Machine Learning (ICML)*, Stockholm, Sweden, 2018.

- 2018 R. Gabrys and **F. Sala**, “Codes correcting two deletions,” in *Proc. IEEE International Symposium on Information Theory (ISIT)*, Vail, CO, 2018.
- 2017 S. Kabir, **F. Sala**, G. V. d. Broeck, and L. Dolecek. “Coded machine learning: Joint informed replication and learning for linear regression,” in *Proc. IEEE 54th Allerton Conference on Communication, Control, and Computing*, Monticello, IL, 2017.
- 2016 K. Mazooji, **F. Sala**, G. V. d. Broeck, and L. Dolecek, “Robust channel coding strategies for machine learning data,” in *Proc. IEEE 54th Allerton Conference on Communication, Control, and Computing*, Monticello, IL, 2016.
- 2016 **F. Sala**, R. Gabrys, C. Schoeny, K. Mazooji, and L. Dolecek, “Exact sequence reconstruction for insertion-correcting codes,” in *Proc. IEEE International Symp. on Information Theory (ISIT)*, Barcelona, Spain, 2016.
- 2015 **F. Sala**, C. Schoeny, D. Divsalar, and L. Dolecek, “Asymmetric error-correcting codes for Flash memories in high-radiation environments,” in *Proc. IEEE International Symposium on Information Theory (ISIT)*, Hong Kong, 2015.
- 2015 C. Schoeny, **F. Sala**, and L. Dolecek, “Analysis and coding schemes for the Flash Normal-Laplace mixture channel,” in *Proc. IEEE International Symposium on Information Theory (ISIT)*, Hong Kong, 2015.
- 2015 **F. Sala**, C. Schoeny, R. Gabrys, and L. Dolecek, “Three novel combinatorial theorems for the insertion/deletion channel,” in *Proc. IEEE International Symposium on Information Theory (ISIT)*, Hong Kong, 2015.
- 2014 **F. Sala**, R. Gabrys, and L. Dolecek, “Deletions in multipermutations,” in *Proc. IEEE International Symposium on Information Theory (ISIT)*, Honolulu, HI, 2014.
- 2014 R. Gabrys, E. Yaakobi, F. Farnoud, **F. Sala**, J. Bruck, and L. Dolecek, “Single-deletion-correcting codes over permutations,” in *Proc. IEEE International Symposium on Information Theory (ISIT)*, Honolulu, HI, 2014.
- 2013 N. Bitouzé, **F. Sala**, S. M. S. Tabatabaei, and L. Dolecek, “A practical framework for efficient file synchronization,” in *Proc. IEEE 51st Allerton Conference on Communication, Control, and Computing*, Monticello, IL, 2013.
- 2013 **F. Sala** and L. Dolecek, “Counting sequences obtained from the synchronization channel,” in *Proc. IEEE International Symposium on Information Theory (ISIT)*, Istanbul, Turkey, 2013.

*: Equal Contribution

Workshop publications

- 2019 I. Chami, A. Wolf, **F. Sala**, and C. Ré, “Low-dimensional knowledge graph embeddings via hyperbolic rotations,” *NeurIPS 2019 Workshop on Graph Representation Learning*, Vancouver, Canada, 2019.
- 2017 **F. Sala**, S. Kabir, L. Dolecek, and G. V. d. Broeck. “Don’t fear the bit flips: Robust linear prediction through informed channel coding,” *Proc. ICML 2017 Workshop on Reliable Machine Learning in the Wild*, Sydney, Australia, 2017.
- 2017 C. Schoeny, **F. Sala**, M. Gottscho, I. Alam, P. Gupta, and L. Dolecek, “Context-aware resiliency: Unequal message protection for random-access memories,” in *Proc. IEEE Information Theory Workshop (ITW)*, Kaohsiung, Taiwan, 2017.
- 2016 **F. Sala**, H. Duwe, L. Dolecek, and R. Kumar, “A unified framework for error correction techniques in on-chip memories,” presented at *Workshop on Silicon Errors in Logic - System Effects (SELSE-12)*, Austin, TX, 2016.
- Best of SELSE-12 paper, presented in special session at IEEE/IFIP International Conference on Dependable Systems and Networks (DSN)**, Toulouse, France, 2016.
- 2013 **F. Sala** and L. Dolecek, “Constrained rank modulation,” in *Proc. IEEE Information Theory Workshop (ITW)*, Sevilla, Spain, 2013.

Monographs & Book Chapters

- 2016 L. Dolecek and **F. Sala**, “Channel coding methods for non-volatile memories,” *Foundations and Trends in Communications and Information Theory*, vol. 13, no. 1, pp. 1-136, Feb. 2016.
- 2016 **F. Sala**, C. Schoeny, and L. Dolecek, “Advanced algebraic and graph-based ECC schemes for Flash memories,” in *3D Flash Memories*, Rino Micheloni, Ed. Springer, 2016, pp. 321-348.

Theses

- 2016 **F. Sala**, “Algorithms and coding techniques for reliable data management and storage.” Ph.D. Dissertation, University of California, Los Angeles, December 2016. Outstanding Ph.D. Dissertation Award - Signals & Systems Track
- 2013 **F. Sala**, “Novel coding strategies for multi-level non-volatile memories.” M.S. Thesis, University of California, Los Angeles, May 2013. Distinguished M.S. Thesis Award - Signals & Systems Track

Patents

- 2019 **F. Sala**, C. Hu, H. Zheng, D. Niu, and M. Chang, Samsung Electronics Co Ltd, “Virtual bucket multiple hash tables for efficient memory in-line deduplication application,” Patent US10496543B2, Granted: Dec. 2019.
- 2018 **F. Sala**, C. Hu, H. Zheng, D. Niu, and M. Chang, Samsung Electronics Co Ltd, “Optimized hopscotch multiple hash tables for efficient memory in-line deduplication application,” Patent US9983821B2, Granted: May 2018.

Workshops Organized

- 2019 Graph representation learning workshop, ICLR 2019.
- 2018 Relational representation learning (R2L) workshop, NeurIPS 2018.

Talks

- 2019 **F. Sala**, “Putting non-Euclidean geometry to work in ML: Hyperbolic and product manifold embeddings,” Physics in ML Workshop in ml4science, Berkeley, CA, May 29, 2019.
- 2018 **F. Sala**, “Codes, embeddings, & non-Euclidean geometry: Unexpected allies in the fight to clean data,” CROSS Research Symposium at UCSC, Santa Cruz, CA, October 3, 2018.
- 2016 **F. Sala**, “Error-correcting codes for radiation-induced error patterns in flash memories,” Non-Volatile Memories Workshop (NVMW), San Diego, CA, March 7, 2016.
- 2016 **F. Sala**, “Exact reconstruction of coded data from traces.” Graduation Day Talk at Information Theory and Applications Workshop (ITA), La Jolla, CA, February 3, 2016.
- 2014 **F. Sala**, “Constrained rank modulation for flash memories,” Non-Volatile Memories Workshop (NVMW), San Diego, CA, March 11, 2014.
- 2013 **F. Sala**, “Reducing energy usage through a novel file synchronization algorithm,” DIMACS Workshop on Algorithms for Green Data Storage, Rutgers University, New Brunswick, NJ, December 18, 2013.
- 2013 **F. Sala**, “Dynamic threshold schemes for multi-level non-volatile memories,” Non-Volatile Memories Workshop (NVMW), San Diego, CA, March 5, 2013.

Industry experience

- 2015 Samsung Electronics, Research Engineering Intern
Memory Systems Laboratory (MSL) - New Memory Technologies Group
- 2014 Jet Propulsion Laboratory (JPL), Research Engineering Intern

Information Processing Group
2010-2011 Microsoft Corporation, Software Development Engineer
Windows Phone Group
2009 Microsoft Corporation, Software Development Engineer Intern
Zune/Xbox 360 Group
2008 Microsoft Corporation, Software Development Engineer Intern
Windows Ehome Group

Teaching experience

2016 Teaching Assistant
EE131A (Probability), UCLA Online MS Program, Fall 2016
2016 Instructor
Machine Learning, Social Networks, UCLA LA Computing Circle, Summer 2016
2012 Instructor
Web Services, Social Networks, UCLA LA Computing Circle, Summer 2012

Service

Journal Reviews

IEEE Transactions on Information Theory
IEEE Transactions on Signal Processing
IEEE Journal on Selected Areas in Communications
IEEE Transactions on Communications
IEEE Communications Letters
IEEE Signal Processing Letters
Designs, Codes and Cryptography
International Journal of Electronics and Communications

Conference Reviews

Conference on Neural Information Processing Systems (NeurIPS)
Top Reviewer: 2018, 2019
International Conference on Machine Learning (ICML)
International Conference on Artificial Intelligence and Statistics (AISTATS)
International Conference on Learning Representations (ICLR)
Conference on Uncertainty in Artificial Intelligence (UAI)
International Joint Conference on Artificial Intelligence (IJCAI)
AAAI Conference on Artificial Intelligence
SysML Conference
International Symposium on Information Theory (ISIT)