

Ankit Singh Rawat

Curriculum Vitae

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Google Scholar link, DBLP

Research Interests

My research interests broadly lie in coding theory, statistical machine learning, information theory, and security & privacy. My research primarily focuses on enabling fast, reliable, and secure large-scale information processing; running the gamut from designing novel coding schemes for cloud storage and computing systems to developing efficient learning algorithms to extract useful structures and representations from high-dimensional data.

Work Experience

- October 2018 – present **Research Scientist**
Google, New York City, NY.
- September 2016 – August 2018 **Postdoctoral Associate/Fellow**
EECS Department, Massachusetts Institute of Technology, Cambridge, MA.
- September 2017 – April 2018 **Postdoctoral Research Associate**
College of Information and Computer Sciences, University of Massachusetts, Amherst, MA.
- September 2015 – August 2016 **Postdoctoral Fellow**
Computer Science Department, Carnegie Mellon University, Pittsburgh, PA.

Education

- 2010–2015 **M.S./Ph.D. in Electrical and Computer Engineering**
The University of Texas at Austin, Austin, TX.
Dissertation: *New Coding Techniques for Distributed Storage Systems*.
- 2006–2010 **B.Tech. in Electrical Engineering**
Indian Institute of Technology (IIT) Kanpur, India.
Second highest CGPA among graduating students in *Electrical Engineering* at IIT Kanpur.

Internships

- 2013 **Alcatel Lucent Bell Labs**
Project: *Buffer control and video quality selection algorithm for adaptive video streaming*.
- 2012 **DOCOMO Innovations**
Project: *Interference alignment for multi-user multiple-input and multiple-output (MU-MIMO) systems*.
- 2009 **The Center for Advanced Systems and Engineering at Syracuse University**
Project: *Security issues in collaborative spectrum sensing for cognitive radio*.

Preprints/ in preparation

- [1] **Ankit Singh Rawat**, Jiecao Chen, Felix Yu, Ananda Theertha Suresh, and Sanjiv Kumar. Sampled softmax with random features. *under submission*.
- [2] Arya Mazumdar and **Ankit Singh Rawat**. Representation learning and recovery in the ReLU networks. *under submission*, Available arXiv:1803.04304.
- [3] Hardik Jain, Ethan R Elenberg, **Ankit Singh Rawat**, and Sriram Vishwanath. Coded access architectures for dense memory systems. *working paper*, Available online.

Journal Publications

- [1] **Ankit Singh Rawat**, Onur Ozan Koyluoglu, and Sriram Vishwanath. Centralized repair of multiple node failures with applications to communication efficient secret sharing. *IEEE Transactions on Information Theory*, 64(12):7529–7550, December 2018. Available at IEEE Xplore.

- [2] **Ankit Singh Rawat**, Itzhak Tamo, Venkatesan Guruswami, and Klim Efremenko. MDS code constructions with small sub-packetization and near-optimal repair bandwidth. *IEEE Transactions on Information Theory*, 64(10):6506–6525, October 2018. Available at IEEE Xplore.
- [3] **Ankit Singh Rawat**, Dimitris S. Papailiopoulos, Alexandros G. Dimakis, and Sriram Vishwanath. Locality and availability in distributed storage. *IEEE Transactions on Information Theory*, 62(8):4481–4493, August 2016. Available at IEEE Xplore.
- [4] **Ankit Singh Rawat**, Zhao Song, Alexandros G. Dimakis, and Anna Gal. Batch codes through dense graphs without short cycles. *IEEE Transactions on Information Theory*, 62(4):1592–1604, April 2016. Available at IEEE Xplore.
- [5] **Ankit Singh Rawat**, Arya Mazumdar, and Sriram Vishwanath. Cooperative local repair in distributed storage. *EURASIP Journal on Advances in Signal Processing*, 2015(1), December 2015. Available at Springer Link.
- [6] Natalia Silberstein, **Ankit Singh Rawat**, and Sriram Vishwanath. Error-correcting regenerating and locally repairable codes via rank-metric codes. *IEEE Transactions on Information Theory*, 61(11):5765–5778, November 2015. Available at IEEE Xplore.
- [7] Onur Ozan Koyluoglu, **Ankit Singh Rawat**, and Sriram Vishwanath. Secure cooperative regenerating codes for distributed storage systems. *IEEE Transactions on Information Theory*, 60(9):5228–5244, September 2014. Available at IEEE Xplore.
- [8] **Ankit Singh Rawat**, Onur Ozan Koyluoglu, Natalia Silberstein, and Sriram Vishwanath. Optimal locally repairable and secure codes for distributed storage systems. *IEEE Transactions on Information Theory*, 60(1):212–236, January 2014. Available at IEEE Xplore.
- [9] **Ankit Singh Rawat**, Priyank Anand, Hao Chen, and Pramod K. Varshney. Collaborative spectrum sensing in the presence of byzantine attacks in cognitive radio networks. *IEEE Transactions on Signal Processing*, 59(2):774–786, February 2011. Available at IEEE Xplore.

Refereed Conference Publications

- [1] Raj Kumar Maity, **Ankit Singh Rawat**, and Arya Mazumdar. Robust gradient descent via moment encoding with LDPC codes. to appear in *IEEE International Symposium on Information Theory (ISIT)*, July 2019. (Extended abstract appeared with an oral presentation at SysML Conference, 2018.) Available arXiv:1805.08327.
- [2] Christos Thrampoulidis and **Ankit Singh Rawat**. Lifting high-dimensional nonlinear models with Gaussian regressors. to appear in *22nd International Conference on Artificial Intelligence and Statistics (AISTATS)*, April 2019. Available arXiv:1712.03638.
- [3] Christos Thrampoulidis and **Ankit Singh Rawat**. The generalized lasso for sub-gaussian observations with dithered quantization. In *Proceedings of 56th Annual Allerton Conference on Communication, Control, and Computing (Allerton)*, October 2018. Available arXiv:1807.06976.
- [4] **Ankit Singh Rawat**, Itzhak Tamo, Venkatesan Guruswami, and Klim Efremenko. epsilon-MSR codes with small sub-packetization. In *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, pages 2043–2047, June 2017. Available at IEEE Xplore.
- [5] **Ankit Singh Rawat**. Secrecy capacity of minimum storage regenerating codes. In *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, pages 1406–1410, June 2017. Available at IEEE Xplore.
- [6] Arya Mazumdar and **Ankit Singh Rawat**. Associative memory using dictionary learning and expander decoding. In *Proceedings of the Thirty-First AAAI Conference on Artificial Intelligence (AAAI)*, pages 267–273, February 2017. Available at AAAI Proceedings.
- [7] Venkatesan Guruswami and **Ankit Singh Rawat**. MDS code constructions with small sub-packetization and near-optimal repair bandwidth. In *Proceedings of the Twenty-Eighth Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pages 2109–2122, January 2017. Available at SIAM Proceedings.
- [8] Arya Mazumdar, Yury Polyanskiy, **Ankit Singh Rawat**, and Hajir Roozbehani. Distance preserving maps and combinatorial joint source-channel coding for large alphabets. In *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, pages 3067–3071, July 2016. Available at IEEE Xplore.

- [9] **Ankit Singh Rawat**, Onur Ozan Koyluoglu, and Sriram Vishwanath. Centralized repair of multiple node failures. In *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, pages 1003–1007, July 2016. Available at IEEE Xplore.
- [10] Arya Mazumdar and **Ankit Singh Rawat**. Associative memory via a sparse recovery model. In *Proceedings of the 28th International Conference on Neural Information Processing Systems (NIPS)*, pages 2701–2709, 2015. Available at NIPS Proceedings.
- [11] **Ankit Singh Rawat**, Zhao Song, Alexandros G. Dimakis, and Anna Gal. Batch codes through dense graphs without short cycles. In *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, pages 1477–1481, June 2015. Available at IEEE Xplore.
- [12] Arya Mazumdar and **Ankit Singh Rawat**. On adversarial joint source channel coding. In *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, pages 271–275, June 2015. Available at IEEE Xplore.
- [13] Casen Hunger, Mikhail Kazdagli, **Ankit Singh Rawat**, Alexandros G. Dimakis, Sriram Vishwanath, and Mohit Tiwari. Understanding contention-based channels and using them for defense. In *Proceedings of IEEE 21st International Symposium on High Performance Computer Architecture (HPCA)*, pages 639–650, February 2015. Available at IEEE Xplore.
- [14] **Ankit Singh Rawat** and Emina Soljanin. Dynamic control of video quality for avs. In *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, pages 821–825, June 2014. Available at IEEE Xplore.
- [15] **Ankit Singh Rawat**, Dimitris S. Papailiopoulos, Alexandros G. Dimakis, and Sriram Vishwanath. Locality and availability in distributed storage. In *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, pages 681–685, June 2014. Available at IEEE Xplore.
- [16] Avhishek Chatterjee, **Ankit Singh Rawat**, Sriram Vishwanath, and Sujay Sanghavi. Learning the causal graph of markov time series. In *Proceedings of 51st Annual Allerton Conference on Communication, Control, and Computing (Allerton)*, pages 107–114, October 2013. Available at IEEE Xplore.
- [17] **Ankit Singh Rawat**, Onur Ozan Koyluoglu, Natalia Silberstein, and Sriram Vishwanath. Secure locally repairable codes for distributed storage systems. In *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, pages 2224–2228, July 2013. Available at IEEE Xplore.
- [18] Onur Ozan Koyluoglu, **Ankit Singh Rawat**, and Sriram Vishwanath. The secrecy capacity of minimum bandwidth cooperative regenerating codes. In *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, pages 1421–1425, July 2013. Available at IEEE Xplore.
- [19] Natalia Silberstein, **Ankit Singh Rawat**, Onur Ozan Koyluoglu, and Sriram Vishwanath. Optimal locally repairable codes via rank-metric codes. In *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, pages 1819–1823, July 2013. Available at IEEE Xplore.
- [20] Govinda Kamath, Natalia Silberstein, N. Prakash, **Ankit Singh Rawat**, V. Lalitha, Onur Ozan Koyluoglu, P. Vijay Kumar, and Sriram Vishwanath. Explicit MBR all-symbol locality codes. In *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, pages 504–508, July 2013. Available at IEEE Xplore.
- [21] **Ankit Singh Rawat**, Ozgun Y. Bursalioglu, and Haralabos C. Papadopoulos. Scheduling algorithms for mu-mimo with partial current csit and full delayed csit. In *Proceedings of IEEE 77th Vehicular Technology Conference (VTC Spring)*, pages 1–7, June 2013. Available at IEEE Xplore.
- [22] Natalia Silberstein, **Ankit Singh Rawat**, and Sriram Vishwanath. Error resilience in distributed storage via rank-metric codes. In *Proceedings of 50th Annual Allerton Conference on Communication, Control, and Computing (Allerton)*, pages 1150–1157, October 2012. Available at IEEE Xplore.
- [23] **Ankit Singh Rawat** and Sriram Vishwanath. On locality in distributed storage systems. In *Proceedings of IEEE Information Theory Workshop (ITW)*, pages 497–501, September 2012. Available at IEEE Xplore.
- [24] **Ankit Singh Rawat**, Sriram Vishwanath, Abhishek Bhowmick, and Emina Soljanin. Update efficient codes for distributed storage. In *Proceedings of IEEE International Symposium on Information Theory (ISIT)*, pages 1457–1461, July 2011. Available at IEEE Xplore.

- [25] **Ankit Singh Rawat**, Priyank Anand, Hao Chen, and Pramod K. Varshney. Countering byzantine attacks in cognitive radio networks. In *Proceedings of IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pages 3098–3101, March 2010. Available at IEEE Xplore.
- [26] Priyank Anand, **Ankit Singh Rawat**, Hao Chen, and Pramod K. Varshney. Collaborative spectrum sensing in the presence of byzantine attacks in cognitive radio networks. In *Proceedings of the Second International Conference on COMMunication Systems and NETworks (COMSNETS)*, pages 1–9, January 2010. Available at IEEE Xplore.

Invited Conference Publications

- [1] Islam Samy, Onur Ozan Koyluoglu, and **Ankit Singh Rawat**. Efficient data access in hybrid cloud storage. In *Proceedings of the 55th Annual Allerton Conference on Communication, Control, and Computing (Allerton)*, October 2017. Available online.
- [2] **Ankit Singh Rawat**, Onur Ozan Koyluoglu, and Sriram Vishwanath. Progress on high-rate MSR codes: Enabling arbitrary number of helper nodes. In *Proceedings of Information Theory and Applications Workshop (ITA)*, pages 1–6, January 2016. Available at IEEE Xplore.
- [3] **Ankit Singh Rawat**, Natalia Silberstein, Onur Ozan Koyluoglu, and Sriram Vishwanath. Secure distributed storage systems: Local repair with minimum bandwidth regeneration. In *Proceedings of the 6th International Symposium on Communications, Control and Signal Processing (ISCCSP)*, pages 5–8, May 2014. Available at IEEE Xplore.
- [4] **Ankit Singh Rawat**, Dimitris S. Papailiopoulos, Alexandros G. Dimakis, and Sriram Vishwanath. On codes with availability for distributed storage. In *Proceedings of the 6th International Symposium on Communications, Control and Signal Processing (ISCCSP)*, pages 15–18, May 2014. Available at IEEE Xplore.
- [5] **Ankit Singh Rawat**, Arya Mazumdar, and Sriram Vishwanath. On cooperative local repair in distributed storage. In *Proceedings of the 48th Annual Conference on Information Sciences and Systems (CISS)*, pages 1–5, March 2014. Available at IEEE Xplore.
- [6] **Ankit Singh Rawat**, Dimitris S. Papailiopoulos, and Alexandros G. Dimakis. Availability and locality in distributed storage. In *Proceedings of IEEE Global Conference on Signal and Information Processing (GlobalSIP)*, pages 923–928, December 2013. Available at IEEE Xplore.
- [7] **Ankit Singh Rawat**, Natalia Silberstein, Onur Ozan Koyluoglu, and Sriram Vishwanath. Optimal locally repairable codes with local minimum storage regeneration via rank-metric codes. In *2013 Information Theory and Applications Workshop (ITA)*, pages 1–8, February 2013. Available at IEEE Xplore.

Selected Invited Talks

- June 2018 High-dimensional Inference for Non-linear Models,
Google, New York City, NY.
- June 2018 Secure Distributed Storage and its Connections to Communication-efficient Secret Sharing,
SIAM Conference on Discrete Mathematics, Denver, CO.
- April 2018 MDS Codes with Small Sub-packetization and Near-optimal Repair Bandwidth,
Workshop on Coding and Information Theory, CMSA, Harvard University, Cambridge, MA.
- March 2018 New Paradigm for Data Storage and Processing in Large-scale Distributed Systems,
Departments of Computer Science and Electrical & Computer Engineering, National University of Singapore, Singapore.
- March 2018 Representation Learning and Signal Recovery in Nonlinear Models,
Dagstuhl Seminar Series on Coding Theory for Inference, Learning, and Optimization, Wadern, Germany.
- October 2017 Faster Data-Processing in Cloud-based Systems,
Signal and Information Processing Seminar Series, Rutgers University, Piscataway, NJ.
- October 2017 Efficient Data Access in Hybrid Cloud Storage,
55th Annual Allerton Conf. on Communication, Control, and Computing (Allerton), Monticello, IL.
- June 2017 MDS Codes with Small Sub-packetization and Near-optimal Repair Bandwidth,
6th Biennial Canadian Discrete and Algorithmic Mathematics Conf. (CanaDAM), Toronto, Canada.
- March 2017 New Paradigms for Cloud Storage,
Department of Electrical Engineering, University of Notre Dame, South Bend, IN.

- March 2017 New Paradigms for Cloud-based Systems,
Department of Electrical Engineering, Columbia University, New York City, NY.
- November 2016 New Coding Techniques for Distributed Storage Systems,
Department of Electrical and Computer Engineering, Texas A&M University, College Station, TX.
- September 2016 Neural Auto-associative Memory via Sparse Recovery,
LIDS & Stats Tea Talk, Massachusetts Institute of Technology, Boston, MA.
- April 2016 New Coding Techniques for Distributed Storage Systems,
Signals, Information, and Algorithms Lab., EECS, Massachusetts Institute of Technology, Boston, MA.
- April 2016 New Coding Techniques for Distributed Storage Systems,
Theory Seminar, College of Inf. and Computer Sciences, University of Massachusetts, Amherst, MA.
- February 2016 New Coding Techniques for Distributed Storage Systems,
Graduation Day Talk, Information Theory and Applications Workshop (ITA), San Diego, CA.
- October 2015 Codes to Enable Parallel Reads in Distributed Storage Systems,
Theory Lunch Seminar, Computer Science Department, Carnegie Mellon University, Pittsburgh, PA.
- October 2015 Dynamic Control of Video Quality in Adaptive Video Streaming,
BIRS Workshop on Mathematical Coding Theory for Streaming, Banff, Canada.
- December 2013 Update and Repair Efficient Codes for Distributed Storage,
DIMACS Workshop on Algorithms for Green Data Storage, Piscataway, NJ.
- September 2013 Optimal Locally Repairable Codes for Distributed Storage Systems,
Department of Electrical & Computer Engineering, University of Minnesota, Minneapolis, MN.
- August 2013 Optimal Locally Repairable Codes for Distributed Storage Systems,
Mathematics Colloquium & Informal Seminar, Bell Labs, NJ.

Teaching Experience

- Spring 2015 **Teaching Assistant** for Information Theory (EE381K-7), UT Austin.
Instructor: *Prof. Alexandros G. Dimakis.*
- Spring 2013 **Teaching Assistant** for Modeling of Large Wireless Networks (EE381K-5), UT Austin.
Instructor: *Prof. François Baccelli.*

Awards and Achievements

- 2010–2011 Recipient of **Microelectronics and Computer Development (MCD) Fellowship** at UT Austin.
- 2008–2009 Recipient of **Sri Singhasan Singh Scholarship** at IIT Kanpur.
- 2006–2008 Awarded **Academic Excellence Award** for the academic years 2006-07 & 2007-08 at IIT Kanpur.
- 2006–2010 Recipient of **Nita Goyal and Ashish Gupta Scholarship** at IIT Kanpur.
- 2006 Awarded **CBSE Merit Scholarship** for securing all India rank (AIR) **159** in All India Engineering Entrance Examination (AIEEE) 2006.

Selected Coursework

Sparsity, Structure and Algorithms, Convex Optimization: Theory and Applications, Randomized Algorithms, Learning Theory, Algorithms: Techniques and Theory, Coding Theory, Information Theory and Statistics, Theory of Probability I & II, Data Mining: A Mathematical Perspective, Universal Compression Algorithms and Entropy Rate.

Computer Skills

Python, C, C++, Java, MATLAB, TensorFlow.

Professional Service

Technical Program Committee (TPC) Member:

- IEEE International Symposium on Information Theory (ISIT), 2019.
- IEEE International Symposium on Information Theory (ISIT), 2018.
- International Workshop on Distributed Storage Systems and Coding for Big Data (BigData) 2018.
- International Workshop on Distributed Storage Systems and Coding for Big Data (BigData) 2017.

- International Workshop on Distributed Storage Systems and Coding for Big Data (BigData) 2015.

Session Chair:

- Information Theory and Applications Workshop (ITA) 2016.

Reviewer:

- IEEE Transactions on Information Theory.
- IEEE/ACM Transactions on Networking.
- ACM Transactions on Storage.
- IEEE Transactions on Signal Processing.
- IEEE Transactions on Vehicular Technology.
- IEEE Transactions on Communications.
- IEEE Journal of Selected Topics in Signal Processing.
- IEEE Transactions on Computers.
- IEEE Communications Letters.
- EURASIP Journal on Wireless Communications and Networking.
- IEEE Transactions on Network Science and Engineering.
- IEEE International Symposium on Information Theory (ISIT), 2011 – 2019.
- International Conference for Learning Representations (ICLR), 2019.
- ACM Symposium on Theory of Computing (STOC), 2019.
- Conference on Neural Information Processing Systems (NIPS), 2016 – 2019.
- International Conference on Machine Learning (ICML), 2018.
- International Conference on Randomization and Computation (RANDOM), 2018.
- IEEE Symposium on Foundations of Computer Science (FOCS), 2017.
- IEEE International Conference on Computer Communications (INFOCOM), 2017, 2018.
- IEEE Information Theory Workshop (ITW), 2014, 2015, 2017.
- IEEE Vehicular Technology Conference (VTC), 2014.
- IEEE International Symposium on Personal, Indoor and Mobile Radio Comm. (PIMRC), 2013.
- IEEE Wireless Communications and Networking Conference (WCNC), 2013.
- IEEE International Conference on Communications (ICC), 2012.
- IEEE International Symposium on Information Theory and Its Applications (ISITA), 2012.
- IEEE International Conference on Cognitive Radio Oriented Wireless Networks (CROWNCOM), 2011.
- IEEE Global Communications Conference (GLOBECOM), 2011.
- IEEE Symposium on Computers and Communications started (ISCC), 2011.
- International Conference on Signal Processing and Communications (SPCOM), 2010.