- Adamczak, R. 2008. A tail inequality for suprema of unbounded empirical processes with applications to Markov chains. *Electronic Journal of Probability*, **34**, 1000–1034.
- Adamczak, R., Litvak, A. E., Pajor, A., and Tomczak-Jaegermann, N. 2010. Quantitative estimations of the convergence of the empirical covariance matrix in log-concave ensembles. *Journal of the American Mathematical Society*, 23, 535–561.
- Agarwal, A., Negahban, S., and Wainwright, M. J. 2012. Noisy matrix decomposition via convex relaxation: Optimal rates in high dimensions. *Annals of Statistics*, **40**(2), 1171–1197.
- Ahlswede, R., and Winter, A. 2002. Strong converse for identification via quantum channels. *IEEE Transactions on Information Theory*, **48**(3), 569–579.
- Aizerman, M. A., Braverman, E. M., and Rozonoer, L. I. 1964. Theoretical foundations of the potential function method in pattern recognition learning. *Automation and Remote Control*, 25, 821–837.
- Akcakaya, M., and Tarokh, V. 2010. Shannon theoretic limits on noisy compressive sampling. *IEEE Transactions on Information Theory*, **56**(1), 492–504.
- Alexander, K. S. 1987. Rates of growth and sample moduli for weighted empirical processes indexed by sets. Probability Theory and Related Fields, 75, 379–423.
- Alliney, S., and Ruzinsky, S. A. 1994. An algorithm for the minimization of mixed ℓ_1 and ℓ_2 norms with application to Bayesian estimation. *IEEE Transactions on Signal Processing*, **42**(3), 618–627.
- Amini, A. A., and Wainwright, M. J. 2009. High-dimensional analysis of semdefinite relaxations for sparse principal component analysis. *Annals of Statistics*, **5B**, 2877–2921.
- Anandkumar, A., Tan, V. Y. F., Huang, F., and Willsky, A. S. 2012. High-dimensional structure learning of Ising models: Local separation criterion. *Annals of Statistics*, **40**(3), 1346–1375.
- Anderson, T. W. 1984. An Introduction to Multivariate Statistical Analysis. Wiley Series in Probability and Mathematical Statistics. New York, NY: Wiley.
- Ando, R. K., and Zhang, T. 2005. A framework for learning predictive structures from multiple tasks and unlabeled data. *Journal of Machine Learning Research*, **6**(December), 1817–1853.
- Aronszajn, N. 1950. Theory of reproducing kernels. Transactions of the American Mathematical Society, 68, 337–404.
- Assouad, P. 1983. Deux remarques sur l'estimation. Comptes Rendus de l'Académie des Sciences, Paris, 296, 1021–1024.
- Azuma, K. 1967. Weighted sums of certain dependent random variables. *Tohoku Mathematical Journal*, 19, 357–367.
- Bach, F., Jenatton, R., Mairal, J., and Obozinski, G. 2012. Optimization with sparsity-inducing penalties. *Foundations and Trends in Machine Learning*, **4**(1), 1–106.
- Bahadur, R. R., and Rao, R. R. 1960. On deviations of the sample mean. *Annals of Mathematical Statistics*, **31**, 1015–1027.
- Bai, Z., and Silverstein, J. W. 2010. Spectral Analysis of Large Dimensional Random Matrices. New York, NY: Springer. Second edition.
- Baik, J., and Silverstein, J. W. 2006. Eigenvalues of large sample covariance matrices of spiked populations models. *Journal of Multivariate Analysis*, 97(6), 1382–1408.
- Balabdaoui, F., Rufibach, K., and Wellner, J. A. 2009. Limit distribution theory for maximum likelihood estimation of a log-concave density. *Annals of Statistics*, 62(3), 1299–1331.

- Ball, K. 1997. An elementary introduction to modern convex geometry. Pages 1–55 of: *Flavors of Geometry*. MSRI Publications, vol. 31. Cambridge, UK: Cambridge University Press.
- Banerjee, O., El Ghaoui, L., and d'Aspremont, A. 2008. Model selection through sparse maximum likelihood estimation for multivariate Gaussian or binary data. *Journal of Machine Learning Research*, **9**(March), 485–516.
- Baraniuk, R. G., Cevher, V., Duarte, M. F., and Hegde, C. 2010. Model-based compressive sensing. *IEEE Transactions on Information Theory*, **56**(4), 1982–2001.
- Barndorff-Nielson, O. E. 1978. Information and Exponential Families. Chichester, UK: Wiley.
- Bartlett, P. L., and Mendelson, S. 2002. Gaussian and Rademacher complexities: Risk bounds and structural results. *Journal of Machine Learning Research*, **3**, 463–482.
- Bartlett, P. L., Bousquet, O., and Mendelson, S. 2005. Local Rademacher complexities. *Annals of Statistics*, **33**(4), 1497–1537.
- Baxter, R. J. 1982. Exactly Solved Models in Statistical Mechanics. New York, NY: Academic Press.
- Bean, D., Bickel, P. J., El Karoui, N., and Yu, B. 2013. Optimal M-estimation in high-dimensional regression. *Proceedings of the National Academy of Sciences of the USA*, **110**(36), 14563–14568.
- Belloni, A., Chernozhukov, V., and Wang, L. 2011. Square-root lasso: pivotal recovery of sparse signals via conic programming. *Biometrika*, **98**(4), 791–806.
- Bennett, G. 1962. Probability inequalities for the sum of independent random variables. *Journal of the American Statistical Association*, **57**(297), 33–45.
- Bento, J., and Montanari, A. 2009 (December). Which graphical models are difficult to learn? In: *Proceedings of the NIPS Conference*.
- Berlinet, A., and Thomas-Agnan, C. 2004. Reproducing Kernel Hilbert Spaces in Probability and Statistics. Norwell, MA: Kluwer Academic.
- Bernstein, S. N. 1937. On certain modifications of Chebyshev's inequality. *Doklady Akademii Nauk SSSR*, **16**(6), 275–277.
- Berthet, Q., and Rigollet, P. 2013 (June). Computational lower bounds for sparse PCA. In: *Conference on Computational Learning Theory*.
- Bertsekas, D. P. 2003. Convex Analysis and Optimization. Boston, MA: Athena Scientific.
- Besag, J. 1974. Spatial interaction and the statistical analysis of lattice systems. *Journal of the Royal Statistical Society, Series B*, **36**, 192–236.
- Besag, J. 1975. Statistical analysis of non-lattice data. The Statistician, 24(3), 179–195.
- Besag, J. 1977. Efficiency of pseudolikelihood estimation for simple Gaussian fields. *Biometrika*, **64**(3), 616–618.
- Bethe, H. A. 1935. Statistics theory of superlattices. *Proceedings of the Royal Society of London, Series A*, **150**(871), 552–575.
- Bhatia, R. 1997. Matrix Analysis. Graduate Texts in Mathematics. New York, NY: Springer.
- Bickel, P. J., and Doksum, K. A. 2015. *Mathematical Statistics: Basic Ideas and Selected Topics*. Boca Raton, FL: CRC Press.
- Bickel, P. J., and Levina, E. 2008a. Covariance regularization by thresholding. *Annals of Statistics*, **36**(6), 2577–2604.
- Bickel, P. J., and Levina, E. 2008b. Regularized estimation of large covariance matrices. *Annals of Statistics*, **36**(1), 199–227.
- Bickel, P. J., Ritov, Y., and Tsybakov, A. B. 2009. Simultaneous analysis of lasso and Dantzig selector. *Annals of Statistics*, **37**(4), 1705–1732.
- Birgé, L. 1983. Approximation dans les espaces metriques et theorie de l'estimation. *Z. Wahrsch. verw. Gebiete*, **65**, 181–327.
- Birgé, L. 1987. Estimating a density under order restrictions: Non-asymptotic minimax risk. *Annals of Statistics*, **15**(3), 995–1012.
- Birgé, L. 2005. A new lower bound for multiple hypothesis testing. *IEEE Transactions on Information Theory*, **51**(4), 1611–1614.
- Birgé, L., and Massart, P. 1995. Estimation of integral functionals of a density. *Annals of Statistics*, **23**(1), 11–29.

- Birnbaum, A., Johnstone, I. M., Nadler, B., and Paul, D. 2012. Minimax bounds for sparse PCA with noisy high-dimensional data. *Annals of Statistics*, **41**(3), 1055–1084.
- Bobkov, S. G. 1999. Isoperimetric and analytic inequalities for log-concave probability measures. *Annals of Probability*, **27**(4), 1903–1921.
- Bobkov, S. G., and Götze, F. 1999. Exponential integrability and transportation cost related to logarithmic Sobolev inequalities. *Journal of Functional Analysis*, **163**, 1–28.
- Bobkov, S. G., and Ledoux, M. 2000. From Brunn-Minkowski to Brascamp-Lieb and to logarithmic Sobolev inequalities. *Geometric and Functional Analysis*, **10**, 1028–1052.
- Borgwardt, K., Gretton, A., Rasch, M., Kriegel, H. P., Schölkopf, B., and Smola, A. J. 2006. Integrating structured biological data by kernel maximum mean discrepancy. *Bioinformatics*, **22**(14), 49–57.
- Borwein, J., and Lewis, A. 1999. Convex Analysis. New York, NY: Springer.
- Boser, B. E., Guyon, I. M., and Vapnik, V. N. 1992. A training algorithm for optimal margin classifiers. Pages 144–152 of: *Proceedings of the Conference on Learning Theory (COLT)*. New York, NY: ACM.
- Boucheron, S., Lugosi, G., and Massart, P. 2003. Concentration inequalities using the entropy method. *Annals of Probability*, **31**(3), 1583–1614.
- Boucheron, S., Lugosi, G., and Massart, P. 2013. Concentration inequalities: A nonasymptotic theory of independence. Oxford, UK: Oxford University Press.
- Bourgain, J., Dirksen, S., and Nelson, J. 2015. Toward a unified theory of sparse dimensionality reduction in Euclidean space. *Geometric and Functional Analysis*, **25**(4).
- Bousquet, O. 2002. A Bennett concentration inequality and its application to suprema of empirical processes. *Comptes Rendus de l'Académie des Sciences, Paris, Série I*, **334**, 495–500.
- Bousquet, O. 2003. Concentration inequalities for sub-additive functions using the entropy method. *Stochastic Inequalities and Applications*, **56**, 213–247.
- Boyd, S., and Vandenberghe, L. 2004. Convex optimization. Cambridge, UK: Cambridge University Press. Brascamp, H. J., and Lieb, E. H. 1976. On extensions of the Brunn–Minkowski and Prékopa–Leindler theorems, including inequalities for log concave functions, and with an application to the diffusion equation. Journal of Functional Analysis, 22, 366–389.
- Breiman, L. 1992. Probability. Classics in Applied Mathematics. Philadelphia, PA: S IAM.
- Bresler, G. 2014. Efficiently learning Ising models on arbitrary graphs. Tech. rept. MIT.
- Bresler, G., Mossel, E., and Sly, A. 2013. Reconstruction of Markov Random Fields from samples: Some observations and algorithms. SIAM Journal on Computing, 42(2), 563–578.
- Bronshtein, E. M. 1976. ϵ -entropy of convex sets and functions. *Siberian Mathematical Journal*, **17**, 393–398.
- Brown, L. D. 1986. Fundamentals of statistical exponential families. Hayward, CA: Institute of Mathematical Statistics.
- Brunk, H. D. 1955. Maximum likelihood estimates of monotone parameters. *Annals of Math. Statistics*, **26**, 607–616.
- Brunk, H. D. 1970. Estimation of isotonic regression. Pages 177–197 of: *Nonparametric techniques in statistical inference*. New York, NY: Cambridge University Press.
- Bühlmann, P., and van de Geer, S. 2011. *Statistics for high-dimensional data*. Springer Series in Statistics. Springer.
- Buja, A., Hastie, T. J., and Tibshirani, R. 1989. Linear smoothers and additive models. *Annals of Statistics*, 17(2), 453–510.
- Buldygin, V. V., and Kozachenko, Y. V. 2000. *Metric characterization of random variables and random processes*. Providence, RI: American Mathematical Society.
- Bunea, F., Tsybakov, A. B., and Wegkamp, M. 2007. Sparsity oracle inequalities for the Lasso. *Electronic Journal of Statistics*, 169–194.
- Bunea, F., She, Y., and Wegkamp, M. 2011. Optimal selection of reduced rank estimators of high-dimensional matrices. *Annals of Statistics*, 39(2), 1282–1309.
- Cai, T. T., Zhang, C. H., and Zhou, H. H. 2010. Optimal rates of convergence for covariance matrix estimation. *Annals of Statistics*, **38**(4), 2118–2144.
- Cai, T. T., Liu, W., and Luo, X. 2011. A constrained ℓ₁-minimization approach to sparse precision matrix estimation. *Journal of the American Statistical Association*, **106**, 594–607.

- Cai, T. T., Liang, T., and Rakhlin, A. 2015. Computational and statistical boundaries for submatrix localization in a large noisy matrix. Tech. rept. Univ. Penn.
- Candès, E. J., and Plan, Y. 2010. Matrix completion with noise. Proceedings of the IEEE, 98(6), 925-936.
- Candès, E. J., and Recht, B. 2009. Exact matrix completion via convex optimization. Foundations of Computational Mathematics, 9(6), 717–772.
- Candès, E. J., and Tao, T. 2005. Decoding by linear programming. *IEEE Transactions on Information Theory*, 51(12), 4203–4215.
- Candès, E. J., and Tao, T. 2007. The Dantzig selector: statistical estimation when p is much larger than n. *Annals of Statistics*, **35**(6), 2313–2351.
- Candès, E. J., Li, X., Ma, Y., and Wright, J. 2011. Robust principal component analysis? *Journal of the ACM*, **58**(3), 11 (37pp).
- Candès, E. J., Strohmer, T., and Voroninski, V. 2013. PhaseLift: exact and stable signal recovery from magnitude measurements via convex programming. *Communications on Pure and Applied Mathematics*, 66(8), 1241–1274.
- Cantelli, F. P. 1933. Sulla determinazione empirica della legge di probabilita. Giornale dell'Istituto Italiano degli Attuari, 4, 421–424.
- Carl, B., and Pajor, A. 1988. Gelfand numbers of operators with values in a Hilbert space. *Inventiones Mathematicae*, 94, 479–504.
- Carl, B., and Stephani, I. 1990. Entropy, Compactness and the Approximation of Operators. Cambridge Tracts in Mathematics. Cambridge, UK: Cambridge University Press.
- Carlen, E. 2009. Trace inequalities and quantum entropy: an introductory course. In: *Entropy and the Quantum*. Providence, RI: American Mathematical Society.
- Carroll, R. J., Ruppert, D., and Stefanski, L. A. 1995. Measurement Error in Nonlinear Models. Boca Raton, FL: Chapman & Hall/CRC.
- Chai, A., Moscoso, M., and Papanicolaou, G. 2011. Array imaging using intensity-only measurements. *Inverse Problems*, **27**(1), 1—15.
- Chandrasekaran, V., Sanghavi, S., Parrilo, P. A., and Willsky, A. S. 2011. Rank-Sparsity Incoherence for Matrix Decomposition. SIAM Journal on Optimization, 21, 572–596.
- Chandrasekaran, V., Recht, B., Parrilo, P. A., and Willsky, A. S. 2012a. The convex geometry of linear inverse problems. *Foundations of Computational Mathematics*, **12**(6), 805–849.
- Chandrasekaran, V., Parrilo, P. A., and Willsky, A. S. 2012b. Latent variable graphical model selection via convex optimization. *Annals of Statistics*, **40**(4), 1935–1967.
- Chatterjee, S. 2005 (October). An error bound in the Sudakov-Fernique inequality. Tech. rept. UC Berkeley. arXiv:math.PR/0510424.
- Chatterjee, S. 2007. Stein's method for concentration inequalities. *Probability Theory and Related Fields*, **138**(1–2), 305–321.
- Chatterjee, S., Guntuboyina, A., and Sen, B. 2015. On risk bounds in isotonic and other shape restricted regression problems. *Annals of Statistics*, **43**(4), 1774–1800.
- Chen, S., Donoho, D. L., and Saunders, M. A. 1998. Atomic decomposition by basis pursuit. *SIAM J. Sci. Computing*, **20**(1), 33–61.
- Chernoff, H. 1952. A measure of asymptotic efficiency for tests of a hypothesis based on a sum of observations. *Annals of Mathematical Statistics*, **23**, 493–507.
- Chernozhukov, V., Chetverikov, D., and Kato, K. 2013. Comparison and anti-concentration bounds for maxima of Gaussian random vectors. Tech. rept. MIT.
- Chung, F.R.K. 1991. Spectral Graph Theory. Providence, RI: American Mathematical Society.
- Clifford, P. 1990. Markov random fields in statistics. In: Grimmett, G.R., and Welsh, D. J. A. (eds), *Disorder in physical systems*. Oxford Science Publications.
- Cohen, A., Dahmen, W., and DeVore, R. A. 2008. Compressed sensing and best k-term approximation. *J. of. American Mathematical Society*, **22**(1), 211–231.
- Cormode, G. 2012. Synopses for massive data: Samples, histograms, wavelets and sketches. *Foundations and Trends in Databases*, **4**(2), 1–294.
- Cover, T.M., and Thomas, J.A. 1991. Elements of Information Theory. New York, NY: Wiley.

- Cule, M., Samworth, R. J., and Stewart, M. 2010. Maximum likelihood estimation of a multi-dimensional log-concave density. J. R. Stat. Soc. B, 62, 545–607.
- Dalalyan, A. S., Hebiri, M., and Lederer, J. 2014. *On the prediction performance of the Lasso*. Tech. rept. ENSAE. arxiv:1402,1700, to appear in Bernoulli.
- d'Aspremont, A., El Ghaoui, L., Jordan, M. I., and Lanckriet, G. R. 2007. A direct formulation for sparse PCA using semidefinite programming. *SIAM Review*, **49**(3), 434–448.
- d'Aspremont, A., Banerjee, O., and El Ghaoui, L. 2008. First order methods for sparse covariance selection. *SIAM Journal on Matrix Analysis and Its Applications*, **30**(1), 55–66.
- Davidson, K. R., and Szarek, S. J. 2001. Local operator theory, random matrices, and Banach spaces. Pages 317–336 of: *Handbook of Banach Spaces*, vol. 1. Amsterdam, NL: Elsevier.
- Dawid, A. P. 2007. The geometry of proper scoring rules. *Annals of the Institute of Statistical Mathematics*, **59**, 77–93.
- de La Pena, V., and Giné, E. 1999. *Decoupling: From dependence to independence*. New York, NY: Springer.
- Dembo, A. 1997. Information inequalities and concentration of measure. *Annals of Probability*, **25**(2), 927–939.
- Dembo, A., and Zeitouni, O. 1996. Transportation approach to some concentration inequalities in product spaces. *Electronic Communications in Probability*, **1**, 83–90.
- DeVore, R. A., and Lorentz, G. G. 1993. Constructive Approximation. New York, NY: Springer.
- Devroye, L., and Györfi, L. 1986. Nonparametric density estimation: the L_1 view. New York, NY: Wiley.
- Donoho, D. L. 2006a. For most large underdetermined systems of linear equations, the minimal ℓ_1 -norm near-solution approximates the sparsest near-solution. *Communications on Pure and Applied Mathematics*, **59**(7), 907–934.
- Donoho, D. L. 2006b. For most large underdetermined systems of linear equations, the minimal ℓ_1 -norm solution is also the sparsest solution. *Communications on Pure and Applied Mathematics*, **59**(6), 797–829.
- Donoho, D. L., and Huo, X. 2001. Uncertainty principles and ideal atomic decomposition. *IEEE Transactions on Information Theory*, 47(7), 2845–2862.
- Donoho, D. L., and Johnstone, I. M. 1994. Minimax risk over ℓ_p -balls for ℓ_q -error. *Probability Theory and Related Fields*, **99**, 277–303.
- Donoho, D. L., and Montanari, A. 2013. High dimensional robust M-estimation: asymptotic variance via approximate message passing. Tech. rept. Stanford University. Posted as arxiv:1310.7320.
- Donoho, D. L., and Stark, P. B. 1989. Uncertainty principles and signal recovery. SIAM Journal of Applied Mathematics, 49, 906–931.
- Donoho, D. L., and Tanner, J. M. 2008. Counting faces of randomly-projected polytopes when the projection radically lowers dimension. *Journal of the American Mathematical Society*, July.
- Duchi, J. C., Wainwright, M. J., and Jordan, M. I. 2013. Local privacy and minimax bounds: Sharp rates for probability estimation. Tech. rept. UC Berkeley.
- Duchi, J. C., Wainwright, M. J., and Jordan, M. I. 2014. Privacy-aware learning. *Journal of the ACM*, 61(6), Article 37.
- Dudley, R. M. 1967. The sizes of compact subsets of Hilbert spaces and continuity of Gaussian processes. *Journal of Functional Analysis*, **1**, 290–330.
- Dudley, R. M. 1978. Central limit theorems for empirical measures. Annals of Probability, 6, 899–929.
- Dudley, R. M. 1999. Uniform central limit theorems. Cambridge, UK: Cambridge University Press.
- Dümbgen, L., Samworth, R. J., and Schuhmacher, D. 2011. Approximation by log-concave distributions with applications to regression. *Annals of Statistics*, **39**(2), 702–730.
- Durrett, R. 2010. Probability: Theory and examples. Cambridge, UK: Cambridge University Press.
- Dvoretsky, A., Kiefer, J., and Wolfowitz, J. 1956. Asymptotic minimax character of the sample distribution function and of the classical multinomial estimator. *Annals of Mathematical Statistics*, 27, 642–669.
- Eggermont, P. P. B., and LaRiccia, V. N. 2001. *Maximum penalized likelihood estimation: V. I Density estimation.* Springer Series in Statistics, vol. 1. New York, NY: Springer.
- Eggermont, P. P. B., and LaRiccia, V. N. 2007. *Maximum penalized likelihood estimation: V. II Regression*. Springer Series in Statistics, vol. 2. New York, NY: Springer.

- El Karoui, N. 2008. Operator norm consistent estimation of large-dimensional sparse covariance matrices. *Annals of Statistics*, **36**(6), 2717–2756.
- El Karoui, N. 2013. Asymptotic behavior of unregularized and ridge-regularized high-dimensional robust regression estimators: rigorous results. Tech. rept. UC Berkeley. Posted as arxiv:1311.2445.
- El Karoui, N., Bean, D., Bickel, P. J., and Yu, B. 2013. On robust regression with high-dimensional predictors. *Proceedings of the National Academy of Sciences of the USA*, **110**(36), 14557–14562.
- Elad, M., and Bruckstein, A. M. 2002. A generalized uncertainty principle and sparse representation in pairs of bases. *IEEE Transactions on Information Theory*, **48**(9), 2558–2567.
- Fan, J., and Li, R. 2001. Variable selection via non-concave penalized likelihood and its oracle properties. *Journal of the American Statistical Association*, **96**(456), 1348–1360.
- Fan, J., and Lv, J. 2011. Nonconcave penalized likelihood with NP-dimensionality. IEEE Transactions on Information Theory, 57(8), 5467–5484.
- Fan, J., Liao, Y., and Mincheva, M. 2013. Large covariance estimation by thresholding principal orthogonal components. *Journal of the Royal Statistical Society B*, **75**, 603–680.
- Fan, J., Xue, L., and Zou, H. 2014. Strong oracle optimality of folded concave penalized estimation. Annals of Statistics, 42(3), 819–849.
- Fazel, M. 2002. *Matrix Rank Minimization with Applications*. Ph.D. thesis, Stanford. Available online: http://faculty.washington.edu/mfazel/thesis-final.pdf.
- Fernique, X. M. 1974. Des resultats nouveaux sur les processus Gaussiens. *Comptes Rendus de l'Académie des Sciences, Paris*, 278, A363–A365.
- Feuer, A., and Nemirovski, A. 2003. On sparse representation in pairs of bases. *IEEE Transactions on Information Theory*, **49**(6), 1579–1581.
- Fienup, J. R. 1982. Phase retrieval algorithms: a comparison. Applied Optics, 21(15), 2758–2769.
- Fienup, J. R., and Wackerman, C. C. 1986. Phase-retrieval stagnation problems and solutions. *Journal of the Optical Society of America A*, **3**, 1897–1907.
- Fletcher, A. K., Rangan, S., and Goyal, V. K. 2009. Necessary and Sufficient Conditions for Sparsity Pattern Recovery. *IEEE Transactions on Information Theory*, **55**(12), 5758–5772.
- Foygel, R., and Srebro, N. 2011. Fast rate and optimistic rate for ℓ_1 -regularized regression. Tech. rept. Toyoto Technological Institute. arXiv:1108.037v1.
- Friedman, J. H., and Stuetzle, W. 1981. Projection pursuit regression. *Journal of the American Statistical Association*, **76**(376), 817–823.
- Friedman, J. H., and Tukey, J. W. 1994. A projection pursuit algorithm for exploratory data analysis. *IEEE Transactions on Computers*, **C-23**, 881–889.
- Friedman, J. H., Hastie, T. J., and Tibshirani, R. 2007. Sparse inverse covariance estimation with the graphical Lasso. *Biostatistics*.
- Fuchs, J. J. 2004. Recovery of exact sparse representations in the presence of noise. Pages 533–536 of: *ICASSP*, vol. 2.
- Gallager, R. G. 1968. Information theory and reliable communication. New York, NY: Wiley.
- Gao, C., Ma, Z., and Zhou, H. H. 2015. *Sparse CCA: Adaptive estimation and computational barriers*. Tech. rept. Yale University.
- Gardner, R. J. 2002. The Brunn-Minkowski inequality. Bulletin of the American Mathematical Society, 39, 355–405.
- Geman, S. 1980. A limit theorem for the norm of random matrices. Annals of Probability, 8(2), 252–261.
- Geman, S., and Geman, D. 1984. Stochastic Relaxation, Gibbs Distributions, and the Bayesian Restoration of Images. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, **6**, 721–741.
- Geman, S., and Hwang, C. R. 1982. Nonparametric maximum likelihood estimation by the method of sieves. *Annals of Statistics*, **10**(2), 401–414.
- Glivenko, V. 1933. Sulla determinazione empirica della legge di probabilita. *Giornale dell'Istituto Italiano degli Attuari*, **4**, 92–99.
- Gneiting, T., and Raftery, A. E. 2007. Strictly proper scoring rules, prediction, and estimation. *Journal of the American Statistical Association*, **102**(477), 359–378.
- Goldberg, K., Roeder, T., Gupta, D., and Perkins, C. 2001. Eigentaste: A constant time collaborative filtering algorithm. *Information Retrieval*, **4**(2), 133–151.

- Good, I. J., and Gaskins, R. A. 1971. Nonparametric roughness penalties for probability densities. Biometrika, 58, 255–277.
- Gordon, Y. 1985. Some inequalities for Gaussian processes and applications. *Israel Journal of Mathematics*, 50, 265–289.
- Gordon, Y. 1986. On Milman's inequality and random subspaces which escape through a mesh in \mathbb{R}^n . Pages 84–106 of: *Geometric aspects of functional analysis*. Lecture Notes in Mathematics, vol. 1317. Springer-Verlag.
- Gordon, Y. 1987. Elliptically contoured distributions. *Probability Theory and Related Fields*, **76**, 429–438.
- Götze, F., and Tikhomirov, A. 2004. Rate of convergence in probability to the Marčenko-Pastur law. *Bernoulli*, **10**(3), 503–548.
- Grechberg, R. W., and Saxton, W. O. 1972. A practical algorithm for the determination of phase from image and diffraction plane intensities. *Optik*, 35, 237–246.
- Greenshtein, E., and Ritov, Y. 2004. Persistency in high dimensional linear predictor-selection and the virtue of over-parametrization. *Bernoulli*, 10, 971–988.
- Gretton, A., Borgwardt, K., Rasch, M., Schölkopf, B., and Smola, A. 2012. A kernel two-sample test. *Journal of Machine Learning Research*, **13**, 723–773.
- Griffin, D., and Lim, J. 1984. Signal estimation from modified short-time Fourier transforms. *IEEE Transactions on Acoustics, Speech, and Signal Processing*, **32**(2), 236–243.
- Grimmett, G. R. 1973. A theorem about random fields. Bulletin of the London Mathematical Society, 5, 81–84.
- Gross, D. 2011. Recovering low-rank matrices from few coefficients in any basis. *IEEE Transactions on Information Theory*, 57(3), 1548–1566.
- Gross, L. 1975. Logarithmic Sobolev inequalities. American Journal Math., 97, 1061–1083.
- Gu, C. 2002. Smoothing spline ANOVA models. Springer Series in Statistics. New York, NY: Springer.
- Guédon, O., and Litvak, A. E. 2000. Euclidean projections of a p-convex body. Pages 95–108 of: Geometric aspects of functional analysis. Springer.
- Guntuboyina, A. 2011. Lower bounds for the minimax risk using *f*-divergences and applications. *IEEE Transactions on Information Theory*, **57**(4), 2386–2399.
- Guntuboyina, A., and Sen, B. 2013. Covering numbers for convex functions. *IEEE Transactions on Information Theory*, 59, 1957–1965.
- Gyorfi, L., Kohler, M., Krzyzak, A., and Walk, H. 2002. A Distribution-Free Theory of Nonparametric Regression. Springer Series in Statistics. Springer.
- Hammersley, J. M., and Clifford, P. 1971. Markov fields on finite graphs and lattices. Unpublished.
- Hanson, D. L., and Pledger, G. 1976. Consistency in concave regression. Annals of Statistics, 4, 1038–1050.
- Hanson, D. L., and Wright, F. T. 1971. A bound on tail probabilities for quadratic forms in independent random variables. *Annals of Mathematical Statistics*, **42**(3), 1079–1083.
- Härdle, W. K., and Stoker, T. M. 1989. Investigating smooth multiple regression by the method of average derivatives. *Journal of the American Statistical Association*, 84, 986–995.
- Härdle, W. K., Hall, P., and Ichimura, H. 1993. Optimal smoothing in single-index models. Annals of Statistics, 21, 157–178.
- Härdle, W. K., Müller, M., Sperlich, S., and Werwatz, A. 2004. *Nonparametric and semiparametric models*. Springer Series in Statistics. New York, NY: Springer.
- Harper, L. H. 1966. Optimal numberings and isoperimetric problems on graphs. *Journal of Combinatorial Theory*, 1, 385–393.
- Harrison, R. W. 1993. Phase problem in crystallography. *Journal of the Optical Society of America A*, 10(5), 1046–1055.
- Hasminskii, R. Z. 1978. A lower bound on the risks of nonparametric estimates of densities in the uniform metric. Theory of Probability and Its Applications, 23, 794–798.
- Hasminskii, R. Z., and Ibragimov, I. 1981. *Statistical estimation: Asymptotic theory*. New York, NY: Springer.
- Hasminskii, R. Z., and Ibragimov, I. 1990. On density estimation in the view of Kolmogorov's ideas in approximation theory. *Annals of Statistics*, 18(3), 999–1010.
- Hastie, T. J., and Tibshirani, R. 1986. Generalized additive models. Statistical Science, 1(3), 297–310.

- Hastie, T. J., and Tibshirani, R. 1990. Generalized Additive Models. Boca Raton, FL: Chapman & Hall/CRC.
- Hildreth, C. 1954. Point estimates of ordinates of concave functions. *Journal of the American Statistical Association*, 49, 598–619.
- Hiriart-Urruty, J., and Lemaréchal, C. 1993. Convex Analysis and Minimization Algorithms. Vol. 1. New York, NY: Springer.
- Hoeffding, W. 1963. Probability inequalities for sums of bounded random variables. *Journal of the American Statistical Association*, **58**, 13–30.
- Hoerl, A. E., and Kennard, R. W. 1970. Ridge Regression: Biased Estimation for Nonorthogonal Problems. *Technometrics*, **12**, 55–67.
- Hölfing, H., and Tibshirani, R. 2009. Estimation of sparse binary pairwise Markov networks using pseudo-likelihoods. *Journal of Machine Learning Research*, **19**, 883–906.
- Holley, R., and Stroock, D. 1987. Log Sobolev inequalities and stochastic Ising models. *Journal of Statistical Physics*, 46(5), 1159–1194.
- Horn, R. A., and Johnson, C. R. 1985. Matrix Analysis. Cambridge, UK: Cambridge University Press.
- Horn, R. A., and Johnson, C. R. 1991. Topics in Matrix Analysis. Cambridge, UK: Cambridge University Press.
- Hristache, M., Juditsky, A., and Spokoiny, V. 2001. Direct estimation of the index coefficient in a single index model. Annals of Statistics, 29, 595–623.
- Hsu, D., Kakade, S. M., and Zhang, T. 2012a. Tail inequalities for sums of random matrices that depend on the intrinsic dimension. *Electronic Communications in Probability*, **17**(14), 1–13.
- Hsu, D., Kakade, S. M., and Zhang, T. 2012b. A tail inequality for quadratic forms of sub-Gaussian random vectors. *Electronic Journal of Probability*, **52**, 1–6.
- Huang, J., and Zhang, T. 2010. The benefit of group sparsity. Annals of Statistics, 38(4), 1978–2004.
- Huang, J., Ma, S., and Zhang, C. H. 2008. Adaptive Lasso for sparse high-dimensional regression models. *Statistica Sinica*, **18**, 1603–1618.
- Huber, P. J. 1973. Robust regression: Asymptotics, conjectures and Monte Carlo. Annals of Statistics, 1(5), 799–821.
- Huber, P. J. 1985. Projection pursuit. Annals of Statistics, 13(2), 435–475.
- Ichimura, H. 1993. Semiparametric least squares (SLS) and weighted (SLS) estimation of single index models. *Journal of Econometrics*, 58, 71–120.
- Ising, E. 1925. Beitrag zur Theorie der Ferromagnetismus. Zeitschrift für Physik, 31(1), 253–258.
- Iturria, S. J., Carroll, R. J., and Firth, D. 1999. Polynomial Regression and Estimating Functions in the Presence of Multiplicative Measurement Error. *Journal of the Royal Statistical Society B*, **61**, 547–561.
- Izenman, A. J. 1975. Reduced-rank regression for the multivariate linear model. *Journal of Multivariate Analysis*, 5, 248–264.
- Izenman, A. J. 2008. Modern multivariate statistical techniques: Regression, classification and manifold learning. New York, NY: Springer.
- Jacob, L., Obozinski, G., and Vert, J. P. 2009. Group Lasso with overlap and graph Lasso. Pages 433–440 of: *International Conference on Machine Learning (ICML)*.
- Jalali, A., Ravikumar, P., Sanghavi, S., and Ruan, C. 2010. A Dirty Model for Multi-task Learning. Pages 964–972 of: *Advances in Neural Information Processing Systems 23*.
- Johnson, W. B., and Lindenstrauss, J. 1984. Extensions of Lipschitz mappings into a Hilbert space. Contemporary Mathematics, 26, 189–206.
- Johnstone, I. M. 2001. On the distribution of the largest eigenvalue in principal components analysis. *Annals of Statistics*, **29**(2), 295–327.
- Johnstone, I. M. 2015. Gaussian estimation: Sequence and wavelet models. New York, NY: Springer.
- Johnstone, I. M., and Lu, A. Y. 2009. On consistency and sparsity for principal components analysis in high dimensions. *Journal of the American Statistical Association*, **104**, 682–693.
- Jolliffe, I. T. 2004. Principal Component Analysis. New York, NY: Springer.
- Jolliffe, I. T., Trendafilov, N. T., and Uddin, M. 2003. A modified principal component technique based on the LASSO. *Journal of Computational and Graphical Statistics*, 12, 531–547.

- Juditsky, A., and Nemirovski, A. 2000. Functional aggregation for nonparametric regression. Annals of Statistics, 28, 681–712.
- Kahane, J. P. 1986. Une inequalité du type de Slepian et Gordon sur les processus Gaussiens. *Israel Journal of Mathematics*, **55**, 109–110.
- Kalisch, M., and Bühlmann, P. 2007. Estimating high-dimensional directed acyclic graphs with the PC algorithm. *Journal of Machine Learning Research*, 8, 613–636.
- Kane, D. M., and Nelson, J. 2014. Sparser Johnson-Lindenstrauss transforms. Journal of the ACM, 61(1).
- Kantorovich, L. V., and Rubinstein, G. S. 1958. On the space of completely additive functions. Vestnik Leningrad Univ. Ser. Math. Mekh. i. Astron, 13(7), 52–59. In Russian.
- Keener, R. W. 2010. Theoretical Statistics: Topics for a Core Class. New York, NY: Springer.
- Keshavan, R. H., Montanari, A., and Oh, S. 2010a. Matrix Completion from Few Entries. IEEE Transactions on Information Theory, 56(6), 2980–2998.
- Keshavan, R. H., Montanari, A., and Oh, S. 2010b. Matrix Completion from Noisy Entries. *Journal of Machine Learning Research*, 11(July), 2057–2078.
- Kim, Y., Kim, J., and Kim, Y. 2006. Blockwise sparse regression. Statistica Sinica, 16(2).
- Kimeldorf, G., and Wahba, G. 1971. Some results on Tchebycheffian spline functions. *Journal of Mathematical Analysis and Applications*, **33**, 82–95.
- Klein, T., and Rio, E. 2005. Concentration around the mean for maxima of empirical processes. Annals of Probability, 33(3), 1060–1077.
- Koller, D., and Friedman, N. 2010. Graphical Models. New York, NY: MIT Press.
- Kolmogorov, A. N. 1956. Asymptotic characterization of some completely bounded metric spaces. *Doklady Akademii Nauk SSSR*, 108, 585–589.
- Kolmogorov, A. N. 1958. Linear dimension of topological vector spaces. *Doklady Akademii Nauk SSSR*, 120, 239–241–589.
- Kolmogorov, A. N., and Tikhomirov, B. 1959. ε-entropy and ε-capacity of sets in functional spaces. *Uspekhi Mat. Nauk.*, **86**, 3–86. Appeared in English as *1961. American Mathematical Society Translations*, **17**, 277–364.
- Koltchinskii, V. 2001. Rademacher penalities and structural risk minimization. *IEEE Transactions on Information Theory*, 47(5), 1902–1914.
- Koltchinskii, V. 2006. Local Rademacher complexities and oracle inequalities in risk minimization. Annals of Statistics, 34(6), 2593–2656.
- Koltchinskii, V., and Panchenko, D. 2000. Rademacher processes and bounding the risk of function learning. Pages 443–459 of: *High-dimensional probability II*. Springer.
- Koltchinskii, V., and Yuan, M. 2010. Sparsity in multiple kernel learning. Annals of Statistics, 38, 3660–3695.
- Koltchinskii, V., Lounici, K., and Tsybakov, A. B. 2011. Nuclear-norm penalization and optimal rates for noisy low-rank matrix completion. *Annals of Statistics*, 39, 2302–2329.
- Kontorovich, L. A., and Ramanan, K. 2008. Concentration inequalities for dependent random variables via the martingale method. *Annals of Probability*, **36**(6), 2126–2158.
- Kruskal, J. B. 1969. Towards a practical method which helps uncover the structure of a set of multivariate observation by finding the linear transformation which optimizes a new 'index of condensation'. In: Statistical computation. New York, NY: Academic Press.
- Kühn, T. 2001. A lower estimate for entropy numbers. Journal of Approximation Theory, 110, 120–124.
- Kullback, S., and Leibler, R. A. 1951. On information and sufficiency. *Annals of Mathematical Statistics*, **22**(1), 79–86.
- Lam, C., and Fan, J. 2009. Sparsistency and Rates of Convergence in Large Covariance Matrix Estimation. Annals of Statistics, 37, 4254–4278.
- Laurent, M. 2001. Matrix Completion Problems. Pages 221—229 of: The Encyclopedia of Optimization. Kluwer Academic.
- Laurent, M. 2003. A comparison of the Sherali-Adams, Lovász-Schrijver and Lasserre relaxations for 0-1 programming. *Mathematics of Operations Research*, **28**, 470–496.
- Lauritzen, S. L. 1996. *Graphical Models*. Oxford: Oxford University Press.
- Le Cam, L. 1973. Convergence of estimates under dimensionality restrictions. Annals of Statistics, January.

- Ledoux, M. 1996. On Talagrand's deviation inequalities for product measures. *ESAIM: Probability and Statistics*, 1(July), 63–87.
- Ledoux, M. 2001. *The Concentration of Measure Phenomenon*. Mathematical Surveys and Monographs. Providence, RI: American Mathematical Society.
- Ledoux, M., and Talagrand, M. 1991. *Probability in Banach Spaces: Isoperimetry and Processes*. New York, NY: Springer.
- Lee, J. D., Sun, Y., and Taylor, J. 2013. On model selection consistency of M-estimators with geometrically decomposable penalties. Tech. rept. Stanford University. arxiv1305.7477v4.
- Leindler, L. 1972. On a certain converse of Hölder's inequality. *Acta Scientiarum Mathematicarum* (Szeged), 33, 217–223.
- Levy, S., and Fullagar, P. K. 1981. Reconstruction of a sparse spike train from a portion of its spectrum and application to high-resolution deconvolution. *Geophysics*, **46**(9), 1235–1243.
- Lieb, E. H. 1973. Convex trace functions and the Wigner-Yanase-Dyson conjecture. Advances in Mathematics, 11, 267–288.
- Lindley, D. V. 1956. On a measure of the information provided by an experiment. *Annals of Mathematical Statistics*, **27**(4), 986–1005.
- Liu, H., Lafferty, J. D., and Wasserman, L. A. 2009. The nonparanormal: Semiparametric estimation of high-dimensional undirected graphs. *Journal of Machine Learning Research*, **10**, 1–37.
- Liu, H., Han, F., Yuan, M., Lafferty, J. D., and Wasserman, L. A. 2012. High-dimensional semiparametric Gaussian copula graphical models. *Annals of Statistics*, **40**(4), 2293–2326.
- Loh, P., and Wainwright, M. J. 2012. High-dimensional regression with noisy and missing data: Provable guarantees with non-convexity. *Annals of Statistics*, **40**(3), 1637–1664.
- Loh, P., and Wainwright, M. J. 2013. Structure estimation for discrete graphical models: Generalized covariance matrices and their inverses. *Annals of Statistics*, **41**(6), 3022–3049.
- Loh, P., and Wainwright, M. J. 2015. Regularized M-estimators with nonconvexity: Statistical and algorithmic theory for local optima. *Journal of Machine Learning Research*, **16**(April), 559–616.
- Loh, P., and Wainwright, M. J. 2017. Support recovery without incoherence: A case for nonconvex regularization. *Annals of Statistics*, **45**(6), 2455–2482. Appeared as arXiv:1412.5632.
- Lorentz, G. G. 1966. Metric entropy and approximation. Bulletin of the AMS, 72(6), 903–937.
- Lounici, K., Pontil, M., Tsybakov, A. B., and van de Geer, S. 2011. Oracle inequalities and optimal inference under group sparsity. *Annals of Statistics*, **39**(4), 2164–2204.
- Lovász, L., and Schrijver, A. 1991. Cones of matrices and set-functions and 0 1 optimization. *SIAM Journal of Optimization*, **1**, 166–190.
- Ma, Z. 2010. *Contributions to high-dimensional principal component analysis*. Ph.D. thesis, Department of Statistics, Stanford University.
- Ma, Z. 2013. Sparse principal component analysis and iterative thresholding. *Annals of Statistics*, **41**(2), 772–801.
- Ma, Z., and Wu, Y. 2013. Computational barriers in minimax submatrix detection. arXiv preprint arXiv:1309.5914.
- Mackey, L. W., Jordan, M. I., Chen, R. Y., Farrell, B., and Tropp, J. A. 2014. Matrix concentration inequalities via the method of exchangeable pairs. *Annals of Probability*, **42**(3), 906–945.
- Mahoney, M. W. 2011. Randomized algorithms for matrices and data. Foundations and Trends in Machine Learning, 3(2), 123–224.
- Marton, K. 1996a. Bounding *d*-distance by information divergence: a method to prove measure concentration. *Annals of Probability*, **24**, 857–866.
- Marton, K. 1996b. A measure concentration inequality for contracting Markov chains. *Geometric and Functional Analysis*, **6**(3), 556–571.
- Marton, K. 2004. Measure concentration for Euclidean distance in the case of dependent random variables. *Annals of Probability*, **32**(3), 2526–2544.
- Marčenko, V. A., and Pastur, L. A. 1967. Distribution of eigenvalues for some sets of random matrices. *Annals of Probability*, **4**(1), 457–483.
- Massart, P. 1990. The tight constant in the Dvoretzky-Kiefer-Wolfowitz inequality. *Annals of Probability*, **18**, 1269–1283.

- Massart, P. 2000. Some applications of concentration inequalities to statistics. Annales de la Faculté des Sciences de Toulouse, IX, 245–303.
- Maurey, B. 1991. Some deviation inequalities. Geometric and Functional Analysis, 1, 188–197.
- McDiarmid, C. 1989. On the method of bounded differences. Pages 148–188 of: *Surveys in Combinatorics*. London Mathematical Society Lecture Notes, no. 141. Cambridge, UK: Cambridge University Press.
- Mehta, M. L. 1991. Random Matrices. New York, NY: Academic Press.
- Meier, L., van de Geer, S., and Bühlmann, P. 2009. High-dimensional additive modeling. *Annals of Statistics*, **37**, 3779–3821.
- Meinshausen, N. 2008. A note on the lasso for graphical Gaussian model selection. Statistics and Probability Letters, 78(7), 880–884.
- Meinshausen, N., and Bühlmann, P. 2006. High-dimensional graphs and variable selection with the Lasso. *Annals of Statistics*, **34**, 1436–1462.
- Mendelson, S. 2002. Geometric parameters of kernel machines. Pages 29-43 of: Proceedings of COLT.
- Mendelson, S. 2010. Empirical processes with a bounded ψ_1 -diameter. *Geometric and Functional Analysis*, **20**(4), 988–1027.
- Mendelson, S. 2015. Learning without concentration. *Journal of the ACM*, **62**(3), 1–25.
- Mendelson, S., Pajor, A., and Tomczak-Jaegermann, N. 2007. Reconstruction of subgaussian operators. *Geometric and Functional Analysis*, **17**(4), 1248–1282.
- Mézard, M., and Montanari, A. 2008. *Information, Physics and Computation*. New York, NY: Oxford University Press.
- Milman, V., and Schechtman, G. 1986. *Asymptotic Theory of Finite Dimensional Normed Spaces*. Lecture Notes in Mathematics, vol. 1200. New York, NY: Springer.
- Minsker, S. 2011. On some extensions of Bernstein's inequality for self-adjoint operators. Tech. rept. Duke University.
- Mitjagin, B. S. 1961. The approximation dimension and bases in nuclear spaces. *Uspekhi. Mat. Naut.*, **61**(16), 63–132.
- Muirhead, R. J. 2008. Aspects of multivariate statistical theory. Wiley Series in Probability and Mathematical Statistics. New York, NY: Wiley.
- Müller, A. 1997. Integral probability metrics and their generating classes of functions. *Advances in Applied Probability*, **29**(2), 429–443.
- Negahban, S., and Wainwright, M. J. 2011a. Estimation of (near) low-rank matrices with noise and high-dimensional scaling. *Annals of Statistics*, 39(2), 1069–1097.
- Negahban, S., and Wainwright, M. J. 2011b. Simultaneous support recovery in high-dimensional regression: Benefits and perils of $\ell_{1,\infty}$ -regularization. *IEEE Transactions on Information Theory*, **57**(6), 3481–3863.
- Negahban, S., and Wainwright, M. J. 2012. Restricted strong convexity and (weighted) matrix completion: Optimal bounds with noise. *Journal of Machine Learning Research*, **13**(May), 1665–1697.
- Negahban, S., Ravikumar, P., Wainwright, M. J., and Yu, B. 2010 (October). A unified framework for high-dimensional analysis of M-estimators with decomposable regularizers. Tech. rept. UC Berkeley. Arxiv pre-print 1010.2731v1, Version 1.
- Negahban, S., Ravikumar, P., Wainwright, M. J., and Yu, B. 2012. A unified framework for high-dimensional analysis of *M*-estimators with decomposable regularizers. *Statistical Science*, 27(4), 538–557.
- Nemirovski, A. 2000. Topics in non-parametric statistics. In: Bernard, P. (ed), *Ecole d'Été de Probabilities de Saint-Flour XXVIII*. Lecture Notes in Mathematics. Berlin, Germany: Springer.
- Nesterov, Y. 1998. Semidefinite relaxation and nonconvex quadratic optimization. *Optimization methods and software*, **9**(1), 141–160.
- Netrapalli, P., Banerjee, S., Sanghavi, S., and Shakkottai, S. 2010. Greedy learning of Markov network structure. Pages 1295–1302 of: Communication, Control, and Computing (Allerton), 2010 48th Annual Allerton Conference on. IEEE.
- Obozinski, G., Wainwright, M. J., and Jordan, M. I. 2011. Union support recovery in high-dimensional multivariate regression. *Annals of Statistics*, **39**(1), 1–47.
- Oldenburg, D. W., Scheuer, T., and Levy, S. 1983. Recovery of the acoustic impedance from reflection seismograms. *Geophysics*, **48**(10), 1318–1337.

- Oliveira, R. I. 2010. Sums of random Hermitian matrices and an inequality by Rudelson. *Electronic Communications in Probability*, **15**, 203–212.
- Oliveira, R. I. 2013. The lower tail of random quadratic forms, with applications to ordinary least squares and restricted eigenvalue properties. Tech. rept. IMPA, Rio de Janeiro, Brazil.
- Ortega, J. M., and Rheinboldt, W. C. 2000. *Iterative Solution of Nonlinear Equations in Several Variables*. Classics in Applied Mathematics. New York, NY: SIAM.
- Pastur, L. A. 1972. On the spectrum of random matrices. Theoretical and Mathematical Physics, 10, 67–74.
- Paul, D. 2007. Asymptotics of sample eigenstructure for a large-dimensional spiked covariance model. Statistica Sinica, 17, 1617–1642.
- Pearl, J. 1988. Probabilistic Reasoning in Intelligent Systems. San Mateo, CA: Morgan Kaufmann.
- Petrov, V. V. 1995. Limit theorems of probability theory: Sequence of independent random variables. Oxford, UK: Oxford University Press.
- Pilanci, M., and Wainwright, M. J. 2015. Randomized sketches of convex programs with sharp guarantees. *IEEE Transactions on Information Theory*, **9**(61), 5096–5115.
- Pinkus, A. 1985. N-Widths in Approximation Theory. New York: Springer.
- Pisier, G. 1989. *The Volume of Convex Bodies and Banach Space Geometry*. Cambridge Tracts in Mathematics, vol. 94. Cambridge, UK: Cambridge University Press.
- Pollard, D. 1984. Convergence of Stochastic Processes. New York, NY: Springer.
- Portnoy, S. 1984. Asymptotic behavior of M-estimators of p regression parameters when p^2/n is large: I. Consistency. *Annals of Statistics*, **12**(4), 1296–1309.
- Portnoy, S. 1985. Asymptotic behavior of M-estimators of p regression parameters when p^2/n is large: II. Normal approximation. *Annals of Statistics*, **13**(4), 1403–1417.
- Portnoy, S. 1988. Asymptotic behavior of likelhoood methods for exponential families when the number of parameters tends to infinity. *Annals of Statistics*, **16**(1), 356–366.
- Prékopa, A. 1971. Logarithmic concave measures with application to stochastic programming. Acta Scientiarum Mathematicarum (Szeged), 32, 301–315.
- Prékopa, A. 1973. On logarithmic concave measures and functions. *Acta Scientiarum Mathematicarum* (Szeged), **33**, 335–343.
- Rachev, S. T., and Ruschendorf, L. 1998. *Mass Transportation Problems, Volume II, Applications*. New York, NY: Springer.
- Rachev, S. T., Klebanov, L., Stoyanov, S. V., and Fabozzi, F. 2013. *The Method of Distances in the Theory of Probability and Statistics*. New York, NY: Springer.
- Rao, C. R. 1949. On some problems arising out of discrimination with multiple characters. *Sankhya (Indian Journal of Statistics)*, **9**(4), 343–366.
- Raskutti, G., Wainwright, M. J., and Yu, B. 2010. Restricted eigenvalue conditions for correlated Gaussian designs. *Journal of Machine Learning Research*, **11**(August), 2241–2259.
- Raskutti, G., Wainwright, M. J., and Yu, B. 2011. Minimax rates of estimation for high-dimensional linear regression over ℓ_a -balls. *IEEE Transactions on Information Theory*, **57**(10), 6976—6994.
- Raskutti, G., Wainwright, M. J., and Yu, B. 2012. Minimax-optimal rates for sparse additive models over kernel classes via convex programming. *Journal of Machine Learning Research*, 12(March), 389–427.
- Raudys, V., and Young, D. M. 2004. Results in Statistical Discriminant Analysis: A Review of the Former Soviet Union Literature. *Journal of Multivariate Analysis*, **89**(1), 1–35.
- Ravikumar, P., Liu, H., Lafferty, J. D., and Wasserman, L. A. 2009. SpAM: sparse additive models. *Journal of the Royal Statistical Society, Series B*, **71**(5), 1009–1030.
- Ravikumar, P., Wainwright, M. J., and Lafferty, J. D. 2010. High-dimensional Ising model selection using ℓ_1 -regularized logistic regression. *Annals of Statistics*, **38**(3), 1287–1319.
- Ravikumar, P., Wainwright, M. J., Raskutti, G., and Yu, B. 2011. High-dimensional covariance estimation by minimizing ℓ_1 -penalized log-determinant divergence. *Electronic Journal of Statistics*, **5**, 935–980.
- Recht, B. 2011. A Simpler Approach to Matrix Completion. *Journal of Machine Learning Research*, **12**, 3413–3430.
- Recht, B., Xu, W., and Hassibi, B. 2009. *Null space conditions and thresholds for rank minimization*. Tech. rept. U. Madison. Available at http://pages.cs.wisc.edu/ brecht/papers/10.RecXuHas.Thresholds.pdf.

- Recht, B., Fazel, M., and Parrilo, P. A. 2010. Guaranteed Minimum-Rank Solutions of Linear Matrix Equations via Nuclear Norm Minimization. *SIAM Review*, **52**(3), 471–501.
- Reeves, G., and Gastpar, M. 2008 (July). Sampling Bounds for Sparse Support Recovery in the Presence of Noise. In: *International Symposium on Information Theory*.
- Reinsel, G. C., and Velu, R. P. 1998. Multivariate Reduced-Rank Regression. Lecture Notes in Statistics, vol. 136. New York, NY: Springer.
- Ren, Z., and Zhou, H. H. 2012. Discussion: Latent variable graphical model selection via convex optimization. *Annals of Statistics*, 40(4), 1989–1996.
- Richardson, T., and Urbanke, R. 2008. Modern Coding Theory. Cambridge University Press.
- Rockafellar, R. T. 1970. Convex Analysis. Princeton: Princeton University Press.
- Rohde, A., and Tsybakov, A. B. 2011. Estimation of high-dimensional low-rank matrices. Annals of Statistics, 39(2), 887–930.
- Rosenbaum, M., and Tsybakov, A. B. 2010. Sparse recovery under matrix uncertainty. *Annals of Statistics*, **38**, 2620–2651.
- Rosenthal, H. P. 1970. On the subspaces of ℓ^p (p > 2) spanned by sequences of independent random variables. *Israel Journal of Mathematics*, **8**, 1546–1570.
- Rothman, A. J., Bickel, P. J., Levina, E., and Zhu, J. 2008. Sparse permutation invariant covariance estimation. *Electronic Journal of Statistics*, 2, 494–515.
- Rudelson, M. 1999. Random vectors in the isotropic position. *Journal of Functional Analysis*, **164**, 60–72.
- Rudelson, M., and Vershynin, R. 2013. Hanson–Wright inequality and sub-Gaussian concentration. *Electronic Communications in Probability*, **18**(82), 1–9.
- Rudelson, M., and Zhou, S. 2013. Reconstruction from anisotropic random measurements. *IEEE Transactions on Information Theory*, **59**(6), 3434–3447.
- Rudin, W. 1964. Principles of Mathematical Analysis. New York, NY: McGraw-Hill.
- Rudin, W. 1990. Fourier Analysis on Groups. New York, NY: Wiley-Interscience.
- Samson, P. M. 2000. Concentration of measure inequalities for Markov chains and Φ-mixing processes. *Annals of Probability*, **28**(1), 416–461.
- Santhanam, N. P., and Wainwright, M. J. 2012. Information-theoretic limits of selecting binary graphical models in high dimensions. *IEEE Transactions on Information Theory*, 58(7), 4117–4134.
- Santosa, F., and Symes, W. W. 1986. Linear inversion of band-limited reflection seismograms. SIAM Journal on Scientific and Statistical Computing, 7(4), 1307—1330.
- Saulis, L., and Statulevicius, V. 1991. Limit Theorems for Large Deviations. London: Kluwer Academic.
- Schölkopf, B., and Smola, A. 2002. Learning with Kernels. Cambridge, MA: MIT Press.
- Schütt, C. 1984. Entropy numbers of diagonal operators between symmetric Banach spaces. *Journal of Approximation Theory*, 40, 121–128.
- Scott, D. W. 1992. Multivariate Density Estimation: Theory, Practice and Visualization. New York, NY: Wiley.
- Seijo, E., and Sen, B. 2011. Nonparametric least squares estimation of a multivariate convex regression function. Annals of Statistics, 39(3), 1633–1657.
- Serdobolskii, V. 2000. Multivariate Statistical Analysis. Dordrecht, The Netherlands: Kluwer Academic.
- Shannon, C. E. 1948. A mathematical theory of communication. Bell System Technical Journal, 27, 379–423.
- Shannon, C. E. 1949. Communication in the presence of noise. *Proceedings of the IRE*, 37(1), 10–21.
- Shannon, C. E., and Weaver, W. 1949. The Mathematical Theory of Communication. Urbana, IL: University of Illinois Press.
- Shao, J. 2007. Mathematical Statistics. New York, NY: Springer.
- Shor, N. Z. 1987. Quadratic optimization problems. *Soviet Journal of Computer and System Sciences*, **25**, 1–11.
- Silverman, B. W. 1982. On the estimation of a probability density function by the maximum penalized likelihood method. *Annals of Statistics*, **10**(3), 795–810.
- Silverman, B. W. 1986. Density esitmation for statistics and data analysis. Boca Raton, FL: CRC Press.
- Silverstein, J. 1995. Strong convergence of the empirical distribution of eigenvalues of large dimensional random matrices. *Journal of Multivariate Analysis*, **55**, 331–339.

- Slepian, D. 1962. The one-sided barrier problem for Gaussian noise. *Bell System Technical Journal*, **42**(2), 463–501.
- Smale, S., and Zhou, D. X. 2003. Estimating the approximation error in learning theory. *Analysis and Its Applications*, **1**(1), 1–25.
- Spirtes, P., Glymour, C., and Scheines, R. 2000. Causation, Prediction and Search. Cambridge, MA: MIT Press.
- Srebro, N. 2004. *Learning with Matrix Factorizations*. Ph.D. thesis, MIT. Available online: http://ttic.uchicago.edu/ nati/Publications/thesis.pdf.
- Srebro, N., Rennie, J., and Jaakkola, T. S. 2005a (December 2004). Maximum-margin matrix factorization. In: *Advances in Neural Information Processing Systems* 17 (NIPS 2004).
- Srebro, N., Alon, N., and Jaakkola, T. S. 2005b (December). Generalization error bounds for collaborative prediction with low-rank matrices. In: Advances in Neural Information Processing Systems 17 (NIPS 2004).
- Srivastava, N., and Vershynin, R. 2013. Covariance estimation for distributions with $2 + \epsilon$ moments. *Annals of Probability*, **41**, 3081–3111.
- Steele, J. M. 1978. Empirical discrepancies and sub-additive processes. *Annals of Probability*, **6**, 118–127. Steinwart, I., and Christmann, A. 2008. *Support vector machines*. New York, NY: Springer.
- Stewart, G. W. 1971. Error bounds for approximate invariant subspaces of closed linear operators. *SIAM Journal on Numerical Analysis*, **8**(4), 796–808.
- Stewart, G. W., and Sun, J. 1980. Matrix Perturbation Theory. New York, NY: Academic Press.
- Stone, C. J. 1982. Optimal global rates of convergence for non-parametric regression. *Annals of Statistics*, **10**(4), 1040–1053.
- Stone, C. J. 1985. Additive regression and other non-parametric models. *Annals of Statistics*, **13**(2), 689–705.
- Szarek, S. J. 1991. Condition numbers of random matrices. J. Complexity, 7(2), 131–149.
- Talagrand, M. 1991. A new isoperimetric inequality and the concentration of measure phenomenon. Pages 94–124 of: Lindenstrauss, J., and Milman, V. D. (eds), *Geometric Aspects of Functional Analysis*. Lecture Notes in Mathematics, vol. 1469. Berlin, Germany: Springer.
- Talagrand, M. 1995. Concentration of measure and isoperimetric inequalities in product spaces. *Publ. Math. I.H.E.S.*, 81, 73–205.
- Talagrand, M. 1996a. New concentration inequalities in product spaces. *Inventiones Mathematicae*, **126**, 503–563.
- Talagrand, M. 1996b. A new look at independence. Annals of Probability, 24(1), 1–34.
- Talagrand, M. 2000. The Generic Chaining. New York, NY: Springer.
- Talagrand, M. 2003. Spin Glasses: A Challenge for Mathematicians. New York, NY: Springer.
- Tibshirani, R. 1996. Regression shrinkage and selection via the Lasso. *Journal of the Royal Statistical Society, Series B*, **58**(1), 267–288.
- Tibshirani, R., Saunders, M. A., Rosset, S., Zhu, J., and Knight, K. 2005. Sparsity and smoothness via the smoothed Lasso. *Journal of the Royal Statistical Society B*, **67**(1), 91–108.
- Tropp, J. A. 2006. Just relax: Convex programming methods for identifying sparse signals in noise. *IEEE Transactions on Information Theory*, **52**(3), 1030–1051.
- Tropp, J. A. 2010 (April). User-friendly tail bounds for matrix martingales. Tech. rept. Caltech.
- Tsybakov, A. B. 2009. Introduction to non-parametric estimation. New York, NY: Springer.
- Turlach, B., Venables, W.N., and Wright, S.J. 2005. Simultaneous variable selection. *Technometrics*, 27, 349–363.
- van de Geer, S. 2000. Empirical Processes in M-Estimation. Cambridge University Press.
- van de Geer, S. 2014. Weakly decomposable regularization penalties and structured sparsity. *Scandinavian Journal of Statistics*, **41**, 72–86.
- van de Geer, S., and Bühlmann, P. 2009. On the conditions used to prove oracle results for the Lasso. *Electronic Journal of Statistics*, **3**, 1360–1392.
- van der Vaart, A. W., and Wellner, J. A. 1996. Weak Convergence and Empirical Processes. New York, NY: Springer.

- Vempala, S. 2004. The Random Projection Method. Discrete Mathematics and Theoretical Computer Science. Providence, RI: American Mathematical Society.
- Vershynin, R. 2011. Introduction to the non-asymptotic analysis of random matrices. Tech. rept. Univ. Michigan.
- Villani, C. 2008. Optimal Transport: Old and New. Grundlehren der mathematischen Wissenschaften, vol. 338. New York, NY: Springer.
- Vu, V. Q., and Lei, J. 2012. Minimax rates of estimation for sparse PCA in high dimensions. In: 15th Annual Conference on Artificial Intelligence and Statistics.
- Wachter, K. 1978. The strong limits of random matrix spectra for samples matrices of independent elements. Annals of Probability, 6, 1–18.
- Wahba, G. 1990. *Spline Models for Observational Data*. CBMS-NSF Regional Conference Series in Applied Mathematics. Philadelphia, PN: SIAM.
- Wainwright, M. J. 2009a. Information-theoretic bounds on sparsity recovery in the high-dimensional and noisy setting. *IEEE Transactions on Information Theory*, **55**(December), 5728–5741.
- Wainwright, M. J. 2009b. Sharp thresholds for high-dimensional and noisy sparsity recovery using ℓ₁-constrained quadratic programming (Lasso). *IEEE Transactions on Information Theory*, **55**(May), 2183–2202.
- Wainwright, M. J. 2014. Constrained forms of statistical minimax: Computation, communication and privacy. In: *Proceedings of the International Congress of Mathematicians*.
- Wainwright, M. J., and Jordan, M. I. 2008. Graphical models, exponential families and variational inference. *Foundations and Trends in Machine Learning*, **1**(1–2), 1—305.
- Waldspurger, I., d'Aspremont, A., and Mallat, S. 2015. Phase recovery, MaxCut and complex semidefinite programming. *Mathematical Programming A*, **149**(1–2), 47–81.
- Wang, T., Berthet, Q., and Samworth, R. J. 2014 (August). Statistical and computational trade-offs in estimation of sparse principal components. Tech. rept. arxiv:1408.5369. University of Cambridge.
- Wang, W., Wainwright, M. J., and Ramchandran, K. 2010. Information-theoretic limits on sparse signal recovery: dense versus sparse measurement matrices. *IEEE Transactions on Information Theory*, 56(6), 2967–2979.
- Wang, W., Ling, Y., and Xing, E. P. 2015. Collective Support Recovery for Multi-Design Multi-Response Linear Regression. *IEEE Transactions on Information Theory*, 61(1), 513–534.
- Wasserman, L. A. 2006. All of Non-Parametric Statistics. Springer Series in Statistics. New York, NY: Springer.
- Widom, H. 1963. Asymptotic behaviour of Eigenvalues of Certain Integral Operators. Transactions of the American Mathematical Society, 109, 278–295.
- Widom, H. 1964. Asymptotic behaviour of Eigenvalues of Certain Integral Operators II. Archive for Rational Mechanics and Analysis, 17(3), 215–229.
- Wigner, E. 1955. Characteristic vectors of bordered matrices with infinite dimensions. *Annals of Mathematics*, **62**, 548–564.
- Wigner, E. 1958. On the distribution of the roots of certain symmetric matrices. *Annals of Mathematics*, **67**, 325–327.
- Williams, D. 1991. Probability with Martingales. Cambridge, UK: Cambridge University Press.
- Witten, D., Tibshirani, R., and Hastie, T. J. 2009. A penalized matrix decomposition, with applications to sparse principal components and canonical correlation analysis. *Biometrika*, **10**, 515–534.
- Woodruff, D. 2014. Sketching as a tool for numerical linear algebra. *Foundations and Trends in Theoretical Computer Science*, **10**(10), 1–157.
- Wright, F. T. 1973. A bound on tail probabilities for quadratic forms in independent random variables whose distributions are not necessarily symmetric. *Annals of Probability*, **1**(6), 1068–1070.
- Xu, M., Chen, M., and Lafferty, J. D. 2014. Faithful variable selection for high dimensional convex regression. Tech. rept. Univ. Chicago. arxiv:1411.1805.
- Xu, Q., and You, J. 2007. Covariate selection for linear errors-in-variables regression models. *Communications in Statistics Theory and Methods*, **36**(2), 375–386.
- Xue, L., and Zou, H. 2012. Regularized rank-based estimation of high-dimensional nonparanormal graphical models. *Annals of Statistics*, **40**(5), 2541–2571.

- Yang, Y., and Barron, A. 1999. Information-theoretic determination of minimax rates of convergence. Annals of Statistics, 27(5), 1564–1599.
- Ye, F., and Zhang, C. H. 2010. Rate minimaxity of the Lasso and Dantzig selector for the ℓ_q -loss in ℓ_r -balls. *Journal of Machine Learning Research*, **11**, 3519–3540.
- Yu, B. 1996. Assouad, Fano and Le Cam. Research Papers in Probability and Statistics: Festschrift in Honor of Lucien Le Cam, 423–435.
- Yuan, M. 2010. High dimensional inverse covariance matrix estimation via linear programming. *Journal of Machine Learning Research*, **11**, 2261–2286.
- Yuan, M., and Lin, Y. 2006. Model selection and estimation in regression with grouped variables. *Journal of the Royal Statistical Society B*, **1**(68), 49.
- Yuan, M., and Lin, Y. 2007. Model selection and estimation in the Gaussian graphical model. *Biometrika*, **94**(1), 19–35.
- Yuan, X. T., and Zhang, T. 2013. Truncated power method for sparse eigenvalue problems. *Journal of Machine Learning Research*, 14, 899–925.
- Yurinsky, V. 1995. Sums and Gaussian Vectors. Lecture Notes in Mathematics. New York, NY: Springer.
- Zhang, C. H. 2012. Nearly unbiased variable selection under minimax concave penalty. *Annals of Statistics*, **38**(2), 894–942.
- Zhang, C. H., and Zhang, T. 2012. A general theory of concave regularization for high-dimensional sparse estimation problems. *Statistical Science*, **27**(4), 576–593.
- Zhang, Y., Wainwright, M. J., and Jordan, M. I. 2014 (June). Lower bounds on the performance of polynomial-time algorithms for sparse linear regression. In: *Proceedings of the Conference on Learning Theory (COLT)*. Full length version at http://arxiv.org/abs/1402.1918.
- Zhang, Y., Wainwright, M. J., and Jordan, M. I. 2017. Optimal prediction for sparse linear models? Lower bounds for coordinate-separable M-estimators. *Electronic Journal of Statistics*, **11**, 752–799.
- Zhao, P., and Yu, B. 2006. On model selection consistency of Lasso. *Journal of Machine Learning Research*, 7, 2541–2567.
- Zhao, P., Rocha, G., and Yu, B. 2009. Grouped and hierarchical model selection through composite absolute penalties. Annals of Statistics, 37(6A), 3468–3497.
- Zhou, D. X. 2013. Density problem and approximation error in learning theory. Abstract and Applied Analysis, 2013(715683).
- Zou, H. 2006. The Adaptive Lasso and its oracle properties. *Journal of the American Statistical Association*, **101**(476), 1418–1429.
- Zou, H., and Hastie, T. J. 2005. Regularization and variable selection via the elastic net. *Journal of the Royal Statistical Society, Series B*, **67**(2), 301–320.
- Zou, H., and Li, R. 2008. One-step sparse estimates in nonconcave penalized likelihood models. *Annals of Statistics*, **36**(4), 1509–1533.