References

[1] S.M. Aji and R.J. McEliece, "A general algorithm for distributing information on a graph," *Proc. 1997 IEEE Int. Symp. on Inform. Theory,* Ulm, Germany, July 1997.

[2] S.M. Aji, G.B. Horn and R.J. McEliece, "Iterative decoding on graphs with a single cycle," *Proc. 1998 IEEE Int. Symp. on Inform. Theory,* Boston, USA, August 1998.

[3] M. Ajtai, J. Komlos and E. Szemeredi, "Deterministic simulation in logspacc," *Proc. 19th Annual ACM Symp. on Theory of Computing,* pp. 132-139, 1987.

[4] A. Albanese, J. Blömer, J. Edmonds, M. Luby and M. Sudan, "Priority Encoding Transmission," *IEEE Trans. Inform. Theory,* vol. 42, no. 6, pp. 1737-1744, Nov. 1996.

[5] N. Alon, "Eigenvalues and expanders," *Combinatorica,* vol. 6, no. 2, pp. 83-96, 1986.

[6] N. Alon and F.R.K. Chung, "Explicit construction of linear sized tolerant networks," *Discr. Math.,* vol. 72, pp. 15-19, 1988.

[7] N. Alon, J. Bruck, J. Naor, M. Naor and R. Roth, "Construction of asymptotically good low-rate error-correcting codes through pseudo-random graphs," *IEEE Trans. Inform. Theory,* vol. 38, pp. 509-516, 1992.

[8] N. Alon, J. Edmonds, and M. Luby, "Linear Time Erasure Codes with Nearly Optimal Recovery," *Proc. 36th* Annual *Symp. on Foundations of Computer Science,* pp. 512-519, 1995.

[9] N. Alon and M. Luby, "A Linear Time Erasure-Resilient Code with Nearly Optimal Recovery," *IEEE Trans. Inform. Theory,* vol. 42, no. 6, pp. 1732-1736, Nov. 1996.

[10] N. Alon and J.H. Spenser, *The Probabilistic Method.* New York: Wiley, 2000.

[11] L.R. Bahl, J. Cocke, F. Jelinek and J. Raviv, "Optimal decoding of linear codes for minimizing symbol error rate," *IEEE Trans. Inform. Theory,* vol. 20, pp. 284-287, Mar. 1974.

[12] A. Barg, "Complexity Issues in Coding Theory," *Handbook on Coding Theory,* editors V. Pless and W.C. Huffman. Amsterdam, Elsevier Publishing, 1998.

[13] A. Barg and G. Zémor, "Error exponents of expander codes," *IEEE Trans. Inform. Theory,* vol.48, pp. 1725-1729, 2002.

[14] A. Barg and G. Zémor, "Error exponents of expander codes under linear-complexity decoding," manuscript, 2001.

[15] S. Benedetto and G. Montorsi, "Unveiling Turbo Codes: Some Results on Parallel Concatenated Coding Schemes," *IEEE Trans. Inform. Theory,* vol. 42, no. 2, pp. 409-428, Mar. 1996.

[16] S. Benedetto and G. Montorsi, "Design of Parallel Concatenated Convolutional Codes," *IEEE Trans. Commun.,* vol. 44, no. 5, pp. 591-600, May 1996.

[17] S. Benedetto, D. Divsalar, G. Montorsi and F. Pollara, "Serial Concatenation of Interleaved Codes: Performance Analysis, Design, and Iterative Decoding," *IEEE Trans. Inform. Theory,* vol. 44, no. 3, pp. 909-926, May 1998.

[18] E.R. Berlekamp, H. Van Tilborg and R.J. McEliece, "On the inherent intractibility of certain coding problems," *IEEE Trans. Inform. Theory,* vol. 24, pp. 384-386, 1978.

[19] C. Berrou, A. Glavieux and P. Thitimajshima, "Near Shannon limit error-correcting coding and decoding: Turbo-codes(1)," *Proc. IEEE Int. Conf. on Communications,* Geneva, Switzerland, May 1993.

[20] C. Berrou and A. Glavieux, "Near Optimum Error Correcting Coding and Decoding: Turbo-Codes," *IEEE Trans. Commun.,* vol. 44, no. 10, pp. 1261-1271, Oct. 1996.

[21] R. C. Bose and D. K. Ray-Chaudhuri, "On a Class of Error Correcting Binary Group Codes," *Information and Control,* Volume 3, pp. 68 - 79, March 1960.

[22] R. C. Bose and D. K. Ray-Chaudhuri, "Further Results on Error Correcting Binary Group Codes," *Information and Control,* Volume 3, pp. 279 - 290, September 1960.

[23] D. Burshtein and G. Miller, "Expander Graph Arguments for Message-Passing Algorithms," *IEEE Trans. Inform. Theory,* vol. 47, pp. 782-790, Feb. 2001.

[24] J.-F. Cheng and R.J. McEliece, "Some High-Rate Near Capacity Codecs for the Gaussian Channel," *Proc. 34th Allerton Conference on Communications, Control and Computing,* 1996.

[25] S-Y Chung, G.D. Forney Jr., T. Richardson and R. Urbanke, "On the design of low-density parity-check codes within 0.0045 dB of the Shannon limit," *IEEE Commun. Lett.,* vol. 5, pp. 58-60, Feb. 2001.

[26] S-Y Chung, T. Richardson and R. Urbanke, "Analysis of Sum-Product Decoding of Low-Density Parity-Check Codes Using a Gaussian Approximation," *IEEE Trans. Inform. Theory,* vol. 47, pp. 657-670, Feb. 2001.

[27] G.F. Cooper, "The Computational Complexity of Probabilistic Inference Using Bayesian Belief Networks," *Artificial Intelligence,* vol. 42, pp. 393-405, 1990.

[28] T. M. Cover and J. A. Thomas, *Elements of Information Theory,* John Wiley & Sons, Inc., 1991.

[29] P. Dagum and M. Luby, "Approximating probabilistic inference in Bayesian belief networks is NP-hard," *Artificial Intelligence*, vol. 60, pp. 141-153, 1993.

[30] M.C. Davey and D.J.C. MacKay, "Low-Density Parity-Check Codes over *GF(q)," IEEE Commun. Letters,* vol. 2., no. 6, June 1998.

[31] D. Divsalar and F. Pollara, "Multiple Turbo Codes for Deep-Space Communications," *TDA Progress Report 42-121,* pp. 66-77, May 15, 1995.

[32] D. Divsalar and F. Pollara, "Turbo Codes for PCS Applications," *Proc. IEEE Int. Conf. on Communications,* Seattle, Washington, June 1995.

[33] D. Divsalar and R.J. McEliece, "On the Design of Generalized Concatenated Coding Systems with Interleavers," manuscript, 1998.

[34] S. Dolinar and D. Divsalar, "Weight Distributions for Turbo Codes Using Random and Nonrandom Permutations," *TDA Progress Report 42-122,* pp. 56-65, August 15, 1995.

[35] H. El Gamal and A.R. Hammons, Jr, "Analyzing the turbo decoder using the Gaussian approximation," *IEEE Trans. Inform. Theory,* vol. 47, no. 2, pp. 671-686, Feb. 2001.

[36] P. Elias, "Coding for Noisy Channels," *IRE Conv. Record,* Part 4, pp. 37 - 47, 1955.

[37] G. D. Forney, Jr.. *Concatenated Codes*, Cambridge: MIT Press, 1966.

[38] G.D. Forney, Jr., "The forward-backward algorithm," *Proc. 34th Allerton Conference on Communications, Control and Computing,* 1996.

[39] B.J. Frey, *Graphical Models for Machine Learning and Digital Communication.* The M.I.T. Press, Cambridge, MA, 1998.

[40] R.G. Gallager, "Low-density parity-check codes," *IRE Trans. Inform. Theory,* vol. 8, pp. 21-28, Jan. 1962.

[41] R.G. Gallager, *Low-Density Parity-Check Codes*. The M.I.T. Press, Cambridge, MA, 1963.

[42] E.N. Gilbert, "A Comparison of Signaling Alphabets," *Bell Sys. Tech. J.,* vol. 31, pp. 504-522, 1952.

[43] D. Gorenstein and N. Zierler, "A Class of Error Correcting Codes in p^m Symbols," *Journal of the Society of Industrial and Applied Mathematics,* Volume 9, pp. 207 - 214, June 1961.

[44] W.C. Gore, "Transmitting Binary Symbols with Reed-Solomon Codes," *Proceedings of the Princeton Conference on Information Science and Systems,* Princeton, New Jersey, pp. 495 - 497, 1973.

[45] V. Guruswami and P. Indyk, "Linear-time Codes to Correct a Maximum Possible Fraction of Errors," *Proc. 39th Allerton Conference on Communications, Control and Computing,* 2001.

[46] V. Guruswami and P. Indyk, "Near-optimal linear-time codes for unique decoding and new list-decodable codes over smaller alphabets," preprint, 2002.

[47] J. Hagenauer, E. Offer and L. Papke, "Iterative decoding of binary block and convolutional codes," *IEEE Trans. Inform. Theory,* vol. 42, no. 2, pp. 429-445, Mar. 1996.

[48] C. Heegard and S.B. Wicker, *Turbo Coding.* Kluwer Academic Press, 1998.

[49] S. Hirasawa, M. Kasahara, Y. Sugiyama and T. Namekawa, "Modified Product Codes," *IEEE Trans. Inform. Theory,* vol. 30, no. 2, pp. 299-306, Mar. 1984.

[50] A. Hocquenghem, "Codes Correcteurs d'Erreurs," *Chiffres,* Volume 2, pp. 147 - 156, 1959.

[51] T. W. Hungerford, *Algebra,* New York: Springer-Verlag, 1974.

[52] K. A. S, Immink, "RS Codes and the Compact Disc," in *Reed Solomon Codes and Their Applications,* (Stephen Wicker and Vijay Bhargava, ed.) , IEEE Press, 1994.

[53] F.V. Jensen, S.L. Lauritzen and K.G. Olesen, "Bayesian updating in recursive graphical models by local computation," *Computational Statistical Quarterly,* vol. 4, pp. 269-282, 1990.

[54] H. Jin, A. Khandekar and R. McEliece, "Irregular Repeat-Accumulate Codes," *Proc. 2nd. International Conf. Turbo Codes,* Brest, France, pp. 1-8, Sept. 2000.

[55] N. Kahale, "Expander Graphs," Ph.D. dissertation, M.I.T., 1993.

[56] E.M. Kasahara, Y. Sugiyama, S. Hirasawa and T. Namekawa, "New classes of binary codes constructed on the basis of concatenated codes and product codes," *IEEE Trans. Inform. Theory,* vol. IT-22, pp. 462-468, July 1976.

[57] S. Kim, "Probabilistic Reasoning, Parameter Estimation, and Issues in Turbo Decoding," Ph.D. dissertation, Cornell University, 1998.

[58] S. Kim and S.B. Wicker, "Thoughts on Expander Codes: Codes via Irregular Bipartite Graphs," *Annual Conf. on Information Sciences and Systems '00,* Princeton, USA, 2000.

[59] S. Kim and S.B. Wicker, "Linear-Time Encodable and Decodable Irregular Graph Codes," *Proc.* 2000 *IEEE Int. Symp. on Inform. Theory,* Italy, 2000.

[60] F.R. Kschischang and B.J. Frey, "Iterative Decoding of Compound Codes by Probability Propagation in Graphical Models," *IEEE Journal on Selected Areas in Commun.,* vol. 16, pp. 219-230, Feb. 1998.

[61] F.R. Kschischang, B.J. Prey and H-A Loeliger, "Factor Graphs and the Sum-Product Algorithm," *IEEE Trans. Inform. Theory,* vol. 47, no. 2, pp. 498-519, Feb. 2001.

[62] J. Lafferty and D.N. Rockmore, "Spectral Techniques for Expander Codes," Proc. *29th Annual ACM Symposium on Theory of Computing,* pp. 160-167, 1997.

[63] J. Lafferty and D.N. Rockmore, "Codes and Iterative Decoding on Algebraic Expander Graphs," *Int. Symp. Inform. Theory and Appl.,* Nov. 2000.

[64] S.L. Lauritzen and D.J. Spiegelhalter, "Local Computation with Probabilities on Graphical Structures and Their Application to Expert Systems," *Journal of the Royal Statistical Society, Series B,* vol. 50, pp. 157-224, 1988.

[65] S. Le Goff, A. Glavieux and C. Berrou, "Turbo-Codes and High Spectral Efficiency Modulation," *Proc. IEEE Int. Conf. on Communications,* New Orleans, USA, May 1994.

[66] R. Lidl and H. Niederreiter, *Finite Fields,* Reading, Mass.: Addison Wesley, 1983.

[67] A. Lubotzky, R. Phillips and P. Sarnak, "Ramanujan Graphs," *Combinatorica,* vol. 8, no. 3, pp. 261-277, 1988.

[68] S. Lin and E.J. Weldon, "Further Results on Cyclic Product Codes," *IEEE Trans. Inform. Theory,* vol. IT-16, no. 4, pp. 452-459, July 1970.

[69] M. Luby, M. Mitzenmacher, M.A. Shokrollahi, D.A. Spielman and V. Stemann, "Practical Loss-Resilient Codes," *Proc. 29th Annual ACM Symp. on Theory of Computing,* pp. 150-159, 1997.

[70] M. Luby, M. Mitzenmacher and M.A. Shokrollahi, "Analysis of Random Processes via And-Or Trees," in *Proc. 9th Symp. on Discrete Algorithms,* pp. 364-373, 1998.

[71] M. Luby, M. Mitzenmacher, M.A. Shokrollahi and D.A. Spielman, "Analysis of Low Density Codes and Improved Designs Using Irregular Graphs," *Proc. 30th Annual ACM Symposium of Theory of Computing,* pp. 249-258, 1998.

[72] M. Luby, M. Mitzenmacher, M.A. Shokrollahi and D.A. Spielman, "Improved Low-Density Parity-Check Codes Using Irregular Graphs and Belief Propagation," *Proc. 1998 IEEE Int. Symp. on Inform. Theory,* Boston, USA, August 1998.

[73] D.J.C. MacKay and R.M. Neal, "Good error-correcting codes based on very sparse matrices," *Cryptography and Coding, Lecture Notes in Computer Science no. 1025,* pp. 100-111, Springer-Verlag, 1995.

[74] D.J.C. MacKay and R.M. Neal, "Near Shannon limit performance of low density parity check codes," *Electron. Lett.,* vol. 32, no. 18, pp. 1645-1646, Aug. 1996; reprinted *Electron. Lett.,* vol. 33, no. 6, pp. 457-458, Mar. 1997.

[75] D.J.C. MacKay, "Good Error-Correcting Codes based on Very Sparse Matrices," *IEEE Trans. Inform. Theory,* vol. 45, pp. 399-431, Mar. 1999.

[76] F. J. MacWilliams and N. J. A. Sloane, *The Theory of Error Correcting Codes,* Amsterdam: North Holland, 1977.

[77] G.A. Margulis, "Explicit constructions of concentrators," *Probl. Inform. Transm.,* vol. 9, pp. 325-332, 1973.

[78] G.A. Margulis, "Explicit constructions of graphs without short cycles and low density codes," *Combinatorica,* vol. 2, pp. 71-78, 1982.

[79] G.A. Margulis, "Explicit group-theoretical constructions of combinatorial schemes and their applications to the design of expanders and concentrators," *Probl. Inform. Transm.,* vol. 24, pp. 39-46, 1988.

[80] R. J. McEliece, E. R. Rodemich, H. C. Rumsey, Jr. and L. R. Welch, "New Upper Bounds on the Rate of a Code using the Delsarte-MacWilliams Inequalities," *IEEE Trans. Inform. Theory,* vol. 23, pp. 157-166, 1977.

[81] R. J. McEliece, *Finite Fields for Computer Scientists and Engineers,* Boston: Kluwer Academic Publishers, 1987.

[82] R.J. McEliece, E. Rodemich and J.-F. Cheng, "The Turbo Decision Algorithm," *Proc. 33rd Allerton Conference on Communication, Control and Computing,* 1995.

[83] R.J. McEliece, D.J.C. MacKay and J.-F. Cheng, "Turbo Decoding as an Instance of Pearl's 'Belief Propagation' Algorithm," *IEEE Journal on Selected Areas in Commun.,* vol. 16, pp. 140-152, Feb. 1998.

[84] G. Miller and D. Burshtein, "Bounds on the Maximum-Likelihood Decoding Error Probability of Low-Density Parity-Check Codes," *IEEE Trans. Inform. Theory,* vol. 47, pp. 2696-2710, Nov. 2001.

[85] R. Motwani and P. Raghavan, *Randomized Algorithms.* Cambridge University Press, 1995.

[86] P. Oswald and M.A. Shokrollahi, "Capacity-Achieving Sequences for the Erasure Channel," manuscript, 2000.

[87] J. Pearl, *Probabilistic Reasoning in Intelligent Systems: Networks of Plausible Inference.* Morgan Kaufmann Publishers, Inc., San Mateo, CA, 1988.

[88] W. W. Peterson, "Encoding and Error-Correction Procedures for the Bose-Chaudhuri Codes," *IRE Transactions on Information Theory,* Volume IT-6, pp. 459 - 470, September 1960.

[89] L.C. Perez, J. Seghers and D.J. Costello, Jr., "A distance spectrum interpretation of turbo codes," *IEEE Trans. Inform. Theory,* vol. 42, pp. 1698-1709, Nov. 1996.

[90] N. Pippenger, "Superconcentrators," *SIAM Journal of Computing,* vol. 6, pp. 298-304, 1977.

[91] R. Pyndiah, A. Glavieux, A. Picart and S. Jacq, "Near Optimum Decoding of Product Codes," *Proc. of Globecom 94,* vol. 1, pp. 339-343, Nov. 1994.

[92] I. S. Reed, "A Class of Multiple-Error-Correcting Codes and a Decoding Scheme," *IEEE Transactions on Information Theory,* Volume 4, pp. 38 – 49, September 1954.

[93] T. Richardson and R. Urbanke, "The capacity of low-density parity check codes under message-passing decoding," *IEEE Trans. Inform. Theory*, vol. 47, pp. 599-618, Feb. 2001.

[94] T. Richardson, M.A. Shokrollahi and R. Urbanke, "Design of capacity-approaching irregular low-density parity-check codes," *IEEE Trans. Inform. Theory,* vol. 47, pp. 619-637, Feb. 2001.

[95] T. Richardson and R. Urbanke, "Efficient Encoding of Low-Density Parity-Check Codes," *IEEE Trans. Inform. Theory,* vol. 47, pp. 638-656, Feb. 2001.

[96] J. Rosenthal and P. Vontobel, "Construction of Low-Density Parity-Check Codes using Ramanujan Graphs and Ideas from Margulis," *Proc. 38th Allerton Conference on Commun. Control* and *Computing,* Monticello, Illinois, Oct. 2000.

[97] P. Rusmevichientong and B. Van Roy, "An analysis of belief propagation on the turbo decoding graph with Gaussian densities," *IEEE Trans. Inform. Theory,* vol. 47, no. 2, pp.745-765, Feb. 2001.

[98] E. Sakk and S. B. Wicker, "Finite Field Wavelet Packets for Error Control Coding" , *Proceedings of the 39th Annual Allerton Conference on Communication, Control and Computing,* Urbana-Champaign, Il, October 2001.

[99] P. Sarnak, *Some Applications of Modular Forms*. Cambridge University Press, 1990.

[100] C.E. Shannon, "A Mathematical Theory of Communication," *Bell Syst. Tech. J.,* vol 27, pp. 379-423 and pp. 623-656, 1948.

[101] S.E. Shimony, "Finding MAPs for belief networks is NP-hard," *Artificial Intelligence,* vol. 68, pp. 399-410, 1994.

[102] M.A. Shokrollahi, "New Sequences of Linear Time Erasure Codes approaching the Channel Capacity," *Proc. AAECC-13, Lecture Notes in Computer Science no. 1719,* pp. 65-76, 1999.

[103] M. Sipser and D.A. Spielman, "Expander Codes," *IEEE Trans. Inform. Theory,* vol. 42, pp. 1710-1722, Nov. 1996.

[104] P. Smyth, D. Heckerman and M.I. Jordan, "Probabilistic Independence Networks for Hidden Markov Probability Models," *Neural Computation*, vol. 9, pp. 227-269, 1997.

[105] D.A. Spielman, "Linear-Time Encodable and Decodable Error-Correcting Codes," *IEEE Trans. Inform. Theory*, vol. 42, no. 6, pp. 1723-1731, Nov. 1996.

[106] O. Y. Takeshita, O. M. Collins, P. C. Massey and D. J. Costello, Jr., "A note on asymmetric turbo-codes," *IEEE Commun. Letters,* vol. 3, no. 3, pp. 69-71, Mar. 1999.

[107] R.M. Tanner, "A recursive approach to low complexity codes," *IEEE Trans. Inform. Theory,* vol. 27, pp. 533-547, Sept. 1981.

[108] R.M. Tanner, "Explicit concentrators from generalized *n*-gons," *SIAM Journal of Alg. Disc. Meth.,* vol. 5, no. 3, pp. 287-293, Sept. 1984.

[109] R.M. Tanner, "Minimum Distance Bounds by Graph Analysis," manuscript.

[110] P. Thitimajshima, "Les codes convolutifs recursifs systematiques et leur application a la concatenation parallele," (in French), Ph.D. no. 284, Universite de Bretagne Occidcntale, Brest, France, Dec. 1993.

[111] A. Tietäväinen, "On the Nonexistence of Perfect Codes over Finite Fields," *SIAM Journal of Applied Mathematics,* Volume 24, pp. 88 - 96, 1973.

[112] A.J. Viterbi, "Error bounds for convolutional codes and an asymptotically optimum decoding algorithm," *IEEE Trans. Inform. Theory,* vol. 13, pp. 260-269, Apr. 1967.

[113] Y. Weiss, "Correctness of local probability propagation in graphical models and loops," *Neural Computation,* vol. 12, pp. 1-41, 2000.

[114] Y. Weiss and W.T. Freeman, "On the Optimality of Solutions of the Max-Product Belief-Propagation Algorithm in Arbitrary Graphs," *IEEE Trans. Inform. Theory,* vol. 47, pp. 736-744, Feb. 2001.

[115] N. Wiberg, H.-A. Loeliger and R. K*ö*tter, "Codes and iterative decoding on general graphs," *European Trans. on Telecommun.,* vol. 6, pp. 513-525, Sep./Oct. 1995.

[116] S. B. Wicker, *Error Control Systems for Digital Communication and Storage,* Englewood Cliffs: Prentice Hall, 1995.

[117] S. B. Wicker, "Deep Space Applications," *Handbook of Coding Theory,* (Vera Pless and William Cary Huffman, ed.), Amsterdam: Elsevier, 1998.

[118] J.S. Yedidia, W.T. Freeman and Y. Weiss, "Bethe free energy, Kikuchi approximations and belief propagation algorithms," manuscript, 2001.

[119] G. Zémor, "On Expander Codes," *Trans. on Inform. Theory,* vol. 47, pp. 835-837, Feb. 2001.

[120] V.V. Zyablov and M.S. Pinsker, "Estimation of the error correction complexity of Gallager low-density codes," *Probl. Inform. Transm.,* vol. 11, no. 1, pp. 18-28, May 1976.

Index