

References

- [1] M. J. Khan, H. S. Khan, A. Yousaf, K. Khurshid, and A. Abbas, “Modern trends in hyperspectral image analysis: a review,” *IEEE Access*, 2018, vol. 6, pp. 14 118–14 129.
- [2] NASA, “123.0-b-info testdata,” accessed on: 20 Sep 2018. [Online]. Available: <https://cwe.ccsds.org/sls/docs/sls-dc/123.0-B-Info/TestData>
- [3] B. Park and R. Lu, *Hyperspectral imaging technology in food and agriculture*. Springer, 2015.
- [4] C. T. Willoughby, M. A. Folkman, and M. A. Figueroa, “Application of hyperspectral-imaging spectrometer systems to industrial inspection,” in *Three-Dimensional and Unconventional Imaging for Industrial Inspection and Metrology*, vol. 2599. International Society for Optics and Photonics, 1996, pp. 264–272.
- [5] H. Saari, V.-V. Aallos, A. Akujärvi, T. Antila, C. Holmlund, U. Kantojärvi, J. Mäkynen, and J. Ollila, “Novel miniaturized hyperspectral sensor for uav and space applications,” in *Sensors, Systems, and Next-Generation Satellites XIII*, vol. 7474. International Society for Optics and Photonics, 2009, p. 74741M.
- [6] H. Grahn and P. Geladi, *Techniques and applications of hyperspectral image analysis*. John Wiley & Sons, 2007.

-
- [7] E. Magli, "Multiband lossless compression of hyperspectral images," *IEEE Transactions on Geoscience and Remote Sensing*, 2009, vol. 47, no. 4, pp. 1168–1178.
- [8] S. Gupta, I. Agarwal, and R. S. Singh, "Workflow scheduling using jaya algorithm in cloud," *Concurrency and Computation: Practice and Experience*, 2019, vol. 31, no. 17, p. e5251.
- [9] R. C. Gonzalez, *Digital image processing*. Pearson education india, 2009.
- [10] S.-H. Wang, J. Sun, P. Phillips, G. Zhao, and Y.-D. Zhang, "Polarimetric synthetic aperture radar image segmentation by convolutional neural network using graphical processing units," *Journal of Real-Time Image Processing*, 2018, vol. 15, no. 3, pp. 631–642.
- [11] F. Huang, Y. Chen, L. Li, J. Zhou, J. Tao, X. Tan, and G. Fan, "Implementation of the parallel mean shift-based image segmentation algorithm on a gpu cluster," *International Journal of Digital Earth*, 2019, vol. 12, no. 3, pp. 328–353.
- [12] M. Hossam, H. Ebied, M. Abdel-Aziz, and M. F. Tolba, "Accelerated hyperspectral image recursive hierarchical segmentation using gpus, multicore cpus, and hybrid cpu/gpu cluster," *Journal of Real-Time Image Processing*, 2018, vol. 14, no. 2, pp. 413–432.
- [13] R. Ratnakumar and S. J. Nanda, "A low complexity hardware architecture of k-means algorithm for real-time satellite image segmentation," *Multimedia Tools and Applications*, 2019, vol. 78, no. 9, pp. 11 949–11 981.
- [14] H. Gu, Y. Han, Y. Yang, H. Li, Z. Liu, U. Soergel, T. Blaschke, and S. Cui, "An efficient parallel multi-scale segmentation method for remote sensing imagery," *Remote Sensing*, 2018, vol. 10, no. 4, p. 590.
- [15] B. Hou, X. Zhang, D. Gong, S. Wang, X. Zhang, and L. Jiao, "Fast graph-based sar image segmentation via simple superpixels," in *2017 IEEE International*

- Geoscience and Remote Sensing Symposium (IGARSS)*. IEEE, 2017, pp. 799–802.
- [16] P. G. Bascoy, P. Quesada-Barriuso, D. B. Heras, F. Argüello, B. Demir, and L. Bruzzone, “Extended attribute profiles on gpu applied to hyperspectral image classification,” *The Journal of Supercomputing*, 2019, vol. 75, no. 3, pp. 1565–1579.
- [17] L. Pan, H.-C. Li, J. Ni, C. Chen, X.-D. Chen, and Q. Du, “Gpu-based fast hyperspectral image classification using joint sparse representation with spectral consistency constraint,” *Journal of Real-Time Image Processing*, 2018, vol. 15, no. 3, pp. 463–475.
- [18] H. Qu, X. Yin, X. Liang, and W. Liu, “Parallel dimensionality-varied convolutional neural network for hyperspectral image classification,” in *International Conference on Intelligence Science*. Springer, 2018, pp. 302–309.
- [19] E. Torti, A. Fontanella, A. Plaza, J. Plaza, and F. Leporati, “Hyperspectral image classification using parallel autoencoding diabolos networks on multi-core and many-core architectures,” *Electronics*, 2018, vol. 7, no. 12, p. 411.
- [20] S. Liu, R. S. Chu, X. Wang, and W. Luk, “Optimizing cnn-based hyperspectral image classification on fpgas,” in *International Symposium on Applied Reconfigurable Computing*. Springer, 2019, pp. 17–31.
- [21] B. P. Garcia-Salgado, V. I. Ponomaryov, S. Sadovnychiy, and M. Robles-Gonzalez, “Parallel supervised land-cover classification system for hyperspectral and multispectral images,” *Journal of Real-Time Image Processing*, 2018, vol. 15, no. 3, pp. 687–704.
- [22] R. Lazcano, D. Madroñal, G. Florimbi, J. Sancho, S. Sanchez, R. Leon, H. Fabelo, S. Ortega, E. Torti, R. Salvador *et al.*, “Parallel implementations assessment of

- a spatial-spectral classifier for hyperspectral clinical applications,” *IEEE Access*, 2019, vol. 7, pp. 152 316–152 333.
- [23] Y. W. Yang, H. X. Cao, W. Zhang, L. Xu, Q. Wan, Y. Ke, W. Zhang, D. Ge, B. Huang *et al.*, “Hyperspectral identification and classification of oilseed rape waterlogging stress levels using parallel computing,” *IEEE Access*, 2018, vol. 6, pp. 57 663–57 675.
- [24] K. Tan, F. Wu, Q. Du, P. Du, and Y. Chen, “A parallel gaussian–bernoulli restricted boltzmann machine for mining area classification with hyperspectral imagery,” *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 2019, vol. 12, no. 2, pp. 627–636.
- [25] S. Liew, “Principles of Remote Sensing,” 2019, accessed on: 10 Mar 2019. [Online]. Available: <https://crisp.nus.edu.sg/~research/tutorial/image.htm>
- [26] M. Díaz, R. Guerra, P. Horstrand, E. Martel, S. López, J. F. López, and R. Sarmiento, “Real-time hyperspectral image compression onto embedded gpus,” *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 2019, vol. 12, no. 8, pp. 2792–2809.
- [27] A. Rodriguez, L. Santos, R. Sarmiento, and E. De La Torre, “Scalable hardware-based on-board processing for run-time adaptive lossless hyperspectral compression,” *IEEE Access*, 2019, vol. 7, pp. 10 644–10 652.
- [28] J. Li, J. Wu, and G. Jeon, “Gpu acceleration of clustered dpcm for lossless compression of hyperspectral images,” *IEEE Transactions on Industrial Informatics*, 2019.
- [29] A. C. Karaca and M. K. Güllü, “Superpixel based recursive least-squares method for lossless compression of hyperspectral images,” *Multidimensional Systems and Signal Processing*, 2019, vol. 30, no. 2, pp. 903–919.

- [30] W. Wu, Y. Wu, and X. Qiao, "Parallel compression based on prediction algorithm of hyper-spectral imagery," in *MATEC Web of Conferences*, vol. 173. EDP Sciences, 2018, p. 03070.
- [31] W. Wenbin, Y. Wu, and J. Li, "The hyper-spectral image compression based on k-means clustering and parallel prediction algorithm," in *MATEC Web of Conferences*, vol. 173. EDP Sciences, 2018, p. 03071.
- [32] M. Olaru and M. Craus, "Lossless multispectral and hyperspectral image compression on multicore systems," in *2017 21st International Conference on System Theory, Control and Computing (ICSTCC)*. IEEE, 2017, pp. 175–179.
- [33] NASA, "Hyperspectral airborne data," 2019, accessed 27-August-2019. [Online]. Available: <https://airbornescience.nasa.gov/instrument/AVIRIS>
- [34] J. Transon, R. d'Andrimont, A. Maignard, and P. Defourny, "Survey of hyperspectral earth observation applications from space in the sentinel-2 context," *Remote Sensing*, 2018, vol. 10, no. 2, p. 157.
- [35] U. Amato, A. Antoniadis, M. F. Carfora, P. Colandrea, V. Cuomo, M. Franzese, S. Pignatti, and C. Serio, "Statistical classification for assessing prisma hyper-spectral potential for agricultural land use," *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 2013, vol. 6, no. 2, pp. 615–625.
- [36] T. Feingersh and E. B. Dor, "Shalom—a commercial hyperspectral space mission," *Optical payloads for space missions*, 2015, pp. 247–263.
- [37] T. Matsunaga, A. Iwasaki, S. Tsuchida, J. Tanii, O. Kashimura, R. Nakamura, H. Yamamoto, T. Tachikawa, and S. Rokugawa, "Current status of hyperspectral imager suite (hisui)," in *2013 IEEE International Geoscience and Remote Sensing Symposium-IGARSS*. IEEE, 2013, pp. 3510–3513.

- [38] NASA, “HyspIRI Final Report,” 2018, accessed 17-May-2019. [Online]. Available: https://hyspiri.jpl.nasa.gov/downloads/reports_whitepapers/HyspIRI_FINAL_Report_1October2018_20181005a.pdf
- [39] “Hyperspectral Analysis,” 2019, accessed 26-July-2019. [Online]. Available: <https://www.microimages.com/documentation/html/useTNTfor/UseHyperspectralAnalysis.htm>
- [40] “CASI_1500H Specifications,” 2014, accessed 19-Jan-2019. [Online]. Available: http://www.itres.com/wp-content/uploads/2014/10/CASI_1500H1.pdf
- [41] T. Cocks, R. Jenssen, A. Stewart, I. Wilson, and T. Shields, “The hymaptm airborne hyperspectral sensor: The system, calibration and performance,” in *Proceedings of the 1st EARSeL workshop on Imaging Spectroscopy*. EARSeL, 1998, pp. 37–42.
- [42] NASA, “AVIRIS Data,” 2019, accessed 15-March-2019. [Online]. Available: <https://aviris.jpl.nasa.gov/html/data.html>
- [43] —, “HyspIRI Data,” 2019, accessed 15-August-2019. [Online]. Available: <https://hyspiri.jpl.nasa.gov/>
- [44] “The HYDICE instrument design and its application to planetary instruments,” 2019, accessed 15-August-2019. [Online]. Available: <https://ntrs.nasa.gov/search.jsp?R=19930019577>
- [45] U. Amato, A. Antoniadis, M. F. Carfora, P. Colandrea, V. Cuomo, M. Franzese, S. Pignatti, and C. Serio, “Statistical classification for assessing prisma hyperspectral potential for agricultural land use,” *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 2013, vol. 6, no. 2, pp. 615–625.
- [46] D. H. Foster, K. Amano, S. M. Nascimento, and M. J. Foster, “Frequency of metamerism in natural scenes,” *Josa a*, 2006, vol. 23, no. 10, pp. 2359–2372.

- [47] R. Wright, "Hyperspectral Sensors," 2019, accessed 17-August-2019. [Online]. Available: <http://www.ehu.eus/ccwintco/index.php/Sensores-hiperespectrales>
- [48] OSU, "Hyperspectral Imager for the Coastal Ocean," 2019, accessed 17-August-2019. [Online]. Available: <http://hico.coas.oregonstate.edu/>
- [49] S. Liew, "Principles of Remote Sensing," 2019, accessed on: 20 Feb 2020. [Online]. Available: <https://crisp.nus.edu.sg/~research/tutorial/image.htm>
- [50] C. Li, "Parallel implementation of the recursive least square for hyperspectral image compression on gpus." *KSII Transactions on Internet & Information Systems*, 2017, vol. 11, no. 7.
- [51] A. Karami, M. Yazdi, and G. Mercier, "Compression of hyperspectral images using discrete wavelet transform and tucker decomposition," *IEEE journal of selected topics in applied earth observations and remote sensing*, 2012, vol. 5, no. 2, pp. 444–450.
- [52] J. A. Saghri, S. Schroeder, and A. G. Tescher, "Adaptive two-stage karhunen-loeve-transform scheme for spectral decorrelation in hyperspectral bandwidth compression," *Optical Engineering*, 2010, vol. 49, no. 5, p. 057001.
- [53] X. Wang, J. Tao, Y. Shen, M. Qin, and C. Song, "Distributed source coding of hyperspectral images based on three-dimensional wavelet," *Journal of the Indian Society of Remote Sensing*, 2018, vol. 46, no. 4, pp. 667–673.
- [54] S. Bajpai, N. R. Kidwai, H. V. Singh, and A. K. Singh, "Low memory block tree coding for hyperspectral images," *Multimedia Tools and Applications*, 2019, pp. 1–17.
- [55] A. Karami, M. Yazdi, and A. Z. Asli, "Hyperspectral image compression based on tucker decomposition and discrete cosine transform," in *2010 2nd International*

- Conference on Image Processing Theory, Tools and Applications*. IEEE, 2010, pp. 122–125.
- [56] A. Karami, S. Beheshti, and M. Yazdi, “Hyperspectral image compression using 3d discrete cosine transform and support vector machine learning,” in *2012 11th International Conference on Information Science, Signal Processing and their Applications (ISSPA)*. IEEE, 2012, pp. 809–812.
- [57] B. U. Töreym, O. Yilmaz, Y. M. Mert, and F. Türk, “Lossless hyperspectral image compression using wavelet transform based spectral decorrelation,” in *2015 7th International Conference on Recent Advances in Space Technologies (RAST)*. IEEE, 2015, pp. 251–254.
- [58] R. Kozhemiakin, S. Abramov, V. Lukin, B. Djurović, I. Djurović, and B. Vozel, “Lossy compression of landsat multispectral images,” in *2016 5th Mediterranean Conference on Embedded Computing (MECO)*. IEEE, 2016, pp. 104–107.
- [59] R. Giordano and P. Guccione, “Roi-based on-board compression for hyperspectral remote sensing images on gpu,” *Sensors*, 2017, vol. 17, no. 5, p. 1160.
- [60] R. J. Yadav and M. Nagmode, “Compression of hyperspectral image using pca–dct technology,” in *Innovations in Electronics and Communication Engineering*. Springer, 2018, pp. 269–277.
- [61] S. Mei, B. M. Khan, Y. Zhang, and Q. Du, “Low-complexity hyperspectral image compression using folded pca and jpeg2000,” in *IGARSS 2018-2018 IEEE International Geoscience and Remote Sensing Symposium*. IEEE, 2018, pp. 4756–4759.
- [62] A. C. Karaca and M. K. Güllü, “Target preserving hyperspectral image compression using weighted pca and jpeg2000,” in *International Conference on Image and Signal Processing*. Springer, 2018, pp. 508–516.

- [63] R. Guerra, Y. Barrios, M. Díaz, L. Santos, S. López, and R. Sarmiento, “A new algorithm for the on-board compression of hyperspectral images,” *Remote Sensing*, 2018, vol. 10, no. 3, p. 428.
- [64] R. Guerra, M. Díaz, Y. Barrios, S. López, and R. Sarmiento, “A hardware-friendly algorithm for the on-board compression of hyperspectral images,” in *2018 9th Workshop on Hyperspectral Image and Signal Processing: Evolution in Remote Sensing (WHISPERS)*. IEEE, 2018, pp. 1–5.
- [65] E. Can, A. C. Karaca, M. Danişman, O. Urhan, and M. K. Güllü, “Compression of hyperspectral images using luminance transform and 3d-dct,” in *IGARSS 2018-2018 IEEE International Geoscience and Remote Sensing Symposium*. IEEE, 2018, pp. 5073–5076.
- [66] S. Khan, Z. A. Haq, M. Ayyub Khan *et al.*, “Fractional wavelet filter based discrete wavelet transform and spiht for hyperspectral image compression,” *International Journal of Information Systems & Management Science*, 2019, vol. 2, no. 1.
- [67] E. Ahanonu, M. Marcellin, and A. Bilgin, “Clustering regression wavelet analysis for lossless compression of hyperspectral imagery,” 2019.
- [68] R. Nagendran and A. Vasuki, “Hyperspectral image compression using hybrid transform with different wavelet-based transform coding,” *International Journal of Wavelets, Multiresolution and Information Processing*, 2020, vol. 18, no. 01, p. 1941008.
- [69] N. Zikiou, M. Lahdir, and D. Helbert, “Support vector regression-based 3d-wavelet texture learning for hyperspectral image compression,” *The Visual Computer*, 2019, pp. 1–18.
- [70] S. Jafari, “Graph transforms for hyperspectral image compression,” Ph.D. dissertation, Politecnico di Torino, 2019.

-
- [71] D. Monica and A. Widipaminto, “Fuzzy transform for high-resolution satellite images compression.” *Telkomnika*, 2020, vol. 18, no. 2.
- [72] M. Ricci and E. Magli, “Predictor analysis for onboard lossy predictive compression of multispectral and hyperspectral images,” *Journal of Applied Remote Sensing*, 2013, vol. 7, no. 1, p. 074591.
- [73] J. Li and Z. Liu, “Multispectral transforms using convolution neural networks for remote sensing multispectral image compression,” *Remote Sensing*, 2019, vol. 11, no. 7, p. 759.
- [74] J. S. Mielikainen, P. J. Toivanen, and A. Kaarna, “Linear prediction in lossless compression of hyperspectral images,” *Optical Engineering*, 2003, vol. 42, no. 4, pp. 1013–1018.
- [75] J. Luo, J. Wu, S. Zhao, L. Wang, and T. Xu, “Lossless compression for hyperspectral image using deep recurrent neural networks,” *International Journal of Machine Learning and Cybernetics*, 2019, pp. 1–11.
- [76] H. Shen, W. D. Pan, and Y. Dong, “Efficient lossless compression of 4d hyperspectral image data,” in *Proceedings of the 3rd International Conference on Advances in Big Data Analytics, Las Vegas, NV, USA*, 2016, pp. 25–28.
- [77] R. Sugiura, Y. Kamamoto, N. Harada, and T. Moriya, “Optimal golomb-rice code extension for lossless coding of low-entropy exponentially distributed sources,” *IEEE Transactions on Information Theory*, 2018, vol. 64, no. 4, pp. 3153–3161.
- [78] M. Conoscenti, R. Coppola, and E. Magli, “Constant snr, rate control, and entropy coding for predictive lossy hyperspectral image compression,” *IEEE Transactions on Geoscience and Remote Sensing*, 2016, vol. 54, no. 12, pp. 7431–7441.

- [79] D. Zhao, S. Zhu, and F. Wang, “Lossy hyperspectral image compression based on intra-band prediction and inter-band fractal encoding,” *Computers & Electrical Engineering*, 2016, vol. 54, pp. 494–505.
- [80] B. Rusyn, O. Lutsyk, Y. Lysak, A. Lukenyuk, and L. Pohreliuk, “Lossless image compression in the remote sensing applications,” in *2016 IEEE First International Conference on Data Stream Mining & Processing (DSMP)*. IEEE, 2016, pp. 195–198.
- [81] M. B. Nm, S. Sujatha, and A.-S. K. Pathan, “Skip block based distributed source coding for hyperspectral image compression,” *Multimedia Tools and Applications*, 2016, vol. 75, no. 18, pp. 11 267–11 289.
- [82] R. Pizzolante and B. Carpentieri, “Multiband and lossless compression of hyperspectral images,” *Algorithms*, 2016, vol. 9, no. 1, p. 16.
- [83] S. Shahriyar, M. Paul, M. Murshed, and M. Ali, “Lossless hyperspectral image compression using binary tree based decomposition,” in *2016 International Conference on Digital Image Computing: Techniques and Applications (DICTA)*. IEEE, 2016, pp. 1–8.
- [84] H. Shen, W. D. Pan, and D. Wu, “Predictive lossless compression of regions of interest in hyperspectral images with no-data regions,” *IEEE Transactions on Geoscience and Remote Sensing*, 2016, vol. 55, no. 1, pp. 173–182.
- [85] J. Fjeldtvedt, M. Orlandić, and T. A. Johansen, “An efficient real-time fpga implementation of the ccsds-123 compression standard for hyperspectral images,” *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 2018, vol. 11, no. 10, pp. 3841–3852.
- [86] Y. Barrios, A. Sanchez, L. Santos, S. López, J. F. López, and R. Sarmiento, “Hardware implementation of the ccsds 123.0-b-1 lossless multispectral and hy-

- perspectral image compression standard by means of high level synthesis tools,” in *2018 9th Workshop on Hyperspectral Image and Signal Processing: Evolution in Remote Sensing (WHISPERS)*. IEEE, 2018, pp. 1–5.
- [87] Z. Jiang, W. D. Pan, and H. Shen, “Lstm based adaptive filtering for reduced prediction errors of hyperspectral images,” in *2018 6th IEEE International Conference on Wireless for Space and Extreme Environments (WiSEE)*. IEEE, 2018, pp. 158–162.
- [88] M. I. Afjal, M. Al Mamun, and M. P. Uddin, “Band reordering heuristics for lossless satellite image compression with 3d-calic and ccscs,” *Journal of Visual Communication and Image Representation*, 2019, vol. 59, pp. 514–526.
- [89] S. Cang and A. Wang, “Research on hyperspectral image reconstruction based on gismt compressed sensing and interspectral prediction,” *International Journal of Optics*, 2020, vol. 2020.
- [90] D. Bascónes, C. González, and D. Mozos, “An extremely pipelined fpga implementation of a lossy hyperspectral image compression algorithm,” *IEEE Transactions on Geoscience and Remote Sensing*, 2020.
- [91] L. Ke and M. W. Marcellin, “Near-lossless image compression: minimum-entropy, constrained-error dpcm,” *IEEE Transactions on Image Processing*, 1998, vol. 7, no. 2, pp. 225–228.
- [92] D. Manak, S. Qian, A. Hollinger, and D. Williams, “Efficient hyperspectral data compression using vector quantization and scene segmentation,” *Canadian journal of remote sensing*, 1998, vol. 24, no. 2, pp. 133–143.
- [93] R. Gray, “Vector quantization,” *IEEE Assp Magazine*, 1984, vol. 1, no. 2, pp. 4–29.

- [94] S.-E. Qian, A. B. Hollinger, D. Williams, and D. Manak, "Vector quantization using spectral index-based multiple subcodebooks for hyperspectral data compression," *IEEE Transactions on Geoscience and Remote Sensing*, 2000, vol. 38, no. 3, pp. 1183–1190.
- [95] ———, "3d data compression of hyperspectral imagery using vector quantization with ndvi-based multiple codebooks," in *IGARSS'98. Sensing and Managing the Environment. 1998 IEEE International Geoscience and Remote Sensing. Symposium Proceedings. (Cat. No. 98CH36174)*, vol. 5. IEEE, 1998, pp. 2680–2684.
- [96] D. Báscones, C. González, and D. Mozos, "Hyperspectral image compression using vector quantization, pca and jpeg2000," *Remote Sensing*, 2018, vol. 10, no. 6, p. 907.
- [97] W. Jifara, F. Jiang, B. Zhang, H. Wang, J. Li, A. Grigorev, and S. Liu, "Hyperspectral image compression based on online learning spectral features dictionary," *Multimedia Tools and Applications*, 2017, vol. 76, no. 23, pp. 25 003–25 014.
- [98] R. Bal, A. Bakshi, and S. Gupta, "Performance evaluation of optimization techniques with vector quantization used for image compression," in *Harmony Search and Nature Inspired Optimization Algorithms*. Springer, 2019, pp. 879–888.
- [99] R. Li, Z. Pan, and Y. Wang, "The linear prediction vector quantization for hyperspectral image compression," *Multimedia Tools and Applications*, 2019, vol. 78, no. 9, pp. 11 701–11 718.
- [100] K. Gunasheela and H. Prasantha, "Compressive sensing approach to satellite hyperspectral image compression," in *Information and Communication Technology for Intelligent Systems*. Springer, 2019, pp. 495–503.

- [101] Z. Zha, X. Liu, X. Zhang, Y. Chen, L. Tang, Y. Bai, Q. Wang, and Z. Shang, “Compressed sensing image reconstruction via adaptive sparse nonlocal regularization,” *The Visual Computer*, 2018, vol. 34, no. 1, pp. 117–137.
- [102] F. Magalhães, F. M. Araújo, M. Correia, M. Abolbashari, and F. Farahi, “High-resolution hyperspectral single-pixel imaging system based on compressive sensing,” *Optical Engineering*, 2012, vol. 51, no. 7, p. 071406.
- [103] L. Liu, J. Yan, X. Zheng, H. Peng, D. Guo, and X. Qu, “Karhunen-loève transform for compressive sampling hyperspectral images,” *Optical Engineering*, 2015, vol. 54, no. 1, p. 014106.
- [104] K. Xu, B. Liu, Y. Nian, M. He, and J. Wan, “Distributed lossy compression for hyperspectral images based on multilevel coset codes,” *International Journal of Wavelets, Multiresolution and Information Processing*, 2017, vol. 15, no. 02, p. 1750012.
- [105] S. Kumar, S. Chaudhuri, B. Banerjee, and F. Ali, “Onboard hyperspectral image compression using compressed sensing and deep learning,” in *Proceedings of the European Conference on Computer Vision (ECCV)*, 2018, pp. 0–0.
- [106] K. Gunasheela and H. Prasantha, *Compressive Sensing Approach to Satellite Hyperspectral Image Compression: Proceedings of ICTIS 2018, Volume 1*. Information and Communication Technology for Intelligent Systems, 01 2019, pp. 495–503.
- [107] J. Xue, Y. Zhao, W. Liao, and J. C.-W. Chan, “Nonlocal tensor sparse representation and low-rank regularization for hyperspectral image compressive sensing reconstruction,” *Remote Sensing*, 2019, vol. 11, no. 2, p. 193.
- [108] E. Candes and T. Tao, “Decoding by linear programming,” *arXiv preprint math/0502327*, 2005.

- [109] Y.-D. Kim and S. Choi, "Nonnegative tucker decomposition," in *2007 IEEE Conference on Computer Vision and Pattern Recognition*. IEEE, 2007, pp. 1–8.
- [110] A. Karami, R. Heylen, and P. Scheunders, "Hyperspectral image compression optimized for spectral unmixing," *IEEE Transactions on Geoscience and Remote Sensing*, 2016, vol. 54, no. 10, pp. 5884–5894.
- [111] K. Rajan and V. Murugesan, "Hyperspectral image compression based on dwt and td with als method." *International Arab Journal of Information Technology (IAJIT)*, 2016, vol. 13, no. 4.
- [112] Y. Chong, W. Zheng, H. Li, and S. Pan, "Block-sparse tensor based spatial-spectral joint compression of hyperspectral images," in *International Conference on Intelligent Computing*. Springer, 2018, pp. 260–265.
- [113] A. Aidini, M. Giannopoulos, A. Pentari, K. Fotiadou, and P. Tsakalides, "Hyperspectral image compression and super-resolution using tensor decomposition learning," in *2019 53rd Asilomar Conference on Signals, Systems, and Computers*. IEEE, 2019, pp. 1369–1373.
- [114] J. E. Fowler, "Compressive-projection principal component analysis," *IEEE transactions on image processing*, 2009, vol. 18, no. 10, pp. 2230–2242.
- [115] İ. Ülkü and E. Kizgut, "Large-scale hyperspectral image compression via sparse representations based on online learning," *International Journal of Applied Mathematics and Computer Science*, 2018, vol. 28, no. 1, pp. 197–207.
- [116] W. Fu, S. Li, L. Fang, and J. A. Benediktsson, "Adaptive spectral–spatial compression of hyperspectral image with sparse representation," *IEEE Transactions on Geoscience and Remote Sensing*, 2016, vol. 55, no. 2, pp. 671–682.

-
- [117] C. Fu, Y. Yi, and F. Luo, "Hyperspectral image compression based on simultaneous sparse representation and general-pixels," *Pattern Recognition Letters*, 2018, vol. 116, pp. 65–71.
- [118] W. Zhu, Q. Du, and J. E. Fowler, "Multitemporal hyperspectral image compression," *IEEE Geoscience and Remote Sensing Letters*, 2010, vol. 8, no. 3, pp. 416–420.
- [119] Z. Wang, N. M. Nasrabadi, and T. S. Huang, "Spatial–spectral classification of hyperspectral images using discriminative dictionary designed by learning vector quantization," *IEEE Transactions on Geoscience and Remote Sensing*, 2013, vol. 52, no. 8, pp. 4808–4822.
- [120] H. Shen, Z. Jiang, and W. Pan, "Efficient lossless compression of multitemporal hyperspectral image data," *Journal of Imaging*, 2018, vol. 4, no. 12, p. 142.
- [121] G. S. Rao, G. V. Kumari, and B. P. Rao, "Image compression using neural network for biomedical applications," in *Soft Computing for Problem Solving*. Springer, 2019, pp. 107–119.
- [122] Y. M. Masalmah, C. Martínez Nieves, R. Rivera Soto, C. Velez, and J. Gonzalez, "A framework of hyperspectral image compression using neural networks," in *Latin American and Caribbean Conference for Engineering and Technology Proceedings*, vol. 13. Univ. del Turabo (Puerto Rico), 2015.
- [123] R. Dusselaar and M. Paul, "A block-based inter-band predictor using multilayer propagation neural network for hyperspectral image compression," *arXiv preprint arXiv:1902.04191*, 2019.
- [124] J. W. Chai, J. Wang, and C.-I. Chang, "Mixed principal-component-analysis/independent-component-analysis transform for hyperspectral image analysis," *Optical Engineering*, 2007, vol. 46, no. 7, p. 077006.

- [125] Z. Jiang, W. D. Pan, and H. Shen, “Universal golomb–rice coding parameter estimation using deep belief networks for hyperspectral image compression,” *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 2018, vol. 11, no. 10, pp. 3830–3840.
- [126] D. Valsesia and E. Magli, “High-throughput onboard hyperspectral image compression with ground-based cnn reconstruction,” *IEEE Transactions on Geoscience and Remote Sensing*, 2019.
- [127] B. Sujitha, V. S. Parvathy, E. L. Lydia, P. Rani, Z. Polkowski, and K. Shankar, “Optimal deep learning based image compression technique for data transmission on industrial internet of things applications,” *Transactions on Emerging Telecommunications Technologies*, 2020, p. e3976.
- [128] M. Nelson and J.-L. Gailly, *The data compression book*. M & t Books New York, 1996.
- [129] Y. Li, Y. Li, J. Song, W. Liu, and J. Li, “Distributed lossless compression algorithm for hyperspectral images based on the prediction error block and multiband prediction,” *Optical Engineering*, 2016, vol. 55, no. 12, p. 123114.
- [130] R. Ansari, E. Ceran, and N. D. Memon, “Near-lossless image compression techniques,” in *Visual Communications and Image Processing’98*, vol. 3309. International Society for Optics and Photonics, 1998, pp. 731–742.
- [131] A. J. Hussain, A. Al-Fayadh, and N. Radi, “Image compression techniques: A survey in lossless and lossy algorithms,” *Neurocomputing*, 2018, vol. 300, pp. 44–69.
- [132] R. Chandra, L. Dagum, D. Kohr, R. Menon, D. Maydan, and J. McDonald, *Parallel programming in OpenMP*. Morgan kaufmann, 2001.

-
- [133] W. Gropp, R. Thakur, and E. Lusk, *Using MPI-2: Advanced features of the message passing interface*. MIT press, 1999.
- [134] D. Pellerin and S. Thibault, *Practical FPGA programming in C*. Prentice Hall Press, 2005.
- [135] J. Sanders and E. Kandrot, *CUDA by example: an introduction to general-purpose GPU programming*. Addison-Wesley Professional, 2010.
- [136] Y. Peng, D. Meng, Z. Xu, C. Gao, Y. Yang, and B. Zhang, “Decomposable nonlocal tensor dictionary learning for multispectral image denoising,” in *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*, 2014, pp. 2949–2956.
- [137] Z. Wang, A. C. Bovik, H. R. Sheikh, E. P. Simoncelli *et al.*, “Image quality assessment: from error visibility to structural similarity,” *IEEE transactions on image processing*, 2004, vol. 13, no. 4, pp. 600–612.
- [138] J. M. Nascimento and J. M. Dias, “Vertex component analysis: A fast algorithm to unmix hyperspectral data,” *IEEE transactions on Geoscience and Remote Sensing*, 2005, vol. 43, no. 4, pp. 898–910.
- [139] R. H. Yuhas, J. W. Boardman, and A. F. Goetz, “Determination of semi-arid landscape endmembers and seasonal trends using convex geometry spectral unmixing techniques,” *Summaries of the 4th Annual JPL Airborne Geoscience Workshop*, 1993.
- [140] G. Motta, F. Rizzo, and J. A. Storer, *Hyperspectral data compression*. Springer Science & Business Media, 2006.
- [141] S. Sanjith and R. Ganesan, “A review on hyperspectral image compression,” in *2014 International Conference on Control, Instrumentation, Communication and Computational Technologies (ICCICCT)*. IEEE, 2014, pp. 1159–1163.

- [142] K. S. Babu, V. Ramachandran, K. Thyagarajan, and G. Santhosh, “Hyperspectral image compression algorithms—a review,” in *Artificial Intelligence and Evolutionary Algorithms in Engineering Systems*. Springer, 2015, pp. 127–138.
- [143] R. Dusselaar and M. Paul, “Hyperspectral image compression approaches: opportunities, challenges, and future directions: discussion,” *JOSA A*, 2017, vol. 34, no. 12, pp. 2170–2180.
- [144] K. Gunasheela and H. Prasantha, “Satellite image compression-detailed survey of the algorithms,” in *Proceedings of International Conference on Cognition and Recognition*. Springer, 2018, pp. 187–198.
- [145] A. B. Kiely, M. Klimesh, I. Blanes, J. Ligo, E. Magli, N. Aranki, M. Burl, R. Camarero, M. Cheng, S. Dolinar *et al.*, “The new ccsds standard for low-complexity lossless and near-lossless multispectral and hyperspectral image compression,” *International Workshop on On-Board Payload Data Compression*, 2018.
- [146] P. Xi, H. Guan, C. Shu, L. Borgeat, and R. Goubran, “An integrated approach for medical abnormality detection using deep patch convolutional neural networks,” *The Visual Computer*, 2020, vol. 36, no. 9, pp. 1869–1882.
- [147] J. Song, Z. Zhang, and X. Chen, “Lossless compression of hyperspectral imagery via rls filter,” *Electronics Letters*, 2013, vol. 49, no. 16, pp. 992–994.
- [148] N. Cheggoju and V. R. Satpute, “Inpac: Independent pass coding algorithm for robust image data transmission through low snr channels,” *The Visual Computer*, 2018, vol. 34, no. 4, pp. 563–573.
- [149] D. Foster, “Time-lapse hyperspectral images of natural scenes 2015,” accessed on: 20 Feb 2020. [Online]. Available: http://personalpages.manchester.ac.uk/staff/david.foster/Time-Lapse_HSIs/Time-Lapse_HSIs_2015.html

-
- [150] D. H. Foster, K. Amano, and S. M. Nascimento, “Time-lapse ratios of cone excitations in natural scenes,” *Vision research*, 2016, vol. 120, pp. 45–60.
- [151] M. Rouse and M. Rouse, “High-performance computing (hpc),” accessed on: 10 Jan 2019. [Online]. Available: <https://searchdatacenter.techtarget.com/definition/high-performance-computing-HPC>
- [152] M. Bernaschi, M. Bisson, and D. Rossetti, “Benchmarking of communication techniques for gpus,” *Journal of Parallel and Distributed Computing*, 2013, vol. 73, no. 2, pp. 250 – 255.
- [153] L. Kalms and D. Göhringer, “Scalable clustering and mapping algorithm for application distribution on heterogeneous and irregular fpga clusters,” *Journal of Parallel and Distributed Computing*, 2019, vol. 133, pp. 367 – 376.
- [154] NetApp, “What is high-performance computing (hpc)?: How it works,” Jan 2015, accessed on: 20 Oct 2018. [Online]. Available: <https://www.netapp.com/us/info/what-is-high-performance-computing.aspx>
- [155] L. M. E. Silvay and R. Buyya, “Parallel programming models and paradigms,” accessed on: 15 Sep 2021. [Online]. Available: <http://www.buyya.com/cluster/v2chap1.pdf>
- [156] F. N. Iandola, S. Han, M. W. Moskewicz, K. Ashraf, W. J. Dally, and K. Keutzer, “Squeezenet: Alexnet-level accuracy with 50x fewer parameters and < 0.5 mb model size,” *arXiv preprint arXiv:1602.07360*, 2016.
- [157] H. Amiri and A. Shahbahrami, “Simd programming using intel vector extensions,” *Journal of Parallel and Distributed Computing*, 2020, vol. 135, pp. 83–100.
- [158] Y. Lu, Y. Li, B. Song, W. Zhang, H. Chen, and L. Peng, “Parallelizing image feature extraction algorithms on multi-core platforms,” *Journal of Parallel and Distributed Computing*, 2016, vol. 92, pp. 1–14.

- [159] M. S. Rasmussen, M. B. Stuart, and S. Karlsson, “Parallelism and scalability in an image processing application,” *International journal of parallel programming*, 2009, vol. 37, no. 3, pp. 306–323.
- [160] P. E. Hadjidoukas, V. V. Dimakopoulos, M. Delakis, and C. Garcia, “A high-performance face detection system using openmp,” *Concurrency and Computation: Practice and Experience*, 2009, vol. 21, no. 15, pp. 1819–1837.
- [161] I. M. Spiliotis, M. P. Bekakos, and Y. S. Boutalis, “Parallel implementation of the image block representation using openmp,” *Journal of Parallel and Distributed Computing*, 2019.
- [162] Z. Shen, J. Luo, G. Huang, D. Ming, W. Ma, and H. Sheng, “Distributed computing model for processing remotely sensed images based on grid computing,” *Information Sciences*, 2007, vol. 177, no. 2, pp. 504–518.
- [163] A. Plaza, D. Valencia, J. Plaza, and P. Martinez, “Commodity cluster-based parallel processing of hyperspectral imagery,” *Journal of Parallel and Distributed Computing*, 2006, vol. 66, no. 3, pp. 345–358.
- [164] H. Kung and J. A. Webb, “Mapping image processing operations onto a linear systolic machine,” *Distributed Computing*, 1986, vol. 1, no. 4, pp. 246–257.
- [165] S. Cuomo, A. Galletti, and L. Marcellino, “A gpu algorithm in a distributed computing system for 3d mri denoising,” in *2015 10th International Conference on P2P, Parallel, Grid, Cloud and Internet Computing (3PGCIC)*. IEEE, 2015, pp. 557–562.
- [166] F. Gao and S. Guo, “Lossless compression of hyperspectral images using conventional recursive least-squares predictor with adaptive prediction bands,” *Journal of Applied Remote Sensing*, 2016, vol. 10, no. 1, p. 015010.

- [167] J. Song, L. Zhou, C. Deng, and J. An, “Lossless compression of hyperspectral imagery using a fast adaptive-length-prediction rls filter,” *Remote sensing letters*, 2019, vol. 10, no. 4, pp. 401–410.
- [168] M. Weinhardt and W. Luk, “Pipeline vectorization,” *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, 2001, vol. 20, no. 2, pp. 234–248.
- [169] S. v. d. Walt, S. C. Colbert, and G. Varoquaux, “The numpy array: a structure for efficient numerical computation,” *Computing in science & engineering*, 2011, vol. 13, no. 2, pp. 22–30.
- [170] V. Verma, N. Agarwal, and N. Khanna, “Dct-domain deep convolutional neural networks for multiple jpeg compression classification,” *Signal Processing: Image Communication*, 2018, vol. 67, pp. 22–33.
- [171] Y. LeCun, Y. Bengio *et al.*, “Convolutional networks for images, speech, and time series,” *The handbook of brain theory and neural networks*, 1995, vol. 3361, no. 10, p. 1995.
- [172] M. Radosavljević, B. Brkljač, P. Lugonja, V. Crnojević, Ž. Trpovski, Z. Xiong, and D. Vukobratović, “Lossy compression of multispectral satellite images with application to crop thematic mapping: A hevc comparative study,” *Remote Sensing*, 2020, vol. 12, no. 10, p. 1590.
- [173] J. Kuester, W. Gross, and W. Middelmann, “An approach to near-lossless hyperspectral data compression using deep autoencoder,” in *Image and Signal Processing for Remote Sensing XXVI*, vol. 11533. International Society for Optics and Photonics, 2020, p. 1153311.
- [174] I. Goodfellow, Y. Bengio, and A. Courville, *Deep learning*. MIT press, 2016.

- [175] G. E. Hinton and J. L. McClelland, “Learning representations by recirculation,” in *Neural information processing systems*, 1988, pp. 358–366.
- [176] P. Lessons, “Convolutional neural networks (cnn) explained step by step,” Feb 2020, accessed on: 22 Feb 2021. [Online]. Available: <https://medium.com/analytics-vidhya/convolutional-neural-networks-cnn-explained-step-by-step-69137a54e5e7>
- [177] U. Udofia, “Basic overview of convolutional neural network (cnn),” Sep 2019, accessed on: 05 Sep 2019. [Online]. Available: <https://medium.com/dataseries/basic-overview-of-convolutional-neural-network-cnn-4fcc7dbb4f17>
- [178] J. Ballé, V. Laparra, and E. P. Simoncelli, “End-to-end optimized image compression,” *arXiv preprint arXiv:1611.01704*, 2016.
- [179] D. P. Kingma and J. Ba, “Adam: A method for stochastic optimization,” *arXiv preprint arXiv:1412.6980*, 2014.
- [180] V. Dumoulin and F. Visin, “A guide to convolution arithmetic for deep learning,” *arXiv preprint arXiv:1603.07285*, 2016.
- [181] A. Masmoudi, A. Masmoudi, and W. Puech, “An efficient adaptive arithmetic coding for block-based lossless image compression using mixture models,” in *2014 IEEE International Conference on Image Processing (ICIP)*. IEEE, 2014, pp. 5646–5650.
- [182] U. Ojha and A. Garg, “Denoising high resolution multispectral images using deep learning approach,” in *2016 15th IEEE International Conference on Machine Learning and Applications (ICMLA)*. IEEE, 2016, pp. 871–875.
- [183] S. Jeyakumar and S. Sudha, “Hybrid hyperspectral image compression technique for non-iterative factorized tensor decomposition and principal component analy-

- sis: application for nasa's aviris data," *Computational Geosciences*, 2019, vol. 23, no. 5, pp. 969–979.
- [184] S. K. Roy, G. Krishna, S. R. Dubey, and B. B. Chaudhuri, "Hybridsn: Exploring 3-d-2-d cnn feature hierarchy for hyperspectral image classification," *IEEE Geoscience and Remote Sensing Letters*, 2019.
- [185] L. M. Bruce, C. H. Koger, and J. Li, "Dimensionality reduction of hyperspectral data using discrete wavelet transform feature extraction," *IEEE Transactions on geoscience and remote sensing*, 2002, vol. 40, no. 10, pp. 2331–2338.
- [186] M. Vetterli and J. Kovacevic, *Wavelets and subband coding*. Prentice-hall, 1995, no. BOOK.
- [187] P. N. T. Ammah and E. Owusu, "Robust medical image compression based on wavelet transform and vector quantization," *Informatics in Medicine Unlocked*, 2019, vol. 15, p. 100183.
- [188] M. D. Zeiler, D. Krishnan, G. W. Taylor, and R. Fergus, "Deconvolutional networks," in *2010 IEEE Computer Society Conference on computer vision and pattern recognition*. IEEE, 2010, pp. 2528–2535.
- [189] S. Mittal and S. Vaishay, "A survey of techniques for optimizing deep learning on gpus," *Journal of Systems Architecture*, 2019, vol. 99, p. 101635.
- [190] A. N. Philippe Monnoyer, "Vtt creates sixth sense for humanity," accessed on: 20 Oct 2021. [Online]. Available: <https://www.vttresearch.com/en/news-and-ideas/vtt-creates-sixth-sense-humanity>
- [191] Vimeo, "Imec hyperspectral camera," accessed on: 20 Oct 2021. [Online]. Available: <https://vimeo.com/64705346>

LIST OF PUBLICATIONS

Journal Papers

Yaman Dua, Vinod Kumar, and Ravi Shankar Singh. “Parallel lossless HSI compression based on RLS filter.” *Journal of Parallel and Distributed Computing* 150 (2021): 60-68. <https://doi.org/10.1016/j.jpdc.2020.12.004> (Elsevier, IF: 3.734)

Yaman Dua, Ravi Shankar Singh, Smit Lunagariya, Kshitij Parwani and Vinod Kumar. “Convolution Neural Network Based Lossy Compression of Hyperspectral Images.” *Signal Processing: Image Communication* 95 (2021): 116255. <https://doi.org/10.1016/j.image.2021.116255> (Elsevier, IF: 3.256)

Yaman Dua, Ravi Shankar Singh, and Vinod Kumar. “Compression of multi-temporal hyperspectral images based on RLS filter.” *The Visual Computer* (2020): 1-11. <https://doi.org/10.1007/s00371-020-02000-6> (Springer, IF: 2.601)

Yaman Dua, Vinod Kumar, and Ravi Shankar Singh. “Comprehensive review of hyperspectral image compression algorithms.” *Optical Engineering* 59.9 (2020): 090902. <https://doi.org/10.1117/1.OE.59.9.090902> (SPIE, IF: 1.098)

Yaman Dua, Vinod Kumar, and Ravi Shankar Singh. “TuckerNet: A Tucker Decomposition and Neural Network architecture for Hyperspectral Image Compression.” *IEEE Transactions on Multimedia* (IEEE, IF: 6.513) (Communicated)

Yaman Dua, Ravi Shankar Singh, and Vinod Kumar “WaveTraNet: A HSI compression model based on Wavelet Transform and ConvNet.” *IEEE Transactions on Signal Processing* (IEEE, IF: 4.9) (Communicated)

Yaman Dua, and Ravi Shankar Singh. “Advances in Image Compression Techniques for Remote Diagnosis and Medical History of COVID-19 Patients.” *Signal Image and Video Processing* (Springer, IF: 2.157) (Communicated)

Book Chapter

Yaman Dua, Vinod Kumar, and Ravi Shankar Singh (2021) “Advances in Parallel Techniques for Hyperspectral Image Processing.” In Sanjay Saxena and Sudip Paul (eds.) *High-Performance Medical Image Processing. Medicine & Health Sciences*. Apple Academic Press, Chapter No: 9.