References

(2004), "Automatic digital modulation recognition using artificial neural network and genetic algorithm", *Signal Processing*, Vol. 84, No. 2, pp. 351 – 365, special Section on Independent Component Analysis and Beyond 2004

Ahmadi, N. (2010), "Using fuzzy clustering and TTSAS algorithm for modulation classification based on constellation diagram", *Engineering Applications of Artificial Intelligence*, Vol. 23, No. 3, pp. 357–370 2010

Ali, A., Yangyu, F., and Liu, S. (2017), "Automatic modulation classification of digital modulation signals with stacked autoencoders", *Digital Signal Processing*, Vol. 71, pp. 108–116 2017

Anthimopoulos, M., Christodoulidis, S., Ebner, L., Christe, A., and Mougiakakou, S. (2016), "Lung pattern classification for interstitial lung diseases using a deep convolutional neural network", *IEEE transactions on medical imaging*, Vol. 35, No. 5, pp. 1207–1216 2016

Aslam, M. W., Zhu, Z., and Nandi, A. K. (2010), "Automatic digital modulation classification using genetic programming with K-nearest neighbor", *in Military Communications Conference, 2010-MILCOM 2010*, pp. 1731–1736, IEEE 2010

Aslam, M. W., Zhu, Z., and Nandi, A. K. (2012), "Automatic modulation classification using combination of genetic programming and KNN", *IEEE Transactions on wireless communications*, Vol. 11, No. 8, pp. 2742–2750 2012

Azarmanesh, O. and Bilén, S. G. (2013), "IQ diagram utilization in a novel modulation classification technique for cognitive radio applications", *EURASIP Journal on Wireless Communications and Networking*, Vol. 2013, No. 1, p. 289 2013

Azzouz, E. E. and Nandi, A. K. (1995), "Automatic identification of digital modulation types", *Signal Processing*, Vol. 47, No. 1, pp. 55–69 1995

Chen, T., Li, X., Yin, H., and Zhang, J. (2018), "Call attention to rumors: Deep attention based recurrent neural networks for early rumor detection", *in Pacific-Asia conference on knowledge discovery and data mining*, pp. 40–52, Springer 2018

Chen, W., Xie, Z., Ma, L., Liu, J., and Liang, X. (2019), "A faster maximum-likelihood modulation classification in flat fading non-Gaussian channels", *IEEE Communications Letters*, Vol. 23, No. 3, pp. 454–457 2019

Fehske, A., Gaeddert, J., and Reed, J. H. (2005), "A new approach to signal classification using spectral correlation and neural networks", *in New Frontiers in Dynamic Spectrum Access Networks, 2005. DySPAN 2005. 2005 First IEEE International Symposium on*, pp. 144–150, IEEE 2005

Fischer, T. and Krauss, C. (2018), "Deep learning with long short-term memory networks for financial market predictions", *European Journal of Operational Research*, Vol. 270, No. 2, pp. 654–669 2018

Gardner, W. A. and Spooner, C. M. (1988), "Cyclic spectral analysis for signal detection and modulation recognition", *in MILCOM 88, 21st Century Military Communications-What's Possible?'. Conference record. Military Communications Conference*, pp. 419–424, IEEE 1988

Han Gang, Li Jiandong, and Lu Donghua (2004), "Study of modulation recognition based on HOCs and SVM", *in 2004 IEEE 59th Vehicular Technology Conference. VTC 2004-Spring (IEEE Cat. No.04CH37514)*, Vol. 2, pp. 898–902 Vol.2 May 2004

Hauser, S. C., Headley, W. C., and Michaels, A. J. (2017), "Signal detection effects on deep neural networks utilizing raw IQ for modulation classification", *in MILCOM 2017 - 2017 IEEE Military Communications Conference (MILCOM)*, pp. 121–127 Oct 2017

Hazza, A., Shoaib, M., Alshebeili, S. A., and Fahad, A. (2013), "An overview of feature-based

methods for digital modulation classification", *in 2013 1st International Conference on Communications, Signal Processing, and their Applications (ICCSPA)*, pp. 1–6 Feb 2013

He, K., Zhang, X., Ren, S., and Sun, J. (2016), "Deep residual learning for image recognition", *in Proceedings of the IEEE conference on computer vision and pattern recognition*, pp. 770–778 2016

Hipp, J. E. (1986), "Modulation classification based on statistical moments", *in MILCOM 1986-IEEE Military Communications Conference: Communications-Computers: Teamed for the 90's*, Vol. 2, pp. 20–2, IEEE 1986

Hiremath, S. M., Behura, S., Kedia, S., Deshmukh, S., and Patra, S. K. (2019), "Deep Learning-Based Modulation Classification Using Time and Stockwell Domain Channeling", *in 2019 National Conference on Communications (NCC)*, pp. 1–6, IEEE 2019

Hossen, A., Al-Wadahi, F., and Jervase, J. A. (2007), "Classification of modulation signals using statistical signal characterization and artificial neural networks", *Engineering Applications of Artificial Intelligence*, Vol. 20, No. 4, pp. 463 – 472 2007, URL http://www.sciencedirect.com/science/article/pii/S0952197606001436

Hu, H., Wang, Y., and Song, J. (2008), "Signal Classification Based on Spectral Correlation Analysis and SVM in Cognitive Radio", *in 22nd International Conference on Advanced Information Networking and Applications (aina 2008)*, pp. 883–887 March 2008

Hu, S., Pei, Y., Liang, P. P., and Liang, Y.-C. (2019), "Deep neural network for robust modulation classification under uncertain noise conditions", *IEEE Transactions on Vehicular Technology*, Vol. 69, No. 1, pp. 564–577 2019

Ioffe, S. and Szegedy, C. (2015), "Batch normalization: Accelerating deep network training by reducing internal covariate shift", *arXiv preprint arXiv:1502.03167* 2015

Jajoo, G., Kumar, Y., Yadav, S. K., Adhikari, B., and Kumar, A. (2017), "Blind signal modulation recognition through clustering analysis of constellation signature", *Expert Systems with Applications*, Vol. 90, pp. 13–22 2017

Karra, K., Kuzdeba, S., and Petersen, J. (2017), "Modulation recognition using hierarchical deep neural networks", *in 2017 IEEE International Symposium on Dynamic Spectrum Access Networks (DySPAN)*, pp. 1–3 March 2017

Kermany, D. S., Goldbaum, M., Cai, W., Valentim, C. C., Liang, H., Baxter, S. L., McKeown, A., Yang, G., Wu, X., Yan, F. *et al.* (2018), "Identifying medical diagnoses and treatable diseases by image-based deep learning", *Cell*, Vol. 172, No. 5, pp. 1122–1131 2018

Keshk, M. E.-H. M., El-Naby, M. A., Al-Makhlasawy, R. M., El-Khobby, H. A., Hamouda, W., Elnaby, M. M. A., El-Rabaie, E.-S. M., Dessouky, M. I., Alshebeili, S. A., and El-Samie, F. E. A. (2015), "Automatic modulation recognition in wireless multi-carrier wireless systems with cepstral features", *Wireless Personal Communications*, Vol. 81, No. 3, pp. 1243–1288 2015

Kim, B., Kim, J., Chae, H., Yoon, D., and Choi, J. W. (2016), "Deep neural network-based automatic modulation classification technique", *in 2016 International Conference on Information and Communication Technology Convergence (ICTC)*, pp. 579–582 Oct 2016

Kim, B., Kim, J., Chae, H., Yoon, D., and Choi, J. W. (2016), "Deep neural network-based automatic modulation classification technique", *in 2016 International Conference on Information and Communication Technology Convergence (ICTC)*, pp. 579–582, IEEE 2016

Kumar, Y., Jajoo, G., and Yadav, S. K. (2020a), "2D-FFT Based Modulation Classification Using Deep Convolution Neural Network", *in 2020 IEEE 17th India Council International Conference (INDICON)*, pp. 1–6, IEEE 2020a

Kumar, Y., Sheoran, M., Jajoo, G., and Yadav, S. K. (2020b), "Automatic modulation classification based on constellation density using deep learning", *IEEE Communications Letters*, Vol. 24, No. 6, pp. 1275–1278 2020b

Liu, X., Yang, D., and Gamal, A. E. (2017), "Deep neural network architectures for modulation classification", *in 2017 51st Asilomar Conference on Signals, Systems, and Computers*, pp. 915–919 Oct 2017

Louis, C. and Sehier, P. (1994), "Automatic modulation recognition with a hierarchical neural

network", *in Proceedings of MILCOM'94*, pp. 713–717, IEEE 1994

Mendis, G. J., Wei, J., and Madanayake, A. (2016), "Deep learning-based automated modulation classification for cognitive radio", *in 2016 IEEE International Conference on Communication Systems (ICCS)*, pp. 1–6 Dec 2016

Meng, F., Chen, P., Wu, L., and Wang, X. (2018), "Automatic modulation classification: A deep learning enabled approach", *IEEE Transactions on Vehicular Technology*, Vol. 67, No. 11, pp. 10760–10772 2018

Mirarab, M. and Sobhani, M. (2007), "Robust modulation classification for PSK/QAM/ASK using higher-order cumulants", *in 2007 6th International Conference on Information, Communications & Signal Processing*, pp. 1–4, IEEE 2007

Mustafa, H. and Doroslovacki, M. (2004), "Digital modulation recognition using support vector machine classifier", *in Conference Record of the Thirty-Eighth Asilomar Conference on Signals, Systems and Computers, 2004.*, Vol. 2, pp. 2238–2242 Vol.2 Nov 2004

Nandi, A. and Azzouz, E. E. (1995), "Automatic analogue modulation recognition", *Signal processing*, Vol. 46, No. 2, pp. 211–222 1995

Nandi, A. K. and Azzouz, E. E. (1998), "Algorithms for automatic modulation recognition of communication signals", *IEEE Transactions on communications*, Vol. 46, No. 4, pp. 431–436 1998

Norouzi, S., Jamshidi, A., and Zolghadrasli, A. (2016), "Adaptive modulation recognition based on the evolutionary algorithms", *Applied Soft Computing*, Vol. 43, pp. 312–319 2016

O?Shea, T. J., Roy, T., and Clancy, T. C. (2018), "Over-the-air deep learning based radio signal classification", *IEEE Journal of Selected Topics in Signal Processing*, Vol. 12, No. 1, pp. 168–179 2018

Park, C., Choi, J., Nah, S., Jang, W., and Kim, D. Y. (2008), "Automatic Modulation Recognition of Digital Signals using Wavelet Features and SVM", *in 2008 10th International Conference on Advanced Communication Technology*, Vol. 1, pp. 387–390 Feb 2008

Peng, S., Jiang, H., Wang, H., Alwageed, H., and Yao, Y. (2017), "Modulation classification using convolutional Neural Network based deep learning model", *in 2017 26th Wireless and Optical Communication Conference (WOCC)*, pp. 1–5 April 2017

Peng, S., Jiang, H., Wang, H., Alwageed, H., Zhou, Y., Sebdani, M. M., and Yao, Y.-D. (2018), "Modulation classification based on signal constellation diagrams and deep learning", *IEEE transactions on neural networks and learning systems*, Vol. 30, No. 3, pp. 718–727 2018

Peng, S., Jiang, H., Wang, H., Alwageed, H., Zhou, Y., Sebdani, M. M., and Yao, Y. (2019), "Modulation Classification Based on Signal Constellation Diagrams and Deep Learning", *IEEE Transactions on Neural Networks and Learning Systems*, Vol. 30, No. 3, pp. 718–727 March 2019

Popoola, J. J. and van Olst, R. (2011), "Application of neural network for sensing primary radio signals in a cognitive radio environment", *in IEEE Africon'11*, pp. 1–6, IEEE 2011

Qian, L. and Zhu, C. (2010), "Modulation classification based on cyclic spectral features and neural network", *in 2010 3rd International Congress on Image and Signal Processing*, Vol. 8, pp. 3601–3605, IEEE 2010

Ramkumar, B. (2009), "Automatic modulation classification for cognitive radios using cyclic feature detection", *IEEE Circuits and Systems Magazine*, Vol. 9, No. 2, pp. 27–45 2009

Ranjan, R., Patel, V. M., and Chellappa, R. (2017), "Hyperface: A deep multi-task learning framework for face detection, landmark localization, pose estimation, and gender recognition", *IEEE Transactions on Pattern Analysis and Machine Intelligence*, Vol. 41, No. 1, pp. 121–135 2017

Sethi, A. and Ray, B. (2013), "Blind carrier/timing recovery and detection of modulation scheme", US Patent 8,605,830 Dec 10 2013

Shin, H.-C., Roth, H. R., Gao, M., Lu, L., Xu, Z., Nogues, I., Yao, J., Mollura, D., and Summers, R. M. (2016), "Deep convolutional neural networks for computer-aided detection: CNN architectures, dataset characteristics and transfer learning", *IEEE transactions on medical imaging*, Vol. 35, No. 5, pp. 1285–1298 2016

Soliman, S. S. and Hsue, S.-Z. (1992), "Signal classification using statistical moments", *IEEE Transactions on Communications*, Vol. 40, No. 5, pp. 908–916 1992

Sun, Y., Xue, B., Zhang, M., and Yen, G. G. (2019), "Completely automated CNN architecture design based on blocks", *IEEE transactions on neural networks and learning systems*, Vol. 31, No. 4, pp. 1242–1254 2019

Swami, A. and Sadler, B. M. (2000), "Hierarchical digital modulation classification using cumulants", *IEEE Transactions on communications*, Vol. 48, No. 3, pp. 416–429 2000

Szegedy, C., Ioffe, S., Vanhoucke, V., and Alemi, A. (2016), "Inception-v4, inception-resnet and the impact of residual connections on learning", *arXiv preprint arXiv:1602.07261* 2016

Teng, X., Tian, P., and Yu, H. (2008), "Modulation Classification Based on Spectral Correlation and SVM", *in 2008 4th International Conference on Wireless Communications, Networking and Mobile Computing*, pp. 1–4 Oct 2008

Tsai, C.-M. (2013), "Adaptive local power-law transformation for color image enhancement", *Applied Mathematics & Information Sciences*, Vol. 7, No. 5, p. 2019 2013

Umbach, D. and Jones, K. N. (2003), "A few methods for fitting circles to data", *IEEE Transactions on instrumentation and measurement*, Vol. 52, No. 6, pp. 1881–1885 2003

Wang, B., Sun, Y., Xue, B., and Zhang, M. (2019), "Evolving deep neural networks by multi-objective particle swarm optimization for image classification", *in Proceedings of the Genetic and Evolutionary Computation Conference*, pp. 490–498 2019

Wang, Y., Gui, G., Zhao, N., Huang, H., Liu, M., Sun, J., Gacanin, H., Sari, H., and Fumiyuki, A. (2020a), "Deep Learning Method for Generalized Modulation Classification under Varying Noise Condition", *in 2020 International Conference on Computing, Networking and Communications (ICNC)*, pp. 938–943, IEEE 2020a

Wang, Y., Yang, J., Liu, M., and Gui, G. (2020b), "LightAMC: Lightweight automatic modulation classification via deep learning and compressive sensing", *IEEE Transactions on Vehicular Technology*, Vol. 69, No. 3, pp. 3491–3495 2020b

Weber, C., Peter, M., and Felhauer, T. (2015), "Automatic modulation classification technique for radio monitoring", *Electronics Letters*, Vol. 51, No. 10, pp. 794–796 2015

Wong, M. D. and Nandi, A. K. (2004), "Automatic digital modulation recognition using artificial neural network and genetic algorithm", *Signal Processing*, Vol. 84, No. 2, pp. 351–365 2004

Wong, M. D., Ting, S. K., and Nandi, A. K. (2008), "Naive Bayes classification of adaptive broadband wireless modulation schemes with higher order cumulants", *in Signal Processing and Communication Systems, 2008. ICSPCS 2008. 2nd International Conference on*, pp. 1–5, IEEE 2008

Wong, M. L. D., Ting, S. K., and Nandi, A. K. (2008), "Naïve Bayes classification of adaptive broadband wireless modulation schemes with higher order cumulants", *in 2008 2nd International Conference on Signal Processing and Communication Systems*, pp. 1–5 Dec 2008

Yadav, Y. K., Jajoo, G., and Yadav, S. K. (2017), "Modulation scheme detection of blind signal using constellation graphical representation", *in 2017 International conference on computer, communications and electronics (Comptelix)*, pp. 231–235, IEEE 2017

Zhang, Z., Wang, C., Gan, C., Sun, S., and Wang, M. (2019), "Automatic modulation classification using convolutional neural network with features fusion of SPWVD and BJD", *IEEE Transactions on Signal and Information Processing over Networks*, Vol. 5, No. 3, pp. 469–478 2019

Zheng, S., Qi, P., Chen, S., and Yang, X. (2019), "Fusion methods for CNN-based automatic modulation classification", *IEEE Access*, Vol. 7, pp. 66496–66504 2019