DAFTAR PUSTAKA

[1] Kaspersky. (2023) Biometrics definition. [Online]. Available: https://www.kaspersky.com/resource-center/definitions/biometrics

[2] D. of Homeland Security. (n.d.) Biometrics. [Online]. Available: https://www.dhs.gov/biometrics

[3] Recogtech. (2021) 5 common biometric techniques compared. [Online]. Available: https://www.recogtech.com/en/knowledge-base/5-common-biometric-techniques-compared

[4] AnyConnect. (2022) Facial recognition applications: How the tech is being used today. [Online]. Available: https://anyconnect.com/blog/facial-recognition-applications/

[5] O. NISP. (2022) Kyc adalah? [Online]. Available: https://www.ocbcnisp.com/id/article/2022/03/11/kyc-adalah

[6] O. Lucena, A. Junior, V. Moia, R. Souza, E. Valle, and R. Lotufo, "Transfer learning using convolutional neural networks for face anti-spoofing," in *Image Analysis and Recognition: 14th International Conference, ICIAR 2017, Montreal, QC, Canada, July 5–7, 2017, Proceedings 14*. Springer, 2017, pp. 27–34.

[7] Z. Yu, Y. Qin, X. Li, C. Zhao, Z. Lei, and G. Zhao, "Deep learning for face anti-spoofing: A survey," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 2022.

[8] J. Yang, Z. Lei, and S. Z. Li, "Learn convolutional neural network for face anti-spoofing," *arXiv preprint arXiv:1408.5601*, 2014.

[9] Y. A. U. Rehman, L. M. Po, and M. Liu, "Deep learning for face anti-spoofing: An end-to-end approach," in *2017 Signal Processing: Algorithms, Architectures, Arrangements, and Applications (SPA)*. IEEE, 2017, pp. 195–200.

[10] J. Li, Y. Wang, T. Tan, and A. K. Jain, "Live face detection based on the analysis of fourier spectra," in *Biometric technology for human identification*, vol. 5404. SPIE, 2004, pp. 296–303.

[11] J. Määttä, A. Hadid, and M. Pietikäinen, "Face spoofing detection from single images using micro-texture analysis," in *2011 international joint conference on Biometrics (IJCB)*. IEEE, 2011, pp. 1–7.

[12] G. Pan, L. Sun, Z. Wu, and S. Lao, "Eyeblink-based anti-spoofing in face recognition from a generic webcamera," in *2007 IEEE 11th international conference on computer vision*. IEEE, 2007, pp. 1–8.

[13] L. Sun, G. Pan, Z. Wu, and S. Lao, "Blinking-based live face detection using conditional random fields," in *Advances in Biometrics: International Conference, ICB 2007, Seoul, Korea, August 27-29, 2007. Proceedings*. Springer, 2007, pp. 252–260.

[14] K. Kollreider, H. Fronthaler, M. I. Faraj, and J. Bigun, "Real-time face detection and motion analysis with application in "liveness" assessment," *IEEE Transactions on Information Forensics and Security*, vol. 2, no. 3, pp. 548–558, 2007.

[15] M. De Marsico, M. Nappi, D. Riccio, and J.-L. Dugelay, "Moving face spoofing detection via 3d projective invariants," in *2012 5th IAPR International Conference on Biometrics (ICB)*. IEEE, 2012, pp. 73–78.

[16] I. Pavlidis and P. Symosek, "The imaging issue in an automatic face/disguise detection system," in *Proceedings IEEE Workshop on Computer Vision Beyond the Visible Spectrum: Methods and Applications (Cat. No. PR00640)*. IEEE, 2000, pp. 15–24.

[17] Z. Zhang, D. Yi, Z. Lei, and S. Z. Li, "Face liveness detection by learning multispectral reflectance distributions," in *2011 IEEE International Conference on Automatic Face & Gesture Recognition (FG)*. IEEE, 2011, pp. 436–441.

[18] X. Tu, Z. Ma, J. Zhao, G. Du, M. Xie, and J. Feng, "Learning generalizable and identity-discriminative representations for face anti-spoofing," *ACM Transactions on Intelligent Systems and Technology (TIST)*, vol. 11, no. 5, pp. 1–19, 2020.

[19] C. Nagpal and S. R. Dubey, "A performance evaluation of convolutional neural networks for face anti spoofing," in *2019 International Joint Conference on Neural Networks (IJCNN)*. IEEE, 2019, pp. 1–8.

[20] Y. A. U. Rehman, L.-M. Po, M. Liu, Z. Zou, W. Ou, and Y. Zhao, "Face liveness detection using convolutional-features fusion of real and deep network generated face images," *Journal of Visual Communication and Image Representation*, vol. 59, pp. 574–582, 2019.

[21] Z. Xu, S. Li, and W. Deng, "Learning temporal features using lstm-cnn architecture for face anti-spoofing," in *2015 3rd IAPR asian conference on pattern recognition (ACPR)*. IEEE, 2015, pp. 141–145.

[22] L. Li, Z. Xia, L. Li, X. Jiang, X. Feng, and F. Roli, "Face anti-spoofing via hybrid convolutional neural network," in *2017 International Conference on the Frontiers and Advances in Data Science (FADS)*. IEEE, 2017, pp. 120–124.

[23] O. Russakovsky, J. Deng, H. Su, J. Krause, S. Satheesh, S. Ma, Z. Huang, A. Karpathy, A. Khosla, M. Bernstein *et al.*, "Imagenet large scale visual recognition challenge," *International journal of computer vision*, vol. 115, pp. 211–252, 2015.

[24] K. Simonyan and A. Zisserman, "Very deep convolutional networks for large-scale image recognition," *arXiv preprint arXiv:1409.1556*, 2014.

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

[26] J. Yosinski, J. Clune, Y. Bengio, and H. Lipson, "How transferable are features in deep neural networks?" *Advances in neural information processing systems*, vol. 27, 2014.

[27] T.-W. Li and G.-C. Lee, "Performance analysis of fine-tune transferred deep learning," in *2021 IEEE 3rd Eurasia Conference on IOT, Communication and Engineering (ECICE)*, 2021, pp. 315–319.

[28] M. Abadi, A. Agarwal, P. Barham, E. Brevdo, Z. Chen, C. Citro, G. S. Corrado, A. Davis, J. Dean, M. Devin, S. Ghemawat, I. Goodfellow, A. Harp, G. Irving, M. Isard, Y. Jia, R. Jozefowicz, L. Kaiser, M. Kudlur, J. Levenberg, D. Mané, R. Monga, S. Moore, D. Murray, C. Olah, M. Schuster, J. Shlens, B. Steiner, I. Sutskever, K. Talwar, P. Tucker, V. Vanhoucke, V. Vasudevan, F. Viégas, O. Vinyals, P. Warden, M. Wattenberg, M. Wicke, Y. Yu, and X. Zheng, "TensorFlow: Large-scale machine learning on heterogeneous systems," 2015, software available from tensorflow.org. [Online]. Available: https://www.tensorflow.org/

[29] I. Chingovska, A. Anjos, and S. Marcel, "On the effectiveness of local binary patterns in face anti-spoofing," in *2012 BIOSIG-proceedings of the international conference of biometrics special interest group (BIOSIG)*. IEEE, 2012, pp. 1–7.

[30] T. de Freitas Pereira, A. Anjos, J. M. De Martino, and S. Marcel, "Lbp- top based countermeasure against face spoofing attacks," in *Computer Vision-ACCV 2012 Workshops: ACCV 2012 International Workshops, Daejeon, Korea, November 5-6, 2012, Revised Selected Papers, Part I 11*. Springer, 2013, pp. 121–132.

[31] ——, "Can face anti-spoofing countermeasures work in a real world scenario?" in *2013 International Conference on Biometrics (ICB)*, 2013, pp. 1–8.

[32] X. Tan, Y. Li, J. Liu, and L. Jiang, "Face liveness detection from a single image with sparse low rank bilinear discriminative model." *ECCV (6)*, vol. 6316, pp. 504–517, 2010.

[33] R. B. Hadiprakoso and I. K. S. Buana, "Deteksi serangan spoofing wajah menggunakan convolutional neural network," *Jurnal Teknik Informatika dan Sistem Informasi*, vol. 7, no. 3, pp. 618–626, 2021.

[34] Y. Zuo, W. Gao, and J. Wang, "Face liveness detection algorithm based on livenesslight network," in *2020 International Conference on High Performance Big Data and Intelligent Systems (HPBD&IS)*. IEEE, 2020, pp. 1–5.

[35] R. Koshy and A. Mahmood, "Optimizing deep cnn architectures for face liveness detection," *Entropy*, vol. 21, no. 4, p. 423, 2019.

[36] X. Tu and Y. Fang, "Ultra-deep neural network for face anti-spoofing," in *Neural Information Processing: 24th International Conference, ICONIP 2017, Guangzhou, China, November 14-18, 2017, Proceedings, Part II 24*. Springer, 2017, pp. 686–695.

[37] Y. K. Sharma, M. S. P. Patil, and R. D. Patil, "Deep transfer learning for face spoofing detection," *IOSR Journal of Computer Engineering*, vol. 22, pp. 16–20, 10 2020.

[38] G. B. de Souza, J. P. Papa, and A. N. Marana, "On the learning of deep local features for robust face spoofing detection," in *2018 31st SIBGRAPI Conference on Graphics, Patterns and Images (SIBGRAPI)*. IEEE, 2018, pp. 258–265.

[39] B. Chen, W. Yang, and S. Wang, "Face anti-spoofing by fusing high and low frequency features for advanced generalization capability," in *2020 IEEE Conference on Multimedia Information Processing and Retrieval (MIPR)*. IEEE, 2020, pp. 199–204.

[40] M. M. Chakka, A. Anjos, S. Marcel, R. Tronci, D. Muntoni, G. Fadda, M. Pili, N. Sirena, G. Murgia, M. Ristori *et al.*, "Competition on counter measures to 2-d facial spoofing attacks," in *2011 International Joint Conference on Biometrics (IJCB)*. IEEE, 2011, pp. 1–6.

[41] J. Yang, Z. Lei, S. Liao, and S. Z. Li, "Face liveness detection with component dependent descriptor," in *2013 International Conference on Biometrics (ICB)*. IEEE, 2013, pp. 1–6.

[42] V. Wiley and T. Lucas, "Computer vision and image processing: a paper review," *International Journal of Artificial Intelligence Research*, vol. 2, no. 1, pp. 29–36, 2018.

[43] Y. Guo, Y. Liu, A. Oerlemans, S. Lao, S. Wu, and M. S. Lew, "Deep learning for visual understanding: A review," *Neurocomputing*, vol. 187, pp. 27–48, 2016.

[44] J. Chai, H. Zeng, A. Li, and E. W. Ngai, "Deep learning in computer vision: A critical review of emerging techniques and application scenarios," *Machine Learning with Applications*, vol. 6, p. 100134, 2021.

[45] ISO/IEC 30107-3: Information technology - biometric presentation attack detection - part 3: Testing and reporting. Online. Accessed: April 20, 2023. [Online]. Available: https://www.iso.org/obp/ui/#iso:std:iso-iec:30107:-3:dis:ed-1:v1:en:sec:6

[46] IBM. (2021) Machine learning. [Online]. Available: https://www.ibm.com/topics/machine-learning

[47] M. S. S. of Management. (2018) Machine learning explained. [Online]. Available: https://mitsloan.mit.edu/ideas-made-to-matter/machine-learning-explained

[48] SuperAnnotate. (2021) Supervised learning and other machine learning tasks. [Online]. Available: https://www.superannotate.com/blog/supervised-learning-and-other-machine-learning-tasks#supervised-learning

[49] ResearchGate. (2019) Supervised learning and unsupervised learning. [Online]. Available: https://www.researchgate.net/figure/Supervised-learning-and-unsupervised-learning-Supervised-learning-uses-annotation_fig1_329533120

[50] ——. (2019) Illustration of how reinforcement learning works. [Online]. Available: https://www.researchgate.net/figure/Illustration-of-how-Reinforcement-Learning-works-4_fig1_322398453

[51] IBM. (2021) Neural networks. [Online]. Available: https://www.ibm.com/id-en/topics/neural-networks

[52] V. Labs. (2021) Neural network architectures: A comprehensive guide. [Online]. Available: https://www.v7labs.com/blog/neural-network-architectures-guide

[53] GeeksforGeeks. (2021) Introduction to deep learning. [Online]. Available: https://www.geeksforgeeks.org/introduction-deep-learning/

[54] IBM. (2021) Deep learning. [Online]. Available: https://www.ibm.com/id-en/topics/deep-learning

[55] Tanvi. (2021) Forward and backward propagation: Understanding it to master the model training process. [Online]. Available: https://medium.com/geekculture/forward-and-backward-propagation-understanding-it-to-master-the-model-training-process-3819

[56] D. S. G. IITR. (2019) Loss functions and optimization algorithms demystified. [Online]. Available: https://medium.com/data-science-group-iitr/loss-functions-and-optimization-algorithms-demystified-bb92daff331c

[57] Baeldung. (2021) Neural networks: Backprop vs feedforward. [Online]. Available: https://www.baeldung.com/cs/neural-networks-backprop-vs-feedforward

[58] V. Labs, "Neural network activation functions," https://www.v7labs.com/blog/neural-networks-activation-functions, accessed on 23 April 2023.

[59] B. In, "Loss functions in machine learning," https://builtin.com/machine-learning/loss-functions, accessed on 23 April 2023.

[60] Intellipaat, "Convolutional neural networks tutorial for beginners," https://intellipaat.com/blog/tutorial/artificial-intelligence-tutorial/convolution-neural-network/, accessed on 23 April 2023.

[61] S. Team, "The ultimate guide to convolutional neural networks (cnn)," https://www.superdatascience.com/blogs/the-ultimate-guide-to-convolutional-neural-networks-cnn, accessed on 24 April 2023.

[62] S. University, "Pooling layers," https://cs217.stanford.edu/poolinglayers, accessed on 24 April 2023.

[63] A. I. Magazine, "Everything you should know about dropouts and batchnormalization in cnn," https://analyticsindiamag.com/everything-you-should-know-about-dropouts-and-batchnormalization-in-cnn/, accessed on 24 April 2023.

[64] C. Szegedy, W. Liu, Y. Jia, P. Sermanet, S. Reed, D. Anguelov, D. Erhan, V. Vanhoucke, and A. Rabinovich, "Going deeper with convolutions," in *Proceedings of the IEEE conference on computer vision and pattern recognition*, 2015, pp. 1–9.

[65] C. Szegedy, V. Vanhoucke, S. Ioffe, J. Shlens, and Z. Wojna, "Rethinking the inception architecture for computer vision," in *Proceedings of the IEEE conference on computer vision and pattern recognition*, 2016, pp. 2818–2826.

[66] F. Chollet, "Xception: Deep learning with depthwise separable convolutions," in *Proceedings of the IEEE conference on computer vision and pattern recognition*, 2017, pp. 1251–1258.

[67] Google, "Transfer learning and fine-tuning with keras," https://www.tensorflow.org/guide/keras/transfer_learning, Accessed 2023, April 26.

[68] Neptune.ai. (n.d.) Performance metrics in machine learning: Complete guide. [Online]. Available: https://neptune.ai/blog/performance-metrics-in-machine-learning-complete-guide

[69] I. Chingovska, A. R. Dos Anjos, and S. Marcel, "Biometrics evaluation under spoofing attacks," *IEEE transactions on Information Forensics and Security*, vol. 9, no. 12, pp. 2264–2276, 2014.

[70] A. Sabaghi, M. Oghbaie, K. Hashemifard, and M. Akbari, "Deep learning meets liveness detection: recent advancements and challenges," *arXiv preprint arXiv:2112.14796*, 2021.

[71] G. Van Rossum and F. L. Drake, *Python 3 Reference Manual*. Scotts Valley, CA: CreateSpace, 2009.

[72] Google. (n.d.) Python introduction. [Online]. Available: https://developers.google.com/edu/python/introduction

[73] P. S. Foundation, "Python applications," https://www.python.org/about/apps/, Accessed 2023, April 26.

[74] Google, "Tensorflow," https://www.tensorflow.org/, Accessed 2023, April 26.

[75] TensorFlow. (2018) Training and serving ml models with tf.keras. [Online]. Available: https://blog.tensorflow.org/2018/08/training-and-serving-ml-models-with-tf-keras.html

[76] F. Chollet *et al.* (2015) Keras. [Online]. Available: https://github.com/fchollet/keras

[77] K. Team, "Keras: The python deep learning api," https://keras.io/about/, Accessed 2023, April 26.

[78] S. I. Serengil and A. Ozpinar, "Lightface: A hybrid deep face recognition framework," in *2020 Innovations in Intelligent Systems and Applications Conference (ASYU)*. IEEE, 2020, pp. 23–27. [Online]. Available: https://doi.org/10.1109/ASYU50717.2020.9259802