











## REFERENCES

- [1] B. Li, H. Huang, A. Zhang, P. Liu, and C. Liu, "Approaches on crowd counting and density estimation: a review," *Pattern Analysis and Applications*, vol. 24, no. 3, pp. 853–874, Feb. 2021, doi:10.1007/s10044-021-00959-z.
- [2] M. A. Khan, H. Menouar, and R. Hamila, "Revisiting crowd counting: State-of-the-art, trends, and future perspectives," *Image and Vision Computing*, vol. 129, p. 104597, Jan. 2023, doi:10.1016/j.imavis.2022.104597.
- [3] D. Morgan, "Where are we?: camera movements and the problem of point of view," *New Review of Film and Television Studies*, vol. 14, no. 2, pp. 222–248, Feb. 2016, doi: 10.1080/17400309.2015.1125702.
- [4] H. Rahmalan, M. S. Nixon, and J. N. Carter, "On crowd density estimation for surveillance," *IET Conference on Crime and Security*, vol. 2006, pp. 540–545, 2006, doi: 10.1049/ic:20060360.
- [5] H. Rahmalan, N. Suryana, & N. A. Abu, "A general approach for measuring crowd movement," *Malaysian Technical Universities Conference and Exhibition on Engineering and Technology*, Jan. 2009.
- [6] S. A. M. Saleh, S. A. Suandi, and H. Ibrahim, "Recent survey on crowd density estimation and counting for visual surveillance," *Engineering Applications of Artificial Intelligence*, vol. 41, pp. 103–114, May 2015, doi: 10.1016/j.engappai.2015.01.007.
- [7] Z. Fan, H. Zhang, Z. Zhang, G. Lu, Y. Zhang, and Y. Wang, "A survey of crowd counting and density estimation based on convolutional neural network," *Neurocomputing*, vol. 472, pp. 224–251, Feb. 2022, doi: 10.1016/j.neucom.2021.02.103.
- [8] M. Elgendy, *Deep learning for vision systems*, Simon and Schuster, 2020.
- [9] N. Sharma, R. Sharma, & N. Jindal, "Machine learning and deep learning applications-a vision," *Global Transitions Proceedings*, 2(1), pp. 24–28, 2021.
- [10] N. O'Mahony, S. Campbell, A. Carvalho, S. Harapanahalli, G. V. Hernandez, L. Krpalkova, & J. Walsh, "Deep Learning vs. Traditional Computer Vision," *Advances in Computer Vision*, pp. 128–144, Apr. 2019, doi: 10.1007/978-3-030-17795-9\_10.
- [11] S. Islam et al., "A comprehensive survey on applications of transformers for deep learning tasks," *Expert Systems with Applications*, vol. 241, p. 122666, May 2024, doi:10.1016/j.eswa.2023.122666.
- [12] A. Dosovitskiy, L. Beyer, A. Kolesnikov, D. Weissenborn, X. Zhai, T. Unterthiner, & N. Houlsby, "An image is worth 16x16 words: Transformers for image recognition at scale," *arXiv preprint arXiv:2010.11929*, 2020.
- [13] M. Raghu, T. Unterthiner, S. Kornblith, C. Zhang, & A. Dosovitskiy, "Do vision transformers see like convolutional neural networks?," *Advances in Neural Information Processing Systems*, 34, pp. 12116–12128, 2021.
- [14] Y. Chen, J. Yang, B. Chen, and S. Du, "Counting Varying Density Crowds Through Density Guided Adaptive Selection CNN and Transformer Estimation," *IEEE Transactions on Circuits and Systems for Video Technology*, vol. 33, no. 3, pp. 1055–1068, Mar. 2023, doi:10.1109/tcsvt.2022.3208714.
- [15] Y. Xiao et al., "A review of object detection based on deep learning," *Multimedia Tools and Applications*, vol. 79, no. 33–34, pp. 23729–23791, Jun. 2020, doi: 10.1007/s11042-020-08976-6.
- [16] H. Lin, Z. Ma, R. Ji, Y. Wang, and X. Hong, "Boosting Crowd Counting via Multifaceted Attention," *2022 IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, Jun. 2022, doi:10.1109/cvpr52688.2022.01901.
- [17] H. Lin, Z. Ma, X. Hong, Q. Shangguan, and D. Meng, "Gramformer: Learning Crowd Counting via Graph-Modulated Transformer," *Proceedings of the AAAI Conference on Artificial Intelligence*, vol. 38, no. 4, pp. 3395–3403, Mar. 2024, doi: 10.1609/aaai.v38i4.28126.
- [18] M. Zand, H. Damirchi, A. Farley, M. Molahasani, M. Greenspan, and A. Etemad, "Multiscale Crowd Counting and Localization By Multitask Point Supervision," *ICASSP 2022 - 2022 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, May 2022, doi: 10.1109/icassp43922.2022.9747776.
- [19] C. Xu, K. Qiu, J. Fu, S. Bai, Y. Xu, and X. Bai, "Learn to Scale: Generating Multipolar Normalized Density Maps for Crowd Counting," *2019 IEEE/CVF International Conference on Computer Vision (ICCV)*, vol. 521, pp. 8381–8389, Oct. 2019, doi:10.1109/iccv.2019.00847.
- [20] C. Liu, H. Lu, Z. Cao, and T. Liu, "Point-Query Quadtree for Crowd Counting, Localization, and More," *2023 IEEE/CVF International Conference on Computer Vision (ICCV)*, vol. 2105, pp. 1676–1685, Oct. 2023, doi: 10.1109/iccv51070.2023.00161.
- [21] V. Sindagi, R. Yasarla, and V. M. M. Patel, "JHU-CROWD++: Large-Scale Crowd Counting Dataset and A Benchmark Method," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, pp. 1–1, 2020, doi: 10.1109/tpami.2020.3035969.
- [22] Q. Wang, J. Gao, W. Lin, and X. Li, "NWPU-Crowd: A Large-Scale Benchmark for Crowd Counting and Localization," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 43, no. 6, pp. 2141–2149, Jun. 2021, doi: 10.1109/tpami.2020.3013269.
- [23] T. E. Oliphant, *Guide to NumPy (Vol. 1, p. 85)*, USA: Trelgol Publishing, 2006.
- [24] S. van der Walt, S. C. Colbert, and G. Varoquaux, "The NumPy Array: A Structure for Efficient Numerical Computation," *Computing in Science & Engineering*, vol. 13, no. 2, pp. 22–30, Mar. 2011, doi:10.1109/mcse.2011.37.
- [25] R. Shen, S. Bubeck, & S. Gunasekar, "Data augmentation as feature manipulation," *In International Conference on Machine Learning (PMLR)*, pp. 19773–19808, June, 2022.
- [26] S.-H. Choi, "A study on Object Detection Method using Raspberry Pi," *Intelligent Information Convergence and Future Education*, pp.1-6, 2022.
- [27] S.-H. Go, S.-M. Yang, H.-Y. Kim, and S.-B. Gwak, "Multi-Spectrum CNN-Based High-Resolution Color Image Interpolation Technique," *The Korean Association of Computer Education*, 27(3), pp. 145-153, 2024.
- [28] D. Kim, J. Jeon, S. Lim, and H. Lee, "An Object Pseudo-Label Generation Technique based on Self-Supervised Vision Transformer for Improving Dataset Quality," *Journal of KIISE*, vol. 51, no. 1, pp. 49–58, Jan. 2024, doi: 10.5626/jok.2024.51.1.49.
- [29] A. Paszke, S. Gross, F. Massa, A. Lerer, J. Bradbury, G., Chanan, & S. Chintala, "PyTorch: An imperative style, high-performance deep learning library," *Advances in Neural Information Processing Systems*, 32, 2019.
- [30] S. Imambi, K. B. Prakash, & G. R. Kanagachidambaresan, *PyTorch. Programming with TensorFlow: solution for edge computing applications*, pp. 87-104, 2021.
- [31] Z. Ma, X. Hong, X. Wei, Y. Qiu, and Y. Gong, "Towards A Universal Model for Cross-Dataset Crowd Counting," *2021 IEEE/CVF International Conference on Computer Vision (ICCV)*, Oct. 2021, doi:10.1109/iccv48922.2021.00319.