References

[1] Y. Li, Y. Li, and N. Vasconcelos, "Resound: Towards action recognition without representation bias," in *Proceedings of the European Conference on Computer Vision (ECCV)*, 2018, pp. 513–528.

[2] L. Wang, Y. Xiong, Z. Wang, Y. Qiao, D. Lin, X. Tang, and L. Van Gool, "Temporal segment networks: Towards good practices for deep action recognition," in *European conference on computer vision*. Springer, 2016, pp. 20–36.

[3] J. Carreira and A. Zisserman, "Quo vadis, action recognition? a new model and the kinetics dataset," in *proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*, 2017, pp. 6299–6308.

[4] R. Geirhos, P. Rubisch, C. Michaelis, M. Bethge, F. A. Wichmann, and W. Brendel, "Imagenet-trained CNNs are biased towards texture; increasing shape bias improves accuracy and robustness." in *International Conference on Learning Representations*, 2019. [Online]. Available: https://openreview.net/forum?id=Bygh9j09KX

[5] T. Miller, "Explanation in artificial intelligence: Insights from the social sciences," *Artificial intelligence*, vol. 267, pp. 1–38, 2019.

[6] W. Brendel and M. Bethge, "Approximating cnns with bag-of-local-features models works surprisingly well on imagenet," *arXiv preprint arXiv:1904.00760*, 2019.

[7] S. Dodge and L. Karam, "A study and comparison of human and deep learning recognition performance under visual distortions," in *2017 26th international conference on computer communication and networks (ICCCN)*. IEEE, 2017, pp. 1–7.

[8] Y. Li and N. Vasconcelos, "Repair: Removing representation bias by dataset resampling," in *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*, 2019, pp. 9572–9581.

[9] S. Barocas, M. Hardt, and A. Narayanan, *Fairness and Machine Learning*. fairmlbook.org, 2019, http://www.fairmlbook.org.

[10] R. R. Selvaraju, M. Cogswell, A. Das, R. Vedantam, D. Parikh, and D. Batra, "Grad-cam: Visual explanations from deep networks via gradient-based localization," in *Proceedings of the IEEE international conference on computer vision*, 2017, pp. 618–626.

[11] I. Goodfellow, Y. Bengio, A. Courville, and Y. Bengio, *Deep learning*. MIT press Cambridge, 2016, vol. 1, no. 2.

[12] J. Schmidhuber, "Deep learning in neural networks: An overview," *Neural networks*, vol. 61, pp. 85–117, 2015.

[13] A. H. Marblestone, G. Wayne, and K. P. Kording, "Toward an integration of deep learning and neuroscience," *Frontiers in computational neuroscience*, vol. 10, p. 94, 2016.

[14] L. Deng and D. Yu, "Deep learning: methods and applications," *Foundations and trends in signal processing*, vol. 7, no. 3–4, pp. 197–387, 2014.

[15] Y. LeCun, Y. Bengio, and G. Hinton, "Deep learning," *nature*, vol. 521, no. 7553, pp. 436–444, 2015.

[16] 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.

[17] J. Deng, W. Dong, R. Socher, L.-J. Li, K. Li, and L. Fei-Fei, "Imagenet: A large-scale hierarchical image database," in *2009 IEEE conference on computer vision and pattern recognition*. Ieee, 2009, pp. 248–255.

[18] A. Krizhevsky, I. Sutskever, and G. E. Hinton, "Imagenet classification with deep convolutional neural networks," *Advances in neural information processing systems*, vol. 25, pp. 1097–1105, 2012.

[19] 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.

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

[21] 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.

[22] S. Xie, R. Girshick, P. Dollár, Z. Tu, and K. He, "Aggregated residual transformations for deep neural networks," in *Proceedings of the IEEE conference on computer vision and pattern recognition*, 2017, pp. 1492–1500.

[23] G. Huang, Z. Liu, L. Van Der Maaten, and K. Q. Weinberger, "Densely connected convolutional networks," in *Proceedings of the IEEE conference on computer vision and pattern recognition*, 2017, pp. 4700–4708.

[24] R. Girshick, J. Donahue, T. Darrell, and J. Malik, "Rich feature hierarchies for accurate object detection and semantic segmentation," in *Proceedings of the IEEE conference on computer vision and pattern recognition*, 2014, pp. 580–587.

[25] D. Scherer, A. Müller, and S. Behnke, "Evaluation of pooling operations in convolutional architectures for object recognition," in *International conference on artificial neural networks*. Springer, 2010, pp. 92–101.

[26] C. Zhang, S. Bengio, M. Hardt, B. Recht, and O. Vinyals, "Understanding deep learning requires rethinking generalization," *arXiv preprint arXiv:1611.03530*, 2016.

[27] N. Srivastava, G. Hinton, A. Krizhevsky, I. Sutskever, and R. Salakhutdinov, "Dropout: a simple way to prevent neural networks from overfitting," *The journal of machine learning research*, vol. 15, no. 1, pp. 1929–1958, 2014.

[28] S. Ioffe and C. Szegedy, "Batch normalization: Accelerating deep network training by reducing internal covariate shift," in *International conference on machine learning*. PMLR, 2015, pp. 448–456.

[29] R. Geirhos, J.-H. Jacobsen, C. Michaelis, R. Zemel, W. Brendel, M. Bethge, and F. A. Wichmann, "Shortcut learning in deep neural networks," *Nature Machine Intelligence*, vol. 2, no. 11, pp. 665–673, 2020.

[30] S. Beery, G. Van Horn, and P. Perona, "Recognition in terra incognita," in *Proceedings of the European Conference on Computer Vision (ECCV)*, 2018, pp. 456–473.

[31] A. Ilyas, S. Santurkar, D. Tsipras, L. Engstrom, B. Tran, and A. Madry, "Adversarial examples are not bugs, they are features," *arXiv preprint arXiv:1905.02175*, 2019.

[32] A. Nguyen, J. Yosinski, and J. Clune, "Deep neural networks are easily fooled: High confidence predictions for unrecognizable images," in *Proceedings of the IEEE conference on computer vision and pattern recognition*, 2015, pp. 427–436.

[33] W. Kay, J. Carreira, K. Simonyan, B. Zhang, C. Hillier, S. Vijayanarasimhan, F. Viola, T. Green, T. Back, P. Natsev *et al.*, "The kinetics human action video dataset," *arXiv preprint arXiv:1705.06950*, 2017.

[34] Y. He, S. Shirakabe, Y. Satoh, and H. Kataoka, "Human action recognition without human," in *European Conference on Computer Vision*. Springer, 2016, pp. 11–17.

[35] P. Weinzaepfel and G. Rogez, "Mimetics: Towards understanding human actions out of context," *International Journal of Computer Vision*, pp. 1–16, 2021.

[36] B. Zhou, A. Lapedriza, A. Khosla, A. Oliva, and A. Torralba, "Places: A 10 million image database for scene recognition," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 2017.

[37] G. Patterson and J. Hays, "Coco attributes: Attributes for people, animals, and objects," in *European Conference on Computer Vision*. Springer, 2016, pp. 85–100.

[38] C. Schuldt, I. Laptev, and B. Caputo, "Recognizing human actions: a local svm approach," in *Proceedings of the 17th International Conference on Pattern Recognition, 2004. ICPR 2004.*, vol. 3. IEEE, 2004, pp. 32–36.

[39] H. Kuehne, H. Jhuang, E. Garrote, T. Poggio, and T. Serre, "Hmdb: a large video database for human motion recognition," in *2011 International conference on computer vision*. IEEE, 2011, pp. 2556–2563.

[40] K. Soomro, A. R. Zamir, and M. Shah, "Ucf101: A dataset of 101 human actions classes from videos in the wild," *arXiv preprint arXiv:1212.0402*, 2012.

[41] K. Simonyan and A. Zisserman, "Two-stream convolutional networks for action recognition in videos," *arXiv preprint arXiv:1406.2199*, 2014.

[42] S. Hochreiter and J. Schmidhuber, "Long short-term memory," *Neural computation*, vol. 9, no. 8, pp. 1735–1780, 1997.

[43] X. Shi, Z. Chen, H. Wang, D.-Y. Yeung, W.-K. Wong, and W.-c. Woo, "Convolutional lstm network: A machine learning approach for precipitation nowcasting," *arXiv preprint arXiv:1506.04214*, 2015.

[44] J. Donahue, L. Anne Hendricks, S. Guadarrama, M. Rohrbach, S. Venugopalan, K. Saenko, and T. Darrell, "Long-term recurrent convolutional networks for visual recognition and description," in *Proceedings of the IEEE conference on computer vision and pattern recognition*, 2015, pp. 2625–2634.

[45] Z. Li, K. Gavrilyuk, E. Gavves, M. Jain, and C. G. Snoek, "Videolstm convolves, attends and flows for action recognition," *Computer Vision and Image Understanding*, vol. 166, pp. 41–50, 2018.

[46] C.-Y. Ma, M.-H. Chen, Z. Kira, and G. AlRegib, "Ts-lstm and temporal-inception: Exploiting spatiotemporal dynamics for activity recognition," *Signal Processing: Image Communication*, vol. 71, pp. 76–87, 2019.

[47] D. Tran, L. Bourdev, R. Fergus, L. Torresani, and M. Paluri, "Learning spatiotemporal features with 3d convolutional networks," in *Proceedings of the IEEE international conference on computer vision*, 2015, pp. 4489–4497.

[48] F. Caba Heilbron, V. Escorcia, B. Ghanem, and J. Carlos Niebles, "Activitynet: A large-scale video benchmark for human activity understanding," in *Proceedings of the ieee conference on computer vision and pattern recognition*, 2015, pp. 961–970.

[49] K. Hara, H. Kataoka, and Y. Satoh, "Can spatiotemporal 3d cnns retrace the history of 2d cnns and imagenet?" in *Proceedings of the IEEE conference on Computer Vision and Pattern Recognition*, 2018, pp. 6546–6555.

[50] A. Kurakin, I. Goodfellow, and S. Bengio, "Adversarial machine learning at scale," *arXiv preprint arXiv:1611.01236*, 2016.

[51] I. J. Goodfellow, J. Shlens, and C. Szegedy, "Explaining and harnessing adversarial examples," *arXiv preprint arXiv:1412.6572*, 2014.

[52] D. Hendrycks, K. Zhao, S. Basart, J. Steinhardt, and D. Song, "Natural adversarial examples," *arXiv preprint arXiv:1907.07174*, 2019.

[53] D. Hendrycks and T. Dietterich, "Benchmarking neural network robustness to common corruptions and perturbations," *arXiv preprint arXiv:1903.12261*, 2019.

[54] A. Barbu, D. Mayo, J. Alverio, W. Luo, C. Wang, D. Gutfreund, J. Tenenbaum, and B. Katz, "Objectnet: A large-scale bias-controlled dataset for pushing the limits of object recognition models," 2019.

[55] D. Li, Y. Yang, Y.-Z. Song, and T. M. Hospedales, "Deeper, broader and artier domain generalization," in *Proceedings of the IEEE international conference on computer vision*, 2017, pp. 5542–5550.

[56] Q. Zhang, W. Wang, and S.-C. Zhu, "Examining cnn representations with respect to dataset bias," in *Proceedings of the AAAI Conference on Artificial Intelligence*, vol. 32, no. 1, 2018.

[57] Y. Li, Q. Yu, M. Tan, J. Mei, P. Tang, W. Shen, A. Yuille, and C. Xie, "Shape-texture debiased neural network training," *arXiv preprint arXiv:2010.05981*, 2020.

[58] J. Choi, C. Gao, J. C. Messou, and J.-B. Huang, "Why can't i dance in the mall? learning to mitigate scene bias in action recognition," *arXiv preprint arXiv:1912.05534*, 2019.

[59] L.-C. Chen, G. Papandreou, F. Schroff, and H. Adam, "Rethinking atrous convolution for semantic image segmentation," *arXiv preprint arXiv:1706.05587*, 2017.

[60] G. Jocher, Y. Kwon, guigarfr, perry0418, J. Veitch-Michaelis, Ttayu, D. Suess, F. Baltacı, G. Bianconi, IlyaOvodov, Marc, e96031413, C. Lee, D. Kendall, Falak, F. Reveriano, FuLin, GoogleWiki, J. Nataprawira, J. Hu, LinCoce, LukeAI, NanoCode012, NirZarrabi, O. Reda, P. Skalski, SergioSanchezMontesUAM, S. Song, T. Havlik, and T. M. Shead, "ultralytics/yolov3: v9.5.0 - YOLOv5 v5.0 release compatibility update for YOLOv3," Apr. 2021. [Online]. Available: https://doi.org/10.5281/zenodo.4681234

[61] T. Runia, "Optical flow visualization," https://github.com/tomrunia/OpticalFlow_Visualization, 2020.

[62] S. Baker, D. Scharstein, J. Lewis, S. Roth, M. J. Black, and R. Szeliski, "A database and evaluation methodology for optical flow," *International journal of computer vision*, vol. 92, no. 1, pp. 1–31, 2011.

[63] L. A. Hendricks, K. Burns, K. Saenko, T. Darrell, and A. Rohrbach, "Women also snowboard: Overcoming bias in captioning models," in *Proceedings of the European Conference on Computer Vision (ECCV)*, 2018, pp. 771–787.

[64] C. Feichtenhofer, A. Pinz, and A. Zisserman, "Convolutional two-stream network fusion for video action recognition," in *Conference on Computer Vision and Pattern Recognition (CVPR)*, 2016.

[65] D. L. Yue Zhao, Yuanjun Xiong, "Mmaction," https://github.com/open-mmlab/mmaction, 2019.

[66] M. Contributors, "Openmmlab's next generation video understanding toolbox and benchmark," https://github.com/open-mmlab/mmaction2, 2020.

[67] E. Linder-Norén, "Action-recognition," https://github.com/eriklindernoren/Action-Recognition, 2019.

[68] H. Alwassel, "Kinetics-downloader," https://github.com/activitynet/ActivityNet/tree/master/Crawler/Kinetics, 2018.

[69] K. Hara, H. Kataoka, and Y. Satoh, "Can spatiotemporal 3d cnns retrace the history of 2d cnns and imagenet?" in *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2018, pp. 6546–6555.

[70] H. Zhou, "Optical flow extraction," https://github.com/USTC-Video-Understanding/I3D_Finetune/issues/5, 2018.

[71] DeepMind, "I3d models trained on kinetics," https://github.com/deepmind/kinetics-i3d, 2019.

[72] J. Manttari, S. Broomé, J. Folkesson, and H. Kjellstrom, "Interpreting video features: a comparison of 3d convolutional networks and convolutional lstm networks," in *Proceedings of the Asian Conference on Computer Vision*, 2020.

Appendix A

Results: cue conflict test