



Emotion Recognition using Machine Learning

Gaurav Sheth¹, Sahil Pataskar², Siddhesh Kakade³, Prof. Priyanka Khalate⁴

Students, Department of Computer Engineering^{1,2,3}

Faculty, Department of Computer Engineering⁴

Sinhgad Inst. Smt. Kashibai Navale College of Engineering, Vadgaon Bk. Pune, Maharashtra, India

Savitribai Phule Pune University, Pune, Maharashtra, India

Abstract: *One of the most universal ways that people communicate is through facial expressions. Facial expression recognition plays a crucial role in the area of human-machine interaction. Automatic facial expression recognition system has many applications including, but not limited to, human behavior understanding, detection of mental disorders, and synthetic human expressions. Recognition of facial expression by computer with high recognition rate is still a challenging task. In this paper, we take a deep dive, implementing multiple deep learning models for facial expression recognition (FER). Our goals are twofold: we aim not only to maximize accuracy, but also to apply our results to the real-world. Additionally, we showcase a mobile website which runs our FER models on-device in real time.*

Keywords: Machine Learning, Deep Neural Networks, Web Application

REFERENCES

- [1]. S. Li and W. Deng, "Deep facial expression recognition: A survey," arXiv preprint arXiv:1804.08348, 2018.
- [2]. Pramerdorfer, C., Kampel, M.: Facial expression recognition using convolutional neural networks: state of the art. Preprint arXiv:1612.02903v1, 2016.
- [3]. J. Goodfellow, D. Erhan, P. L. Carrier, A. Courville, M. Mirza, B. Hamner, W. Cukierski, Y. Tang, D. Thaler, D.-H. Lee et al., "Challenges in representation learning: A report on three machine learning contests," in International Conference on Neural Information Processing. Springer, 2013, pp. 117–124.
- [4]. Y. Tang, "Deep Learning using Support Vector Machines," in International Conference on Machine Learning (ICML) Workshops, 2013.
- [5]. Z. Zhang, P. Luo, C.-C. Loy, and X. Tang, "Learning Social Relation Traits from Face Images," in Proc. IEEE Int. Conference on Computer Vision (ICCV), 2015, pp. 3631–3639.
- [6]. B.-K. Kim, S.-Y. Dong, J. Roh, G. Kim, and S.-Y. Lee, "Fusing Aligned and Non-Aligned Face Information for Automatic Affect Recognition in the Wild: A Deep Learning Approach," in IEEE Conf. Computer Vision and Pattern Recognition (CVPR) Workshops, 2016, pp. 48–57.
- [7]. Quinn M., Sivesind G., and Reis G., "Real-time Emotion Recognition From Facial Expressions", 2017
- [8]. Wang J., and Mbuthia M., "FaceNet: Facial Expression Recognition Based on Deep Convolutional Neural Network", 2018
- [9]. P. Lucey, J. F. Cohn, T. Kanade, J. Saragih, Z. Ambadar, and I. Matthews, "The Extended Cohn–Kanade dataset (CK+): A complete dataset for action unit and emotion-specified expression," in Proc. IEEE Comput. Soc. Conf. Comput. Vis. Pattern Recognit. Workshops, San Francisco, CA, USA, Jun. 2010, pp. 94–101
- [10]. Brechet P., Chen Z., Jakob N., Wagner S., "Transfer Learning for Facial Expression Classification" Available: <https://github.com/EmCity/transfer-learning-fer2013>
- [11]. Chawla, N. V., Bowyer, K. W., Hall, L. O., and Kegelmeyer, W. P. "SMOTE: Synthetic Minority Over-sampling Technique". JAIR 16 (2002), 321–357.
- [12]. A. Mollahosseini, D. Chan, and M. H. Mahoor, "Going Deeper in Facial Expression Recognition using Deep Neural Networks," CoRR, vol. 1511, 2015.
- [13]. Z. Zhang, P. Luo, C.-C. Loy, and X. Tang, "Learning Social Relation Traits from Face Images," in Proc. IEEE Int. Conference on Computer Vision (ICCV), 2015, pp. 3631–3639
- [14]. 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 2017 IEEE International Conference on Computer



Vision (ICCV), Oct 2017.

- [15]. Kapishnikov, A., Bolukbasi, T., Viégas, F. and Terry, M., “XRAI: Better Attributions Through Regions”, 2019.
- [16]. Minaee S., Abdolrashidi A., “Deep-Emotion: Facial Expression Recognition Using Attentional Convolutional Network”, 2019
- [17]. E. Barsoum, C. Zhang, C. C. Ferrer, and Z. Zhang, “Training deep networks for facial expression recognition with crowd-sourced label distribution,” in Proceedings of the 18th ACM International Conference on Multimodal Interaction. ACM, 2016, pp. 279–283.
- [18]. He H., Bai Y., Garcia E. A., and Li S. “ADASYN: Adaptive synthetic sampling approach for imbalanced learning,” 2008 IEEE International Joint Conference on Neural Networks (IEEE World Congress on Computational Intelligence), Hong Kong, 2008, pp. 1322-1328.
- [19]. A. Mollahosseini, B. Hasani, and M. H. Mahoor, “Affectnet: A database for facial expression, valence, and arousal computing in the wild,” IEEE Transactions on Affective Computing, vol. PP, no. 99, pp. 1–1, 2017.