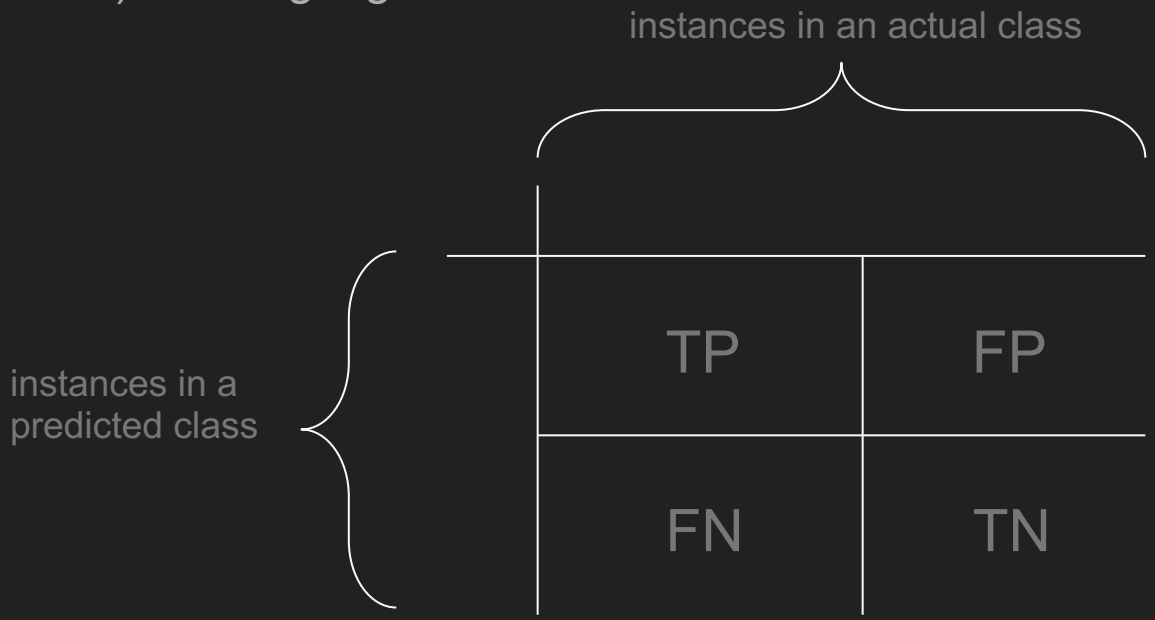
03

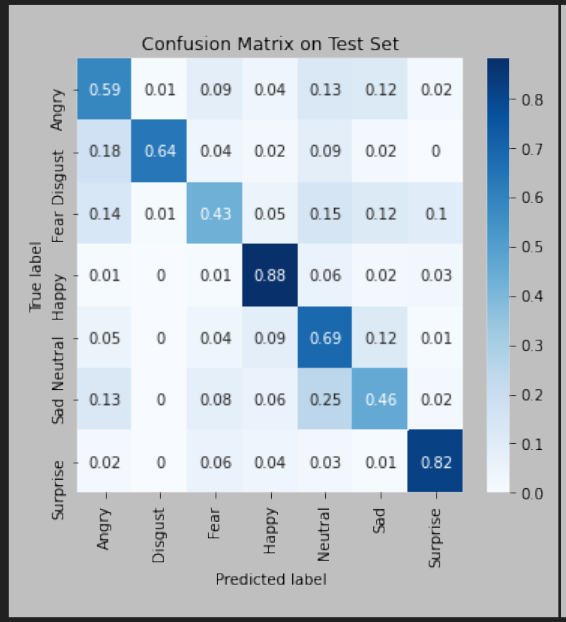
Error Analysis

Confusion Matrix / Occlusion-based Saliency Map

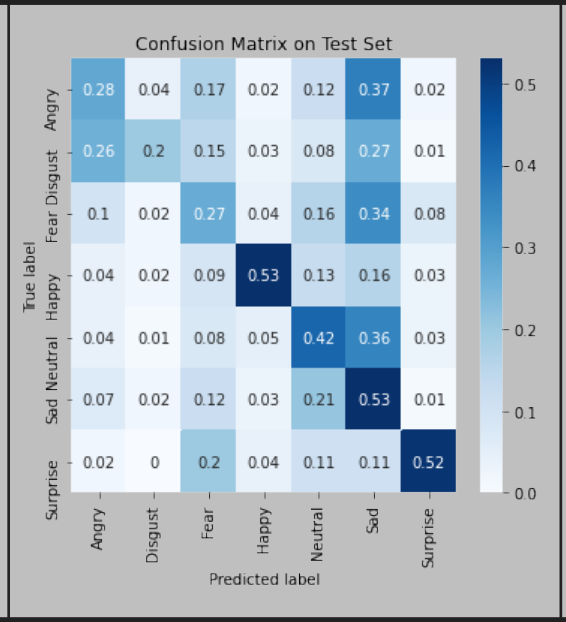
Confusion Matrix

- A specific table layout that allows visualization of the performance of an (often supervised) learning algorithm

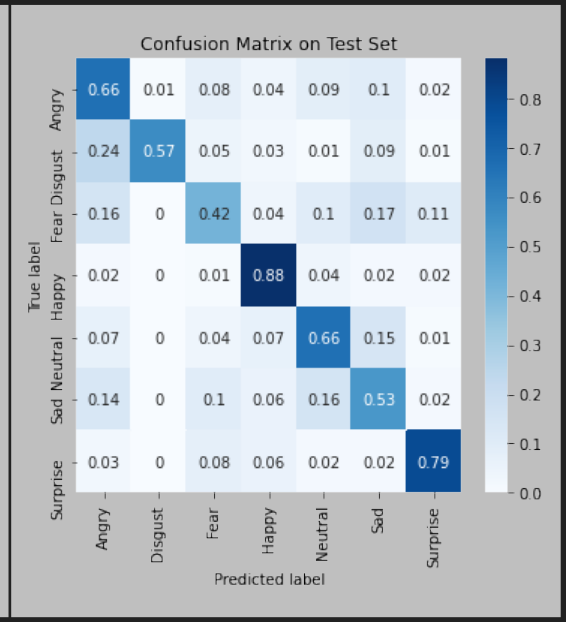




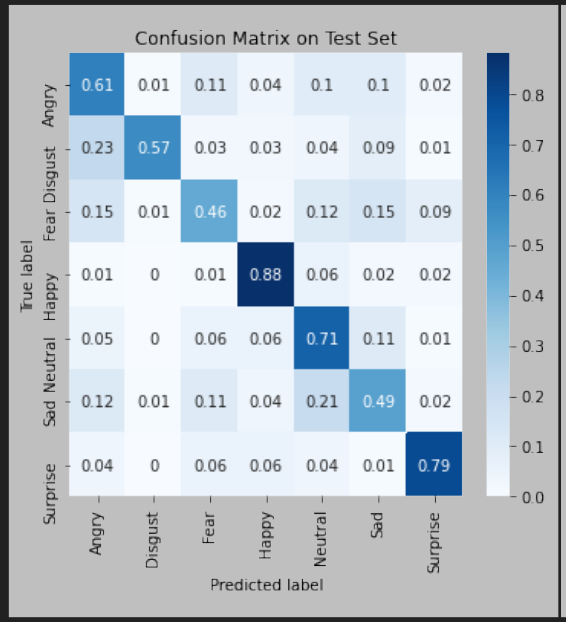
Baseline



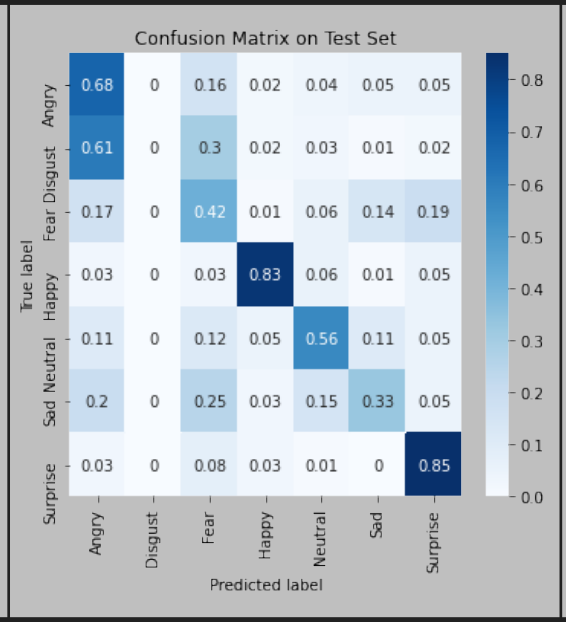
Resnet18



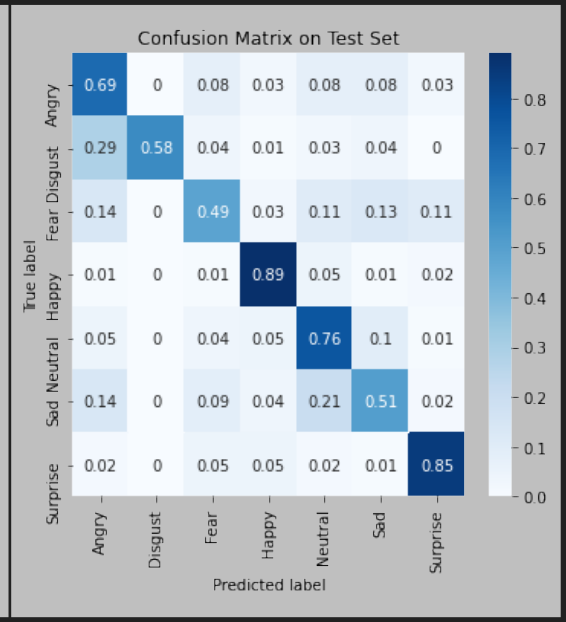
VGG16



Resnet50



Senet50

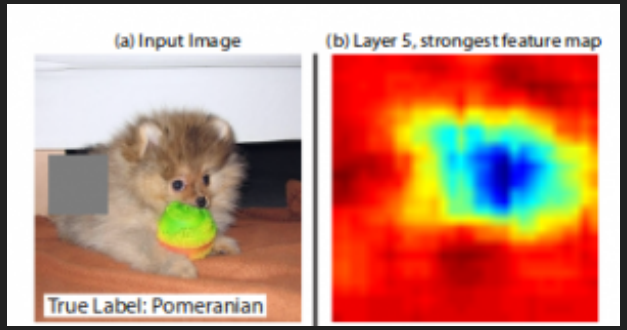


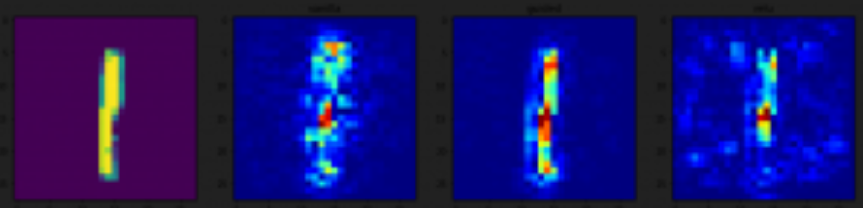
Ensemble

Occlusion-based Saliency Map

- Image occlusion: systematically occlude different portions of the input image and observe the output of the classifier

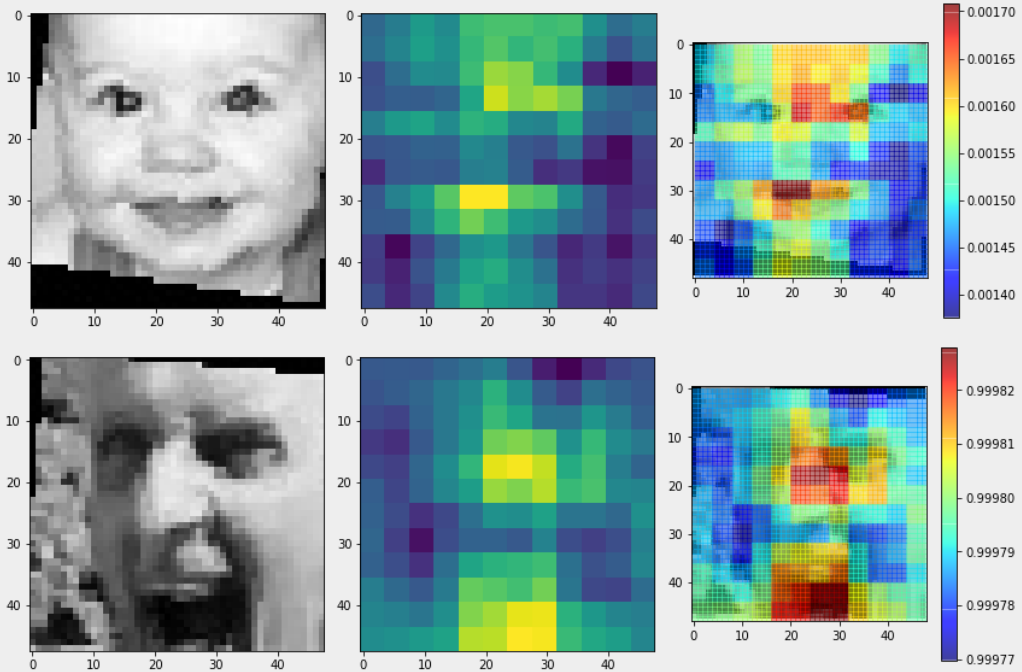
- Saliency map: compute the gradient of the output category with respect to the input image





Source: https://www.kaggle.com/blargl/simple-occlusion-and-saliency-maps

Interpretability



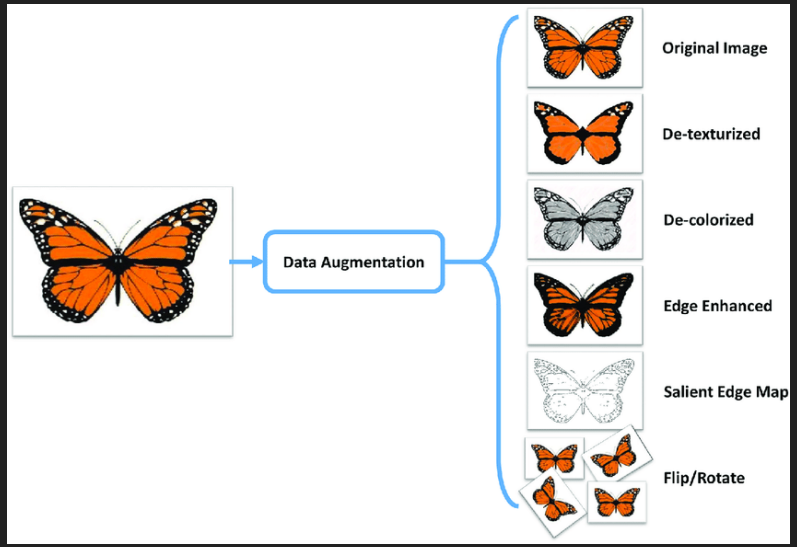
04

Future Works

Data Augmentation / Siamese Net / Triplet Loss

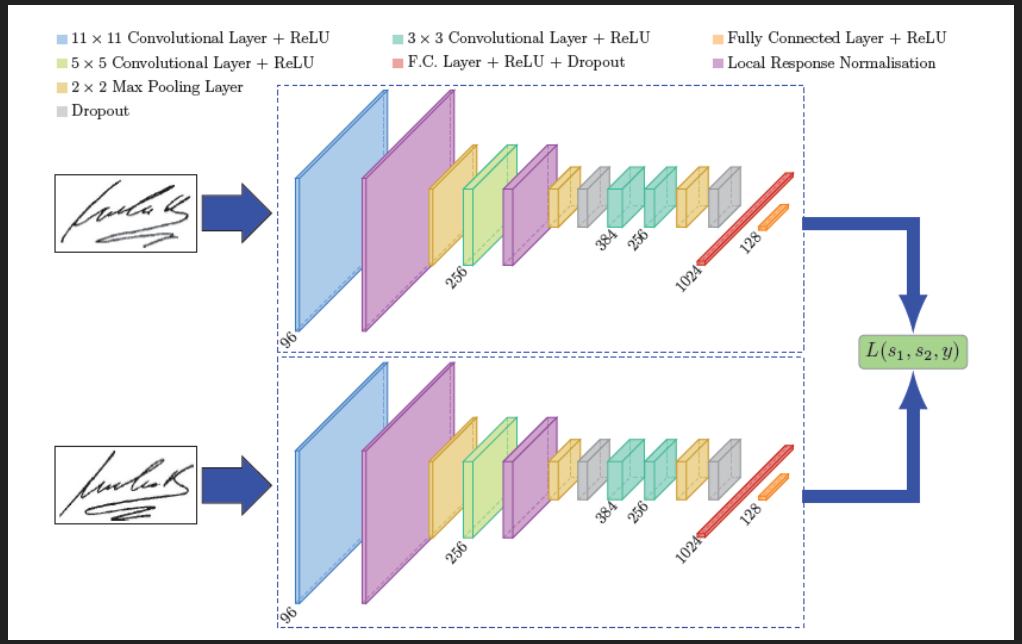
Data Augmentation

- increase the amount of data by adding slightly modified copies or newly created synthetic data from existing data
- acts as a regularizer and helps reduce overfitting



Source: Data augmentation-assisted deep learning of hand-drawn partially colored sketches for visual search

Siamese Network (SNN)



Source: Siamese Network used in Signet

- a class of neural network architectures that contain two or more ‘identical’ subnetworks
- find the similarity of the inputs by comparing its feature vectors
- learn a similarity function

Pros

More robust to class imbalance

Nicely ensembled with other supervised classifiers

Learning from Semantic similarity

Cons

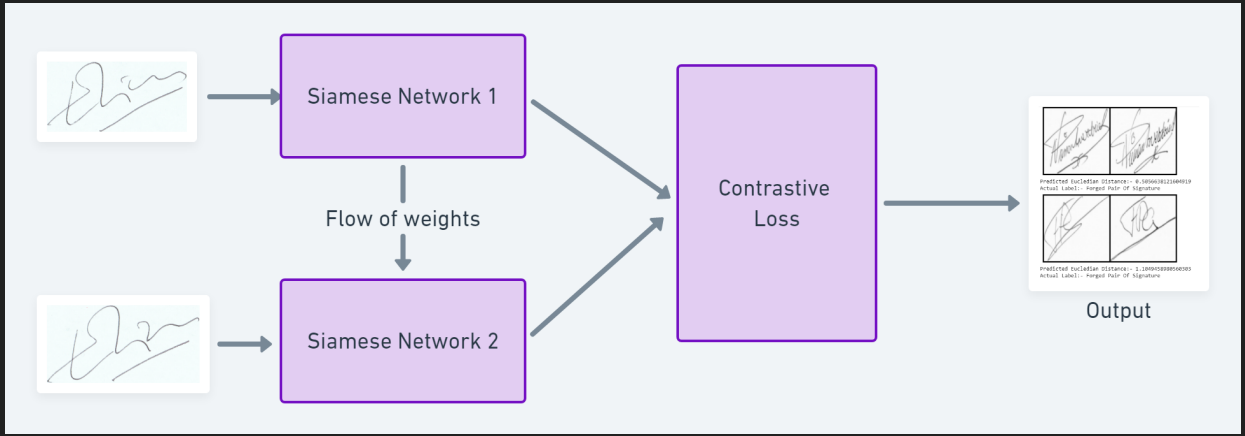
More training time

Doesn’t output probabilities

Triplet Loss (Contrastive Loss)

- **Triplet loss** is a loss function where a baseline (anchor) input is compared to a positive (truthy) input and a negative (falsy) input

- **Contrastive loss** is a distance-based loss used to learn closest embeddings of two similar instances and farthest embeddings otherwise(as opposed to conventional error-prediction loss)



Source: https://towardsdatascience.com/a-friendly-introduction-to-siamese-networks-85ab17522942

Acknowledgement

This work is inspired by the awesome project by Khanzada *et al.*

References

[1] C. Darwin and P. Prodger, *The expression of the emotions in man and animals.*, (1998).

[2] T. Hassner, S. Harel, E. Paz, and R. Enbar, *Effective face frontalization in unconstrained images*, CoRR, abs/1411.7964 (2014).

[3] A. Khanzada, C. Bai, and F. T. Celepcikay, *Facial expression recognition with deep learning*, 2020.

[4] S. Li and W. Deng, *Deep facial expression recognition: A survey*, IEEE Transactions on Affective Computing, (2020), p. 1–1.

[5] C. Pramerdorfer and M. Kampel, *Facial expression recognition using convolutional neural networks: State of the art*, 2016.

[6] Y. Tang, *Deep learning using linear support vector machines*, 2015.