Facial Expression Recognition

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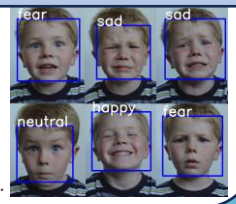
Problem Statement

FER is pivotal in healthcare, security, and user experience, with applications in interactive devices. Our project delves into Facial Expression Recognition (FER) models, assessing datasets and propose performance enhancements.



Original Model

Original model: Attentional CNN

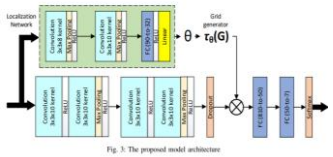


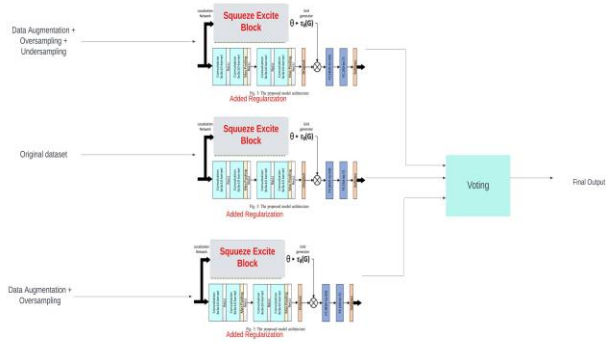
Fig. 3: The proposed model architecture

We chose the attentional CNN model for its simplicity, compatibility with our goal of incorporating attention mechanisms for facial features, and ease of understanding during implementation. Its built-in support for the FER2013 dataset and streamlined architecture also make it efficient for our purposes.

Our Updates

1. Applying Data Augmentation.
2. Running the Model on FER+ Dataset.
3. Fine tuning Model Hyperparameters.
4. Trying different attention mechanisms (self attention, region-based attention, Grid Wise attention).
5. Application of noisy labels handling mechanisms.
6. Usage of Ensemble Classifiers.

Final Model Architecture



Datasets

Datasets selected: FER2013 & FER+. We selected the datasets for their optimal balance of image quantity and manageable size, facilitating efficient model training. The prevalence of these datasets in FER research ensures comprehensive performance evaluation against existing models. Additionally, the preprocessed nature of the data, particularly the alignment of faces in FER 2013, enhances the robustness of our model.

Angry

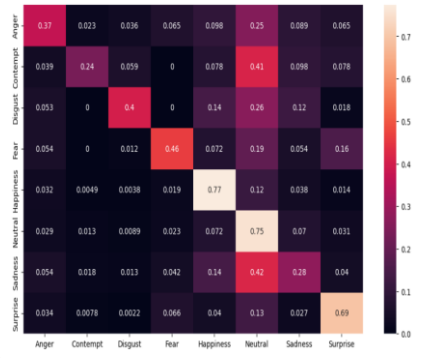
Happy

Results

After finishing all our updates, we had three different models that had a very close performance which are the original model + regularization + augmentation, the ensemble classifier of the original model + regularization and the ensemble classifier of the model + regularization + Squeeze and Excite blocks instead of GWA. We selected the final one as it had a good balance between precision, recall, and accuracy. **Final Model: Ensemble of Regularized CNNs with squeeze and Excite blocks.**

Results:

Testing Accuracy = 64.12%
Weighted Precision = 46.68%
Unweighted Precision = 46.65%
Weighted Recall = 64.12%
Unweighted Recall = 51.14%



Conclusions

Conclusions:
1.Deep Learning is mainly about trial and error.
2.FER+ dataset is a very challenging dataset.

Future Work & References

Future Work:
1.Trying the same problem with a different baseline model.
2.Using transfer learning.

References:

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