NeuroNet: Assessment of Neurological Disorder using Visuals

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SUMMARY

Identification of patients suffering from a neurological disease is highly important. Traditionally, people are called to a doctor's office and asked to perform a certain set of oro-facial tasks which test the movement of their facial features to assess if they are healthy ot not. Due to the time taken by this process and disagreement between different doctors, the need for a fast and reliable system which can aid the doctors arises. In this work, we use a recently released Toronto NeuroFace dataset to evaluate our pipeline, to the best of our knowledge this is the first publicly available dataset for neurological disease assessment.

MOTIVATION

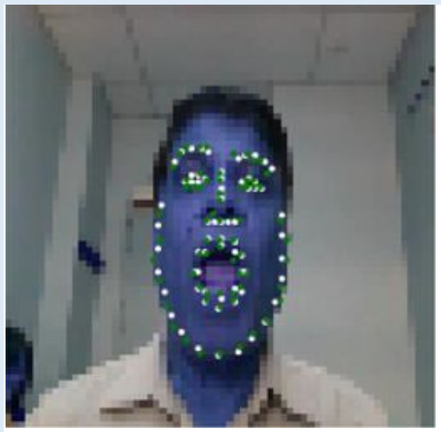
Current state-of-art classification models for ALS and Post-Stroke detection use handcrafted features and then pass them through a SVMs or Random forest. Every previous work has been done on a privately collected dataset and even though the oro-facial tasks are similar, the lack of a publicly available dataset hinders the comparison between different DL models and architectures.

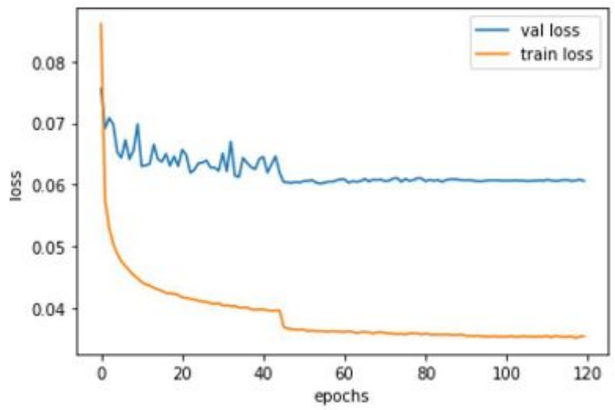
Methodology

This project focuses on providing a clear assessment for the patient based on an oro-facial task performed by them. The patient videos along with some frames annotated with 68 geometric facial feature points are provided. We first train a Facial Alignment Network to identify those 68 feature points in each frame of the video with least error. Then these points are used to remove unnecessary information from the video frame and adjust the perspective of the person's face. The video frames thus created are passed through another neural network to get the classification results. Currently the experiments to achieve the best possible results are still going on but we are able to achieve an average of 60% test accuracy on 10-folds. We are using a CNN-RNN and C3D hybrid to achieve the aforementioned results where a 2D CNN is used to extract features from each frame of the video which are then passed to an LSTM layer and finally combined with the features extracted from a 3D CNN before getting the classification results.

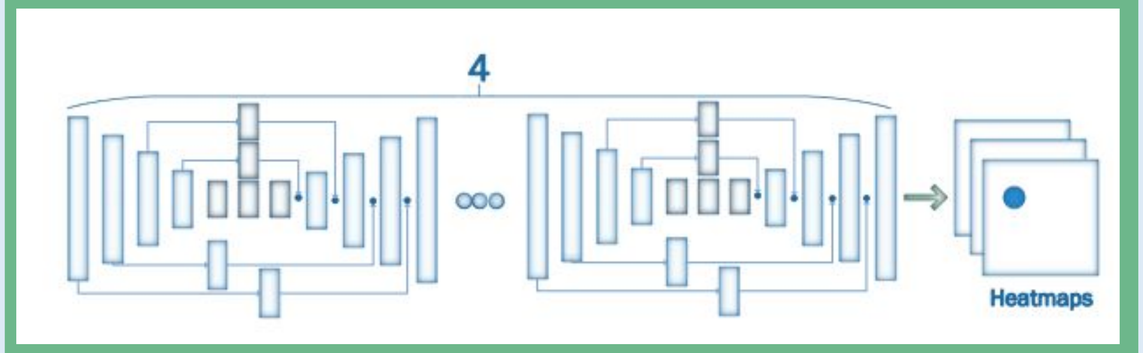
RESULTS

The results for our Face Alignment network trained using Adaptive Wing Loss instead of the normal MSE loss can be seen below along with our intuitive approach to the project as a whole.





Architecture



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