Facial Keypoint Recognition

Under the Guidance of: Prof Amitabha Mukerjee

Abheet Aggarwal

Ajay Sharma

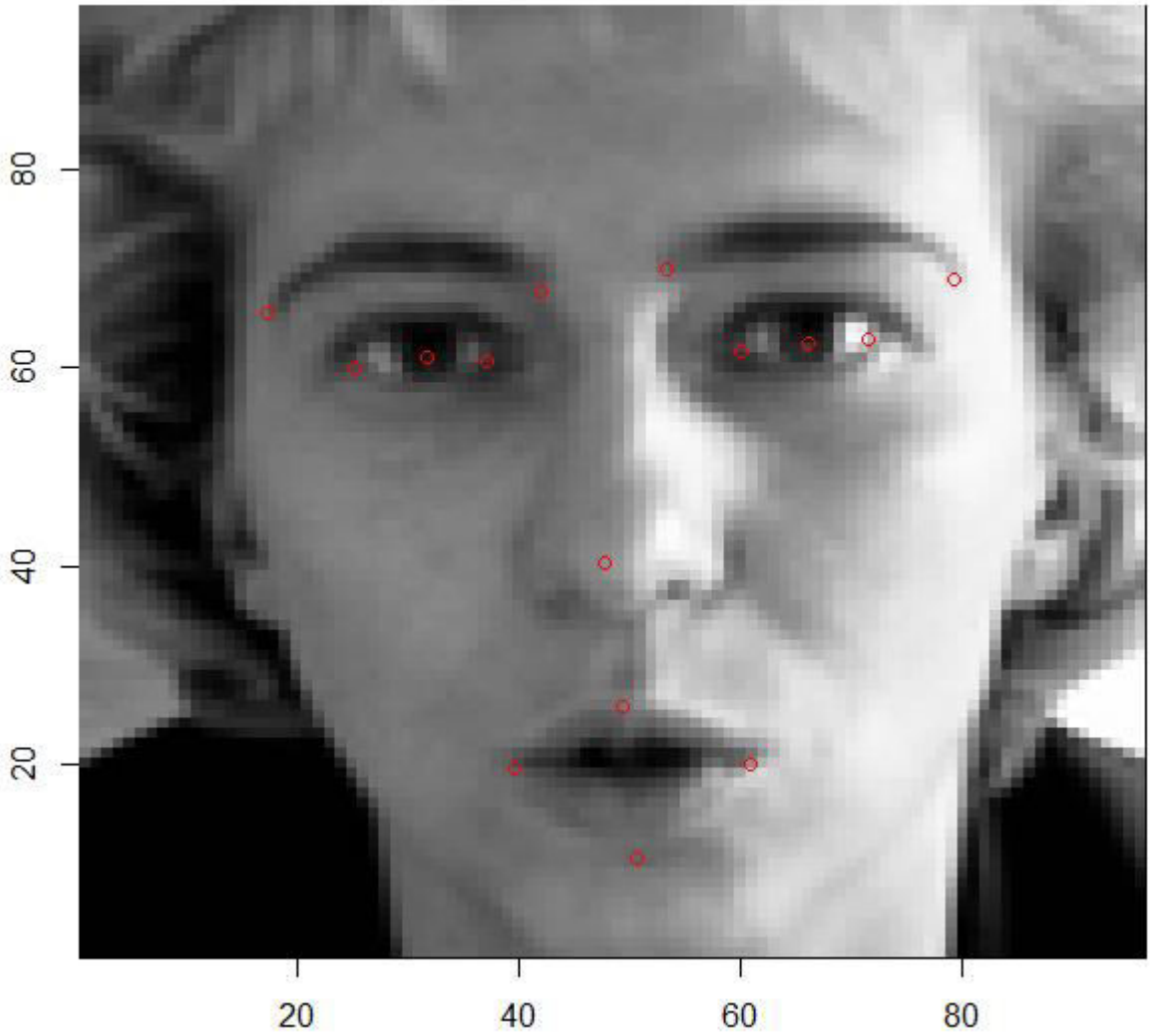
Introduction

- The goal of this project is to apply CNN to label the key points on a grayscale photograph of a human face.
- We are given labelled training data consisting of 7049 images.
- We apply convolutional neural networks to use this data to perform predictions on a test data which has 1783 images
- We have labelled test data which allows us to measure the accuracy of the method.

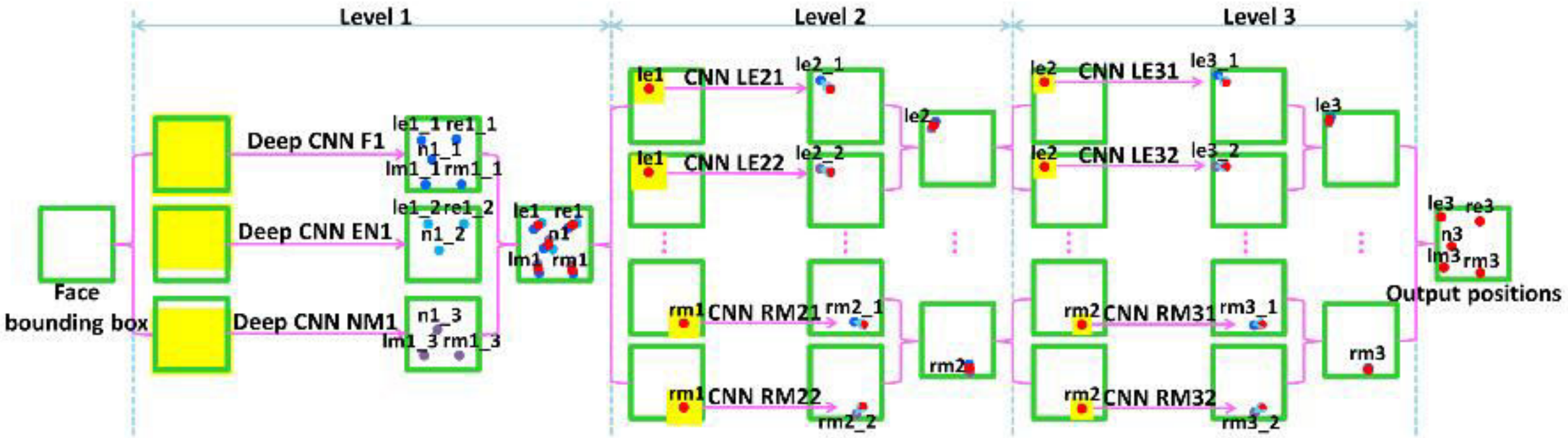
Format of the Data

- Each image is a 96 x 96 size image in grayscale
- Each training image is labelled with the (x,y) coordinates for 15 facial keypoints; which include the centre and corners of the eyes, eyebrows, lips, tip of the nose etc.
- Each of these labels is followed by the 9216 integers which is essentially the grayscale image itself.
- The entire data is given in a CSV file.

Features of an Image:



Three Level Cascaded Convolutional network



Why Cascaded CNN ?

High-level features are highly non-linear. Adding additional layers increases the non-linearity from input to output, and makes it possible to represent the relationship between input and output.

Traditional convolutional networks share weights of all the neurons on the same map. For networks whose inputs contain different semantic regions, locally sharing weights at high layers is more effective for learning different high-level features, e.g., eyes, nose, and mouth.

The use of shared weight in convolutional layers, which means that the same filter (weights bank) is used for each pixel in the layer; this both reduces required memory size and improves performance.

Evaluation of a Network

- We compare the generated results with the labelled test data and calculate the root mean square error of the results.

- The root mean square error will punish large errors and give us a good reflection of the accuracy of the network used.

References

- All the project data is obtained from kaggle.com
- Yi Sun, Xiaogang Wang, Xiaoou Tang - Deep Convolutional Network Cascade for Facial Point Detectionhttp://www.ee.cuhk.edu.hk/~xgwang/papers/sunWTcvpr13.pdf
- Clement Creusot · Nick Pears · Jim Austin - A Machine-Learning Approach to Keypoint Detection