**CSE- 454**

Data Mining Sessional Project

Gender Determination From Facial Image

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**Table of Contents**

Background3

Dataset3

Method3

Performance4

Summery4

**Background :**

As the use of technology is increasing every day, the importance of using robots and computer vision is high in demand. The computer takes images as input or its vision and does necessary analysis for performing the required tasks. Also, image processing and gaining data from images is used in a lot of sectors like biometrics database, area-based security, and restriction purpose, etc.

On the other hand, machine learning is being used for gaining more accuracy and teaching a system how to be more efficient over time. Using the concept of machine learning “Convolution Neural Network (CNN)” has been introduced, which works a lot like the neural system of the human brain.

Using these two methods several systems have been developed like – face detection, person recognition from the image, facial expression detection, age detection, etc. Gender detection from images can be classified into the mentioned category but the approach is different.

Gender detection from images can be used in entrance control, security purposes, gaining information from image databases, understanding marketing demography, and many more aspects.

**Dataset Used :**

The dataset that is used here is from Wikipedia which is one of the largest databases available online. 8000 images are selected for training purposes where metadata of those images are saved in a Matlab file.

**Method:**

Following steps have been conducted for developing the model -

1. Data Pre-processing: OpenCV Face Detector and HaarCascade have been used to find out faces in the image. Images not containing a face or blurry images are left out.

2. Data Cleaning: From the selected data Matlab file has been edited as such that it only contains metadata related to the preprocessed data. Scipy has been used for that.

3. Preparing Model: Following features have been selected as the basis of training from the face images -

* Eyebrows
* Eyes
* Nose tip
* Lip contouring

The CNN model consisting of the following layers have been built for training the model –

* Convolution layer 1: The first convolutional layer has 96 nodes of kernel size 7.
* Convolution layer 2: The second convolutional layer has 256 nodes with a kernel size of 5.
* Convolution layer 3: The third convolutional layer has 384 nodes with kernel size 3.
* The two fully connected layers have 512 nodes each.

4. Training: The dataset from earlier has been used for training purposes. It took almost seven hours for the training to be finished and the result is the model weight that is in CaffeNet form.

5. Testing: Another python code has been developed for combining the weighted data and the CNN model so that it can be used in testing. For a testing total of 50 random images have been selected from the internet keeping the diversity.

**Performance:**

As the performance measurement, the model calculates how much the features of testing data matches with calculated features of trained data. For testing, the model runs on only one image at a time. It calculates the confidence and shows output in an image form, where a square box is drawn around the face, and on the top left corner the output “Male/ Female” is written.

**Summary:**

The model gives correct output for more than 70% of its test data which is quite satisfactory for a small-scale model like this. It can gain efficiency if it is trained on a larger data set.