Machine Learning Engineer Nanodegree

Capstone Proposal

Gender Classification

Domain Background

Gender classification is to determine a person's gender, e.g., male or female, based on his or her biometric cues. Usually facial images are used to extract features and then a classifier is applied to the extracted features to learn a gender recognizer. It is an active research topic in Computer Vision and Biometrics fields. The gender classification result is often a binary value, e.g., 1 or 0, representing either male or female. Gender recognition is essentially a two-class classification problem. Although other biometric traits could also be used for gender classification, such as gait, face-based approaches are still the most popular for gender discrimination [ref].

Problem Statement

The goal is to create a gender classification based on person face image; the tasks involved are the following:

1. Download and preprocess the Adience Benchmark dataset
2. Use a pre-trained CNN model to extract features from the images
3. Build a neural network to classify gender given image features
4. Train and evaluate the classifier

Datasets and Inputs

The dataset used for training and testing for this project is the Adience Benchmark - collection of unfiltered face images. It contains total 26,580 images of 2,284 unique subjects that are collected from Flickr. There are 2 possible gender labels: M, F and 8 possible age ranges: 0-2, 4-6, 8-13, 15-20, 25-32, 38-43, 48-53, 60+. Each image is labelled with the person's gender and age-range (out of 8 possible ranges mentioned above).

Solution Statement

As this problem works with people face images I'm going to use a pre-trained model for image classification (InceptionV3) trained on imagenet dataset to extract useful features from images and then build a neural network that given the image features extracted from InceptionV3 can classify whether the person in this image is male or female.

Benchmark Model

For this problem I'm going to consider my benchmark Model as random guessing, as this a binary classification problem, random guessing can achieve accuracy of 50%.

My goal for this problem is to achieve 80% or better validation accuracy working on Adience Benchmark Dataset.

Evaluation Metrics

For this problem I'm going to work with the accuracy metric provided by keras for binary classification problems.

Project Design

My workflow for this problem:

1. Load the dataset and explore it, remove outliers, make sure it's balanced
2. Load the image and preprocess them for keras pre-trained models for image classifications problems and try different models
3. Build a neural network that given the images features extracted by the pre-trained model can classify whether it's a male or female in
4. Try different architecture for the neural network and different configuration and evaluate them on the validation set and choose the best model
5. Evaluate final model performance on the test set data