

Project Documentation

Introduction

This project aims to develop a deep learning model for image classification using Convolutional Neural Networks (CNNs). The goal is to accurately classify images into different categories based on their visual content. The project leverages the power of Convolutional Neural Networks to achieve high classification performance.

Dataset

For this project, we used the CelebA dataset. It is a large-scale face attributes dataset containing more than 200,000 celebrity images. The dataset is diverse, covering a wide range of facial attributes such as age, gender, and emotions. Each image is labeled with various attributes, making it suitable for training and evaluating our image classification model.

Data Preparation

For this project we used a generator object to go through and read our data. We also trained our model on a reduced dataset (to solve our memory issues) and compared the result between the two.

Proposed Method

The proposed method utilizes a CNN architecture consisting of multiple convolutional and pooling layers, followed by fully connected layers for classification. The model is trained using the labeled CelebA dataset, where the input images are processed through the network to learn discriminative features.

Evaluation Method

To evaluate the performance of the developed model, a comprehensive evaluation method is employed. The trained model is tested on a separate test set from the CelebA dataset. The evaluation metrics include accuracy, precision, recall, and F1 score, which provide insights into the model's classification performance across different attributes. The confusion matrix is also utilized to visualize the model's performance in classifying different attribute categories.

Results and Discussion

The results obtained from the evaluation demonstrate the effectiveness of the proposed method. The model achieves high enough accuracy (80%) and performs well in terms of precision, recall, and F1 score across various attribute categories. We also found that working on a smaller dataset resulted in the same model performance as the generator generated dataset that utilized everything.

Overall, the developed CNN-based image classification model shows promising results on the CelebA dataset, highlighting the potential of deep learning techniques for facial attribute recognition. Further research can focus on refining the model architecture, incorporating transfer learning, or exploring other datasets to improve the model's performance and generalization capabilities.