Dimensionality Reduction of Image Features using an Autoencoder

INTRODUCTION

"Curse of Dimensionality" is one of the important problems that image analysis confronts. High-dimensional image analysis is a challenge for researchers during image annotation, classification, and retrieval. Dimensionality reduction provides an effective way to solve this problem, which can improve the learning accuracy, reducing the computation time, and facilitate a better understanding of the learning models. This paper proposes a novel approach for dimensionality reduction using an Autoencoder.

An Autoencoder is an unsupervised learning algorithm that applies back propagation, setting the target values to be equal to the inputs. The reduced dimensions computed through the autoencoder are used to train the various classifiers and their performances are evaluated. From the performance of the classifiers, it is proven that the reduced dimensions obtained using the autoencoder have good pattern recognition ability than the dimensions obtained through other approaches.

PROPOSED WORK

Dimensionality reduction removes the redundant and irrelevant features and enhances the learning efficiency. Feature selection and Feature extraction are two ways of dimensionality reduction, it is proven that feature extraction methods for dimensionality reduction improve the accuracy of the image classification and the image retrieval systems. In this paper a feature extraction method, an Autoencoder is proposed for dimensionality reduction which transforms the high dimensional image feature set into a reduced feature set with strong pattern recognition ability. The main contribution of this paper is the design of the autoencoder for reducing the dimensions of the image data set used for training the image classifier. The effectiveness of the reduced dimensions is evaluated by comparing the accuracy of the different classifiers which are trained using this reduced feature set.

Dimensionality reduction provides an effective way to solve this problem. This paper presents a novel approach for dimensionality reduction, an Autoencoder which transforms the original features into a new reduced feature set. The experiment was setup to evaluate the effectiveness of the reduced feature set. In order to demonstrate the efficacy of our proposed approach, we have trained the SVM, ANN and the K-NN classifiers using the original and the reduced feature set and evaluated the accuracy of the classifiers. The ten image classes of animals of the MS-COCO 2017 dataset are used to evaluate the performance of the classifier.

The ANN, SVM, and K-NN classifiers are trained using the features obtained from the CART, RF, PCA and Autoencoder method. The autoencoder can be further redesigned and tested for handling a still higher dimensional feature vector and for other types of image features for image classification, annotation, and retrieval.

REFERENCE

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