Image Classification Using Machine Learning Approaches

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Abstract: In machine learning, classification is a supervised learning concept which basically categorizes a set of data into classes. The most common classification problems are – speech recognition, face detection, handwriting recognition, and image classification. Image Classification is one of the most fundamental tasks in computer vision. It has revolutionized and propelled technological advancements in the most prominent fields, including the automobile industry, healthcare, manufacturing, and more. Image Classification (often referred to as Image Recognition) is the task of associating one (single-label classification) or more (multi-label classification) labels to a given image. Image classification is the process of predicting a specific class, or label, for something that is defined by a set of data points. Image classification is a subset of the classification problem, where an entire image is assigned a label. Grouping images into semantically meaningful categories using low-level visual features is a challenging and important problem in content-based image retrieval. Based on these groupings, effective indices can be built for an image database

Keywords- Weather, machine learning, prediction

1. Introduction

An image is a 2-dimensional signal. It defined by the mathematical function where the horizontal coordinate is and y is the vertical coordinate. At any point the value of f(x, y) gives the pixel value of the image at that point. Operations done on image to manipulate and extract useful information from image are called image processing. In general, it is classified into few groups, they are checking for presence, object detection and localization, measurement as well as identification and verification. Fundamental steps in digital image processing are image acquisition, image enhancement, image restoration, color image processing, image classification, compression, segmentation, and morphological processing. Classification is used to identify the category of new observations on the basis of training data. It predicts 'Categorical class labels' like yes or no, male or female, true or false, red or blue, disease or no disease. Ex: When filtering emails "spam" or "not spam", When looking at transaction data, "fraudulent", or "authorized". Image classification is the process of categorizing and labeling groups of pixels or vectors within an image based on specific rules. Image classification is where a computer can analyse an image and identify the image falls under. Algorithms used for classification are Logistic Regression, Naive Bayes, K-Nearest Neighbors, Decision Tree, and Support Vector Machines (SVM), Spam filtering, Random forest, Decision Tress

2. LITERATURE SURVEY

The efforts are made in the paper to identify the contributions made by different authors related to identification and prediction of Heart related issues. The detailed discussion is made with respect to the Approaches/methodology adapted and the outcome of the work.

The paper titled "Classification of IRIS Dataset using Classification Based KNN Algorithm in supervised learning" uses Supervised learning-Nearest Neighbours (KNN) classification Algorithm. The objective is to build a model that isable to automaticallyrecognize the irisspecies (Setosa,Versicolor and Virginica) and classify them. The outcome of the work is able to recognize the iris species accurately on the basis of 3 classes, but somesamples provide themisclassified result.Prediction for class 0and class 2 was 100%correct but prediction forclass 1 was 4% wrong. The tools used are Numpy, Pandas, Matplotlib and machine Learning library Scikit-learn.

The paper titled "Automatic fruit classification using random forest algorithm" objective is to develop an effective classification approach based on Random Forest (RF) algorithm to classify fruits. The features extraction stage uses two algorithms for extracting the fruit images feature which are shape and colour algorithm and Scale Invariant Feature Transform (SIFT) algorithm. The classification is done using the Random Forest (RF) algorithm. MATLAB RF based algorithms provided better accuracy when compared to the other well known machine learning techniques such as K-NN and SVM Algorithms.

The paper titled "Fruit Classification using Statistical Features in SVM Classifier "Proposes a technique uses colour and texture features for fruit classification. Support Vector Machine (SVM) classifier is used to classify the different kinds of fruits. The overall classification accuracy is 95.3% is achieved.

The paper titled" Classifications of High-resolution Optical Images using Supervised algorithms "objective is to perform land use classification of optical data. The Paper uses Maximum likelihood (ML) and Support vector machines (SVM) approaches. Comparison showed an Overall superiority of the Support Vector Machine over maximum Likelihood.

The papr titled "PCA-Based Animal Classification System "objective is Principal Component Analysis (PCA) based application was developed for the recognition and classification of different species of animals. Experimental studies on cow, cat, dog, goat and rabbit animal species shows success rate of 92% in the first nearest recognition and 83% in the second nearest recognition.

The paper titled "On Image Classification: City vs Landscape "objective is how a specific high level Classification problem (city vs. landscape classification) can be solved from relatively simple low-level features suited for the particular classes. It uses k-Nearest Neighbour classifier and Classification system results in an accuracy of 93:9% when evaluated on an image database of 2,716 images using the Leave-one-out method.

The paper titled "Bacteria Classification using Image processing and deep learning "objective is to research the possibility to use image classification and deep learning methods for classifying genera of bacteria. The paper uses LeNet CNN method Python Programming and the Keras API with Tensor Flow Machine Learning framework. The experimental results have confirmed that two species of bacteria indifferent cell shape, Staphylococcus aureus (spherical or round shaped) and Lactobacillus delbrueckii (long-rod shaped) are able to automatically predict using machine learning by image classification and deep learning method.

The paper titled "Improvement of Classification accuracy using image fusion techniques "discusses on classification into three classes i.e. settlement, trees and agricultural by classification of an image which has been enhanced using fusion of two images. The fused images give better classification results than the original Image. The Brovery fused image provides better results than other Fused images. Out ofthree fusion techniquesthe classification accuracy of Broveryfusion has the highestaccuracy as 99.67 %than other techniques

The paper titled" Classification of X-ray Images Using Grid Approach "deals with the Classification of medical image to the image classes. Euclidean distance to obtain image similarity. Freeman Code to represent the shape of X-ray images and Jeffrey Divergence technique, image classification process by using grid approach. The result of this experiment for a number of images shows that there is a different score for Euclidean Distance and Jeffrey Divergence techniques of similarity measurement. The recognition rate of Jeffrey Divergence is better than Euclidean Distance.

The paper titled" Image Classification Skin Cancer Detection with CNN "uses to classify skin cancer to detect if it's benign or malignant. Keras Helps doctors to determine if it is dangerous or not and to maintain its way of treatment

3. TOOLS

- Python programming higher installed in windows 10 or any distribution of Linux.
- Arduino IDE software
- Training of an ANN model using Coding Source in MATLAB.
  Python open source library called TensorFlow1 is used in order to train the neural network

4. APPLICATIONS

Medical imaging: Its aim is to classify medical images into different categories to help doctors in disease diagnosis or further research. It addresses the problem of diagnosis, analysis and teaching purposes in medicine.

Object identification in satellite images: These models involve two steps. In the first step, the regions of presence of objects in the image are detected. In the second step, the objects are classified using convolution neural networks. In this work, a customised convolution neural network is proposed to detect and classify objects in satellite images.

Machine vision: It allows for the classification of a given image as belonging to one of a set of predefined categories.

Image classification with localization involves assigning a class label to an image and showing the location of the object in the image by a bounding box. Some examples of image classification with localization include: Labelling an x-ray as cancer or not and drawing a box around the cancerous region. Classifying photographs of animals and drawing a box around the animal in each scene.

Image Classification for Websites with Large Visual Databases With image recognition, companies can easily organize and categorize their database because it allows for automatic classification of images in large quantities. This helps them monetize their visual content without investing countless hours for manual sorting and tagging.

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