2nd National Conference on Recent Innovation in Engineering, Science, Humanities and Management
REVA University, Yelahanka, Bangalore, (India)
29th-30th March 2019 www.conferenceworld.in ISBN : 978-93-87793-79-8

Apparel Classification Using CNN

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ABSTRACT
In this paper we propose model for the classification of fashion apparel images using Convolutional Neural Networks (CNN).We trained the model with CNN using the Fashion MNIST data set. The fashion MNIST data set contains the 60,000 trained images of 10 different classes and 10,000 testing images and the original size of picture is 51*37 which will be resized to 28*28 grayscale. This CNN model includes batch normalization along with dropout which will reduce the training time of the model. The model classifies the input image based on the features we trained it and hence it shows the impressive results on the benchmark dataset of Fashion-MNIST.
Keywords- Convolutional Neuaral Networks(CNN),Fashion Mixed National Institute of Standards and Technology(MNIST),Deep learning.

I. INTRODUCTION

Computer vision is one area that is advancing rapidly and enabling new applications. Computer vision methods are image classification, object detection and neural style transfer. It is a technique of extracting, analyzing and understanding of useful information from a single image or multiple image in a sequence. The computer vision task that we are using in this project is image classification. Apparel classification is identifying the type of item in an image. This field has applications in social media, e-commerce and in law sector used to identify suspects with their clothes. We will focus on apparel classification, to classify the images we will use Convolutional neural network. The convolutional neural network is class of deep learning and it is widely used method in analyzing images. CNN takes advantage of the 2D structure of an image when generating informations. CNN model demonstrates a method to detect fashion apparels a person in an image is wearing or holding. The types of fashion apparels include hat, bag, skirt, pant, shirt etc. In our model we have used Fashion –MNIST image data set. It is a dataset created in Zalando's research lab having 70,000 fashion article images. It has labeled from 10 classes.

Some of the challenges faced are the classes can share similar characteristics and clothing type might look different depending on aspect ratio and angle.

II. PROBLEM DEFINITION

Classification of image is one of the most foundational problems in computer vision, which has a variety of practical applications such as image and video, Although the problem of identifying an object from an image is a very trivial problem for a human-being to perform, it is very challenging for a computer algorithm to do the same with human level accuracy. The algorithm must be invariant to a number of variations in order to identify and classify the images. This can be achieved by implementing the algorithms in the CNN environment.

III. RELATED WORK

CNN is first choice to do the image classification. To improve the apparel image classification meta-data enrichment is used with five different CNN architecture to analyze the pre-trained models[1]. Implementation of the metadata free database with retraining of the final layer of GoogLeNet for the apparel classification of the image and they had used two apparel classification (a)Multiclass classification of apparel type and (b)Similar Apparel retrival based on query image[2]It introduces fashion-MNIST, with 70,000 fashion products with 10 different classes and the images in fashion MNIST were converted and compared with that of original MNIST dataset making it instantly compatible with all the machine learning packages[3].For the same fashion MNIST

data set, batch normalization and skip connections are added to improve the accuracy of 92.54% and reduces the training time of the model[4]. It incorporates state-of-the-art object detectors with various geometric priors of the object classes. Since the location of fashion items are strongly correlated with the pose of a person, we propose a pose-dependent prior model which can automatically select the most informative joints for each fashion item and learn the distributions from the data[5].

IV. METHODOLOGY

Fashion-MNIST can be used as alternative replacement for the original MNIST dataset (10 categories of handwritten digits). It shares the same image size (28x28) as well as structure of training (60,000) and testing (10,000) splits .Keras is famous and esteemed high-level deep learning API. It's built right into to TensorFlow - an independent open source.

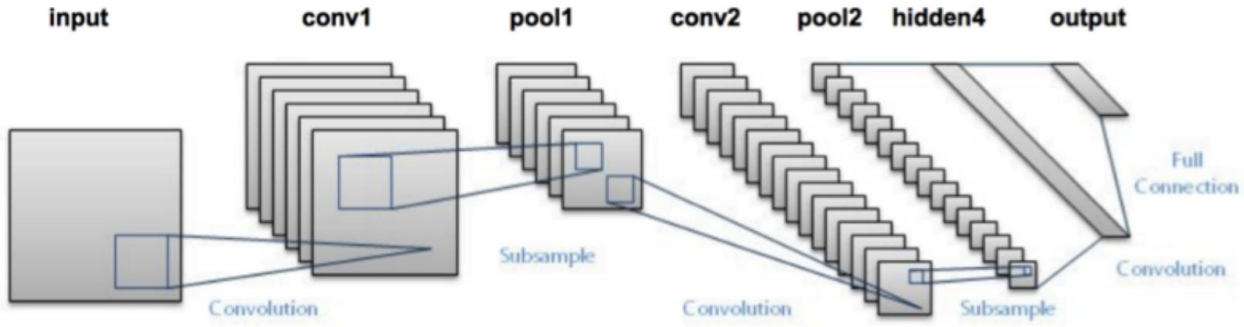


Fig1. CNN Architecture

The following are the steps followed to build the model:

- Import the Fashion-MNIST dataset
  Import the dataset and prepare it for training, validation and test.Load the fashion-MNIST data with the keras datasets API for classification.
- Visualize the data
  Visualize an image from the training data set with matplotlib library's imshow () so that data can be uniquely accessed.
- Data normalization
  Normalize the data dimensions so that they the input data is featured into same scale.
- Split the data into train/validation/test datasets
  Training data — used for training the model
  Validation data — used for tuning the hyper parameters and evaluate the models
  Test data — used to test the model after various validations takes place for accurate values.
- Create the model architecture
  Sequential model API is used to create a simple CNN model repeating with few layers of a convolution layer ordered by a pooling layer followed by a dropout layer.
- Describe the input data shape with first layer. The last layers is a dense layer with softmax activation that classifies the categories of data in fashion_mnist.
- Compile the mode
  lmodel.compile () is used to configure the learning process before training the model with proper inputs.
- Train the model, Test accuracy and visualize the predictions.
  Trained model to make predictions / classifications on the test data set model. If you see the label as red, it means the prediction is not matching the true label; otherwise it's green.
  In this we use Raspberry pi 3b to capture the images by installing the picamera package. With this package, we can get a camera object to control the camera module and specified object is identified.

ISBN : 978-93-87793-79-8

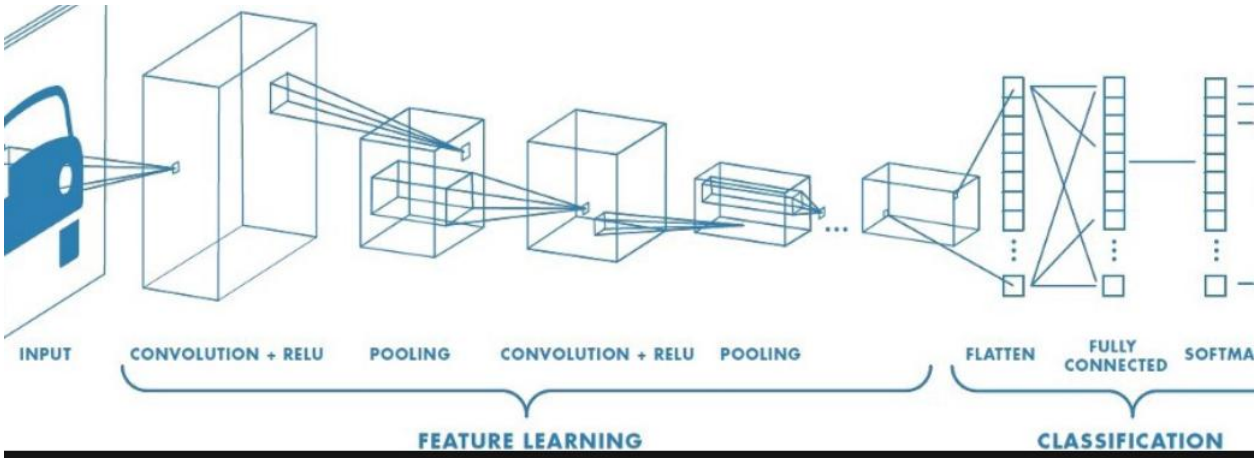
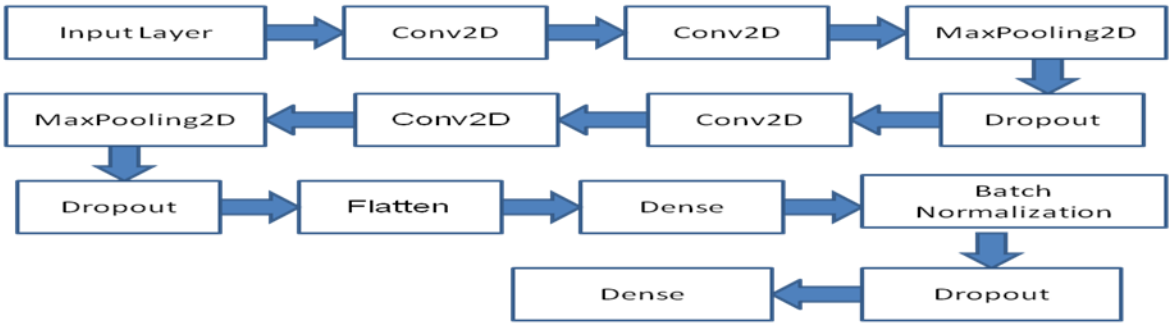


Fig 2. Image Processing and classification

V. FLOW CHART



The Convolutional neural networks are neuro-biologically inspired. A CNN consists of mainly five stages they are convolution2D, MaxPoolong2D, Dropout, Batch Normalization, Dense.

The input image is fed through camera, which forms the input layer of the CNN model where the small portion of the image is called neuron(pixel). The next step is convolution in 2D where the number of filters or kernels are used perform convolution. Generally 3*3,4*4 or 5*5 are slide over the input image to form s feature map. As the kernels slide over the image, the dot product operation is take place between these two result will be stored.

The next step is non-linear activation function over the result of the first step, for the non-linear activation 'ReLU' activation is mostly used in literature. Pooling function is applied to ReLU function, generally max pooling is used. For example if consider the 2*2 max pooling, the maximum of the 2*2 is the output.

Batch Normalization was done before every convolutional layer to increase the training speed of the model. Dropout is a technique which addresses this over fitting problem by randomly dropping out neurons which are under deactivation. This prevents the CNN from over-relying on certain neurons which increase the generalization capability of the model. Flattening is the process of converting all the resultant 2D vectors into long continuous linear vectors.

I. APPLICATION

The apparel image classification mainly used in the field of social media such as(TV shows,movies), e-commerce and criminal law.

II. CONCLUSION

In this paper we describe our approach to classify an apparel from a given image using convolutional neural networks with batch normalization and dropout which have been proven to perform remarkable well in the field of image classification, using CNN with fashion-MNIST as a dataset with accuracy of 90%.

ACKNOWLEDGEMENT
We sincerely thank REVA University, faculty and friends for supporting in all aspects for this technical paper. We also thank our parents and the almighty for all the moral support encouragement.

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