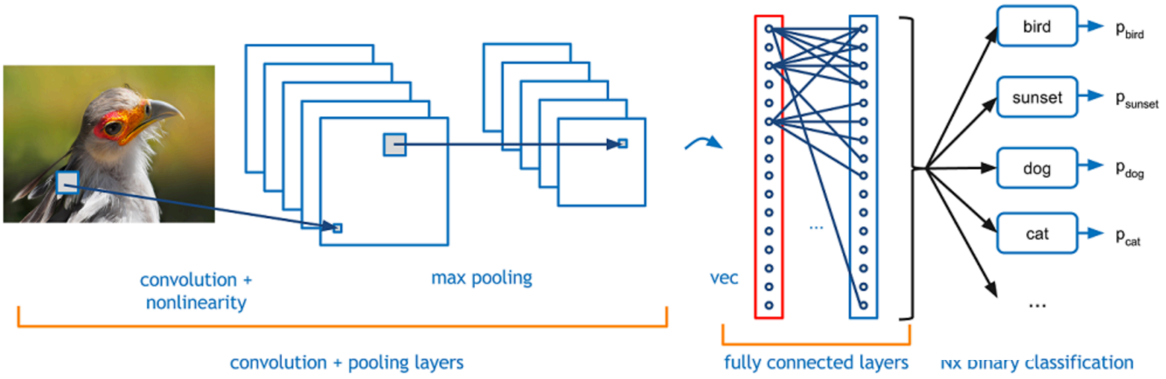
Apparel Classification

based on article type and colour

Approach

I used a Convolution Neural Network (CNN) with one convolution layer and one fully connected layer followed by the output layer. Used Keras with Tensorflow backend to build the CNN on python 3.



Design

Dataset (Link)

Classes*: 0:'black_jeans'
1:’blue_jeans'
2:’blue_shirt'
3:’red_shirt'

Training set:
1161 images belonging to 4 classes. Preprocessing is done to train the model faster and better.
Preprocessing: rescale = 1/255, shear_range=0.2, zoom_range=0.2, horizontal_flip=True

Test set:
240 images belonging to 4 classes.
Preprocessing: rescale = 1/255

* Since I couldn’t find a dataset with only shirt colour classification, I used a dataset with these 4 classes as this can demonstrate the proof of concept in my approach. This dataset classifies not only on the basis of article type but colour as well. Training with dataset of different shirt colours will yield similar results.

Model (Link)

Step1) Convolution+Relu: 2D convolution is performed on the preprocessed input image (size=(32,32,4)) using 16 filters and stride of 1. Relu activation function is then used to set negative values to 0 and induce non-linearity.

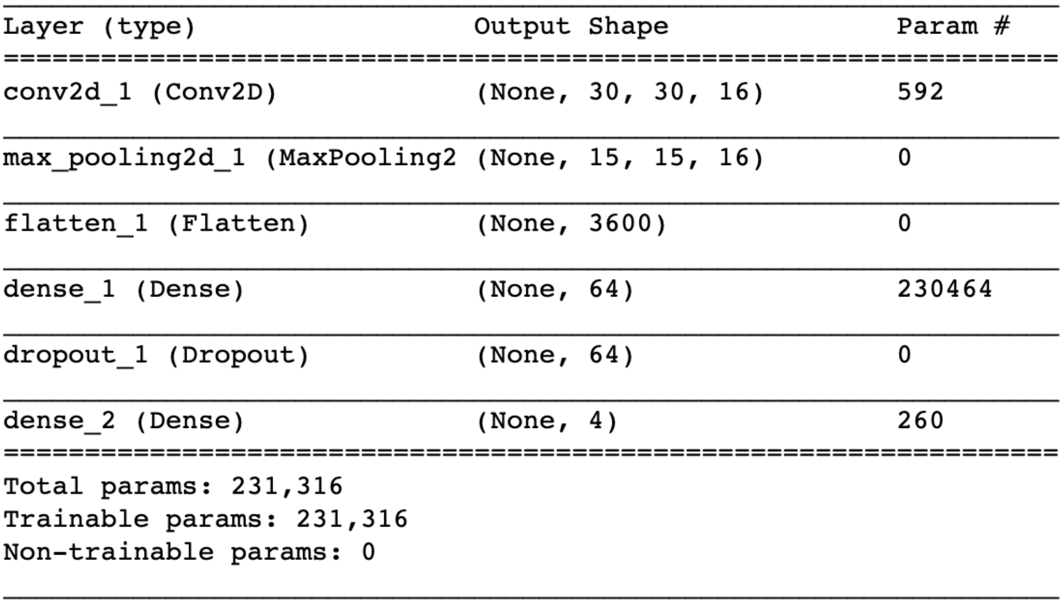
Step2) Maxpooling: Maximum value in a 2x2 unit cell is then mapped to a single pixel in the next layer. This step is repeated with stride of 2. This is done to reduce the input size to the neural network while still conserving the essential features.

Step3) Flatten: The RGBA image is then converted to 1D array.

Step4) Fully Connected Layer: Dimension = 64, Activation = Relu, Dropout = 0.2 (to reduce overfitting)

Step5) Output Layer: Dimension = 4 (number of classes), Activation = Softmax(to get probabilities)

Stochastic gradient descent (adam) is used to optimise weights in fully connected layer.
Categorical_crossentropy function is used to find loss.



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_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv2d_1 (Conv2D)            (None, 30, 30, 16)        592
_________________________________________________________________
max_pooling2d_1 (MaxPooling2 (None, 15, 15, 16)        0
_________________________________________________________________
flatten_1 (Flatten)          (None, 3600)              0
_________________________________________________________________
dense_1 (Dense)              (None, 64)                230464
_________________________________________________________________
dropout_1 (Dropout)          (None, 64)                0
_________________________________________________________________
dense_2 (Dense)              (None, 4)                 260
=================================================================
Total params: 231,316
Trainable params: 231,316
Non-trainable params: 0
_________________________________________________________________
```

Model Summary

test_batch_size:16, train_batch_size:8, steps_per_epoch:120, epochs: 5, validation_steps: 45
Accuracy : 97% on test_set, Loss: 0.095

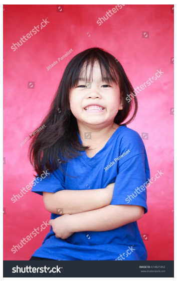
IPyNotebook: Link
Code_pdf: Link

Reason for CNN

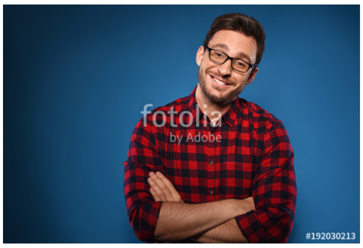
Referred ‘Apparel classification using CNNs’ by Patki R and Suresha S, Stanford University.
The report compared accuracies of different classification methods like SVM, Random Forest and CNN and found CNN to be one of the better approach.

Problems Faced

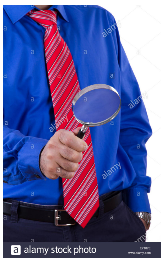
1. Finding dataset with CCTV images of coloured shirt.
2. As the model is not trained with images from CCTV, classification is not accurate for CCTV images. Accuracy will be improved in the case of only colour identification. With current classes accuracy can be improved by training on CCTV images as well.
3. Folded Hands/Ties/Obstructions:



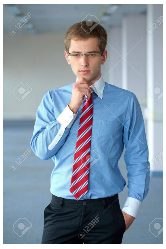
Identified as ‘black_jeans’



Identified as ‘black_jeans’

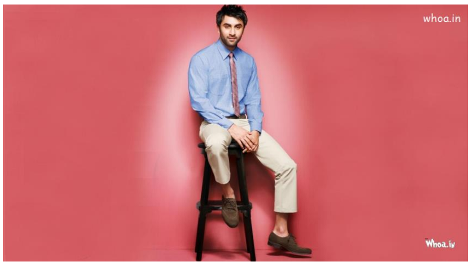


Identified as ‘blue_jeans’

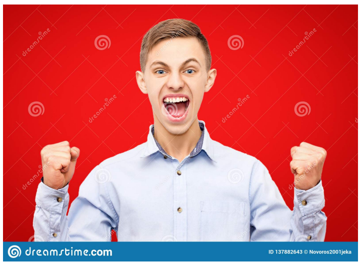


Identified as ‘blue_jeans’

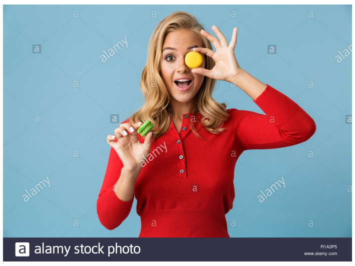
4. Background Colour (Not always and more common with red background):



Identified as ‘red_shirt’



Identified as ‘red_shirt’



Identified as ‘red_shirt’

Scope

- Training with more colours
- Correction for background colour anomaly. Can be done using bounded boxes and cropping only the shirt.
- Correction for folded hands/ties/obstruction. Research to be done.
- Multiple object recognition in single picture.

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IPyNotebook: Link
Code_pdf: Link