

CNN as a feature extractor

Here the dataset selected is the Fashion MNIST dataset. The reason for selecting Fashion MNIST is that it is one of the largest available datasets and also easy to handle and faster to use comparatively because of the images being in grayscale

2.1 About the Dataset

Fashion-MNIST is a dataset of Zalando's article images—consisting of a training set of 60,000 examples and a test set of 10,000 examples. Each example is a 28x28 grayscale image, associated with a label from 10 classes.

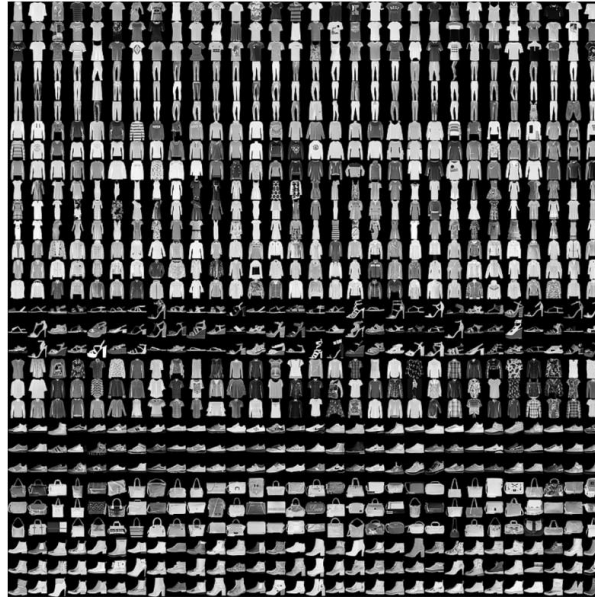


Fig. 8. The Figure shows sample images from the FashionMNIST dataset

2.2 Choice of Model

CNN is chosen as the feature extractor and the random forest classifier as a model on top. The function model() returns two objects: feature extractor and model.

We have defined our neural network as a feature extractor that has 4 convolutional layers along with max pooling, The convolutional layers are designed to detect different features in the image, such as edges, corners, and textures and The max-pooling layers are used to reduce the spatial dimensionality of the feature maps, which helps to reduce the computational complexity of the model. The CNN model also has a fully connected neural network with two dense layers and one softmax output layer, which outputs a probability distribution over the 10 possible classes. we have used ReLu as the activation function We have compiled the CNN model with Rmsprop optimizer and trained the model for 2 epochs and a batch size of 32. We have arrived at this architecture after performing experiments with different combinations of parameters. For eg. Refer to Fig.. 9. The choice of Optimizer was RMSProp because of better results.

Optimiser	Time taken for 3 epochs	accuracy	Prediction accuracy for RF
rmsprop	3.7mins	91	89
adam	3.5 mins	91	89
SGD	3.36	90	87

Fig. 9. The Figure shows the accuracy with respect to different optimizers

Overall, this architecture is designed to learn discriminative features from the input image and use them to classify the image into one of the 10 categories using Random forest.

The model extracted the features for the training data set and the test dataset and thereafter a classifier of choice, ie Random forest, which is a well-known model for ensemble learning, was used to perform classification on the MNIST fashion dataset. RandomizedSearchCV() was used to find the best hyperparameters for the random forest. And later the RF model with the best hyperparameters was trained with the extracted features of the training dataset

2.3 Result

And an accuracy of 89% was achieved after predicting using the trained RF on the extracted features of the test dataset. The same model was then fitted with the Bike and the Horse dataset as well.