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Designing of a Classifier for Virtual Trial Room: A Retrospective

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Abstract: -
Real-time virtual trial and propose dressing room are used in shops, malls, and any shopping centre. Trying dresses in the shopping centre is highly time-consuming activity. Also, it is not possible to try on clothes in online shopping. The main objective of proposed work is to increase time efficiency and improve the accessibility of clothes to try on by creating a virtual dressing room environment. The research focuses on to build an interactive and highly realistic virtual machine using different tasks like segmentation, shape extraction, feature extractions are performed to create virtual environment. In this research paper are analysed different classification algorithm such as SVM, KNN, Decision tree, Naïve base, DA, RF checked with different parameter like accuracy, precision, recall.
Keyword: *Support vector machine (SVM), K-nearest neighbour's (KNN), Decision tree, Naïve base, (Linear Discriminant Analysis) LDA, Random forest (RF)*

I. INTRODUCTION

In IT industry Virtual try-on of clothes has received much attention recently due to its commercial potential. It takes try-on of several clothes before the shopper can make decision on design, color and size of the apparel that satisfies her. Virtual try-on can help to speed-up the process as the shopper can see the clothes on her body without actually wearing them, or narrow down her selections before physical try-on. Furthermore, it can enhance the user's shopping experience through new features, such as side-by-side comparison of various clothes and simultaneous viewing of outfits from different angles.[4]

Our style advice will help you to look and feel your best whatever your shape, size, personal colouring, age, style personality, budget and location. The system will help you discover what to wear to flatter your body shape and colouring and make it easier for you to create a visual balance and colour harmony in your look. The goal is to create the visual balance of the neat hour glass body shape by wearing appropriate clothes styles, patterns and colours. [17]

The system recognise that fit does not equal suitability and just because something is available in your size it is not guaranteed to deliver an attractive visual balance in your look. It is best to choose clothes which were designed with you and your shape in mind. The system recommends the colours which flatter you by creating colour harmony with your personal colouring. Your personal colouring profile is determined by your skin and eye shape.

The system will help you to save money by advising you on how to buy the clothes you will wear rather than the ones that just stay in your wardrobe. Cost per use is more important that the actual cost of the item. [17]

II. METHODOLOGY

A) Feature extraction:

An image is a matrix consisting of certain pixel values. Feature extraction process helps to reduce this matrix size and forms a feature vector which contains information of image like its texture, area, shape, colour, object, edges, etc. The feature extraction used here are color and shape features extraction.

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i) Colour Feature:

Dressing in the right colours can improve your self-esteem and confidence. It's an easy way to look good, feel good and co-ordinate your wardrobe. Not only that but wearing the right colours can help you achieve a younger and healthier.

Extract colour feature by measuring mean, variance and standard derivation.

Mean: The first colour moment can be interpreted as the average colour in the image, and it can be calculated by using the following formula

$$E_i = \sum_{j=1}^{N} \frac{1}{N} p_{ij}$$

Where N is the number of pixels in the image and is the value of the j-th pixel of the image at the i-th colour channel.

Standard Derivation: The second color moment is the standard deviation, which is obtained by taking the square root of the variance of the color distribution.

$$\sigma i = \sqrt{(\frac{1}{N}\sum_{j=1}^{N}(p_{ij} - E_i)^2)}$$

Where is the mean value, or first color moment, for the i-th color channel of the image.

ii) Shape Feature:

The clothes which will flatter you best will depend on your body shape. Today the choice of clothes is so varied that there's something for everyone no matter size, height, proportion or body shape you are. When it comes to looking good, it's not your size or shape that matters, it's the fit of your clothes. Wearing the right clothes shouldn't be about following the latest fashion trends; it should be about choosing what suits you and what makes you feel comfortable and confident.

The garments which will compliment you best will rely upon your body shape. Today the decision of garments is shifted to such an extent that there's something for everybody regardless of what size, stature, extent or body shape you are.

With regards to looking great, it's not your size or shape that issues, it's the attack of your garments. Wearing the correct garments shouldn't be tied in with following the most popular trend patterns; it ought to be tied in with picking what suits you and what causes you to feel good and sure.

Extract face and eye features height and width.

Face Height (Fh): Measure from the center of your hairline to tip of your chin.

Face Width (Fw): Measure your face from the ear to ear.

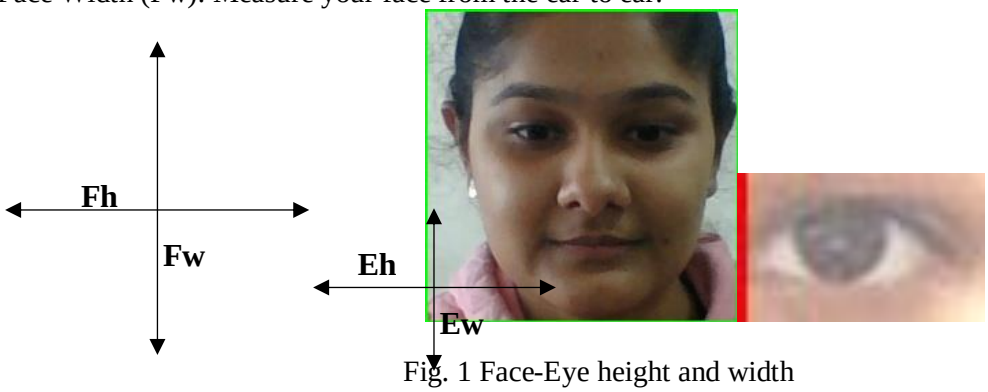

Fig. 1 Face-Eye height and width

Eye Height (Eh): Eye height is a measure of the vertical opening of an eye diagram. An ideal eye opening would be measured from the one level to the zero level.

Eye Width (Ew): Eye width is a measure of the horizontal opening of an eye diagram. Ideally, the eye width would be measured between the crossing points of the eye.

B) Classification

i) KNN:

K-Nearest Neighbors operates by checking the distance from some test example to the known values of some training example. The group of data points/class that would give the smallest distance between the training points and the testing point is the class that is selected.[18]

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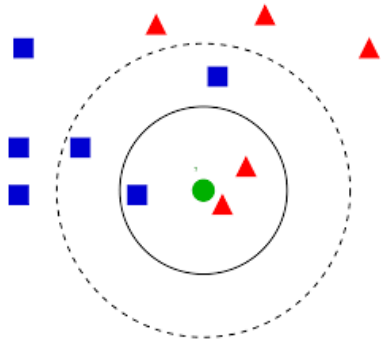

Fig. 3 KNN classifier

ii) Decision Trees

A Decision Tree Classifier functions by breaking down a dataset into smaller and smaller subsets based on different criteria. Different sorting criteria will be used to divide the dataset, with the number of examples getting smaller with every division.[18]

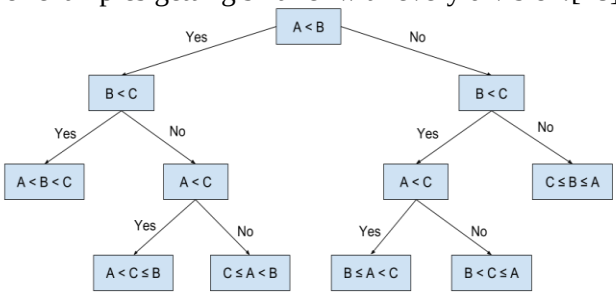

Fig. 2 Decision Tree

iii) Naive Bayes

A **Naive Bayes Classifier** determines the probability that an example belongs to some class, calculating the probability that an event will occur given that some input event has occurred.

When it does this calculation, it is assumed that all the predictors of a class have the same effect on the outcome, that the predictors are independent.[18]

iv) Linear Discriminant Analysis

Linear Discriminant Analysis works by reducing the dimensionality of the dataset, projecting all of the data points onto a line. Then it combines these points into classes based on their distance from a chosen point or centroid.

Linear discriminant analysis, as you may be able to guess, is a linear classification algorithm and best used when the data has a linear relationship.[18]

v) Support Vector Machines

Support vector machine (SVM) is one of the machine learning approach which is used for classification problem. The algorithm used here is simple it creates a line or hyperplane which separates the data into classes.

Support vector machine (SVM) used in our experiment is a linear SVM. Since SVM is a machine learning approach method to design a classifier we have to extract features and then feed these features to the SVM model for training. Three different SVM classifier models are created one model is trained with input as wavelet features, the second model is trained by moment features of data and third model is trained with combined feature vector of wavelet and moment features. The figure shown below shows that how SVM divides data into two separate classes.

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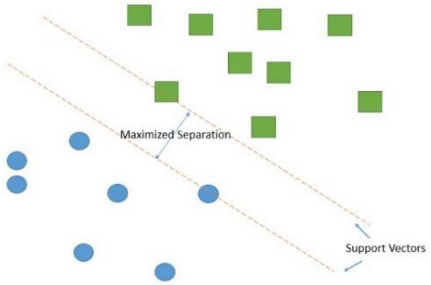

Fig.4 SVM classifier

vi) Random forest:

A random forest is a meta estimator that fits a number of decision tree classifiers on various sub-samples of the dataset and uses averaging to improve the predictive accuracy and control over-fitting. The sub-sample size is always the same as the original input sample size.[18]

III. PROPOSED SYSTEM

Our proposed system implemented in Anaconda Navigator in spydere 3.3.6 version of software environment. The variable explorer of this software helps us to view value matrics of various variable parameter and Ipython console window helps us to view the all layers of the classifier which we have designed.

Lavender	Sea form green	Blush
Soft yellow	Mint green	Coral
Ivory	Peach	

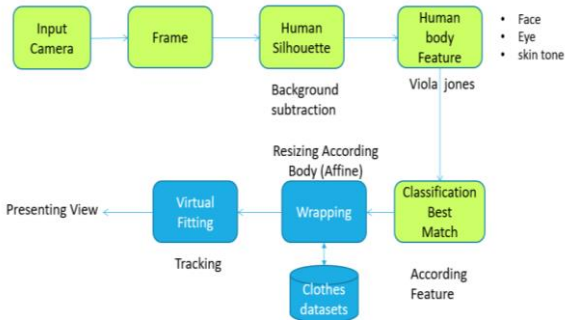

Fig.5 proposed flow

As demonstrated in Fig. camera is connected with the system. The camera continuously capture the image of user and video shown preview frame on desktop screen. The foremost step in process is extract foreground and background subtraction. Extract human silhouette using background subtraction. The system can suggest clothes according the different body features like hair, skin-color, face, and eyes, extra...Then user is allowed to select the cloths model from the given database. According the feature train system to suggest cloths that suits on user. The sample shirt is selected for fitting must be resized according to the size of person. Thus, the sample shirt is wrapped to the silhouette by taking feature point as reference using affine transform. Then, virtually fits the sample shirt.

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To train the system with machine learning approach for suggesting clothes. Following the comparative analysis of classifiers during this phase **Decision tree classifier** give 90 % accuracy. Therefore, Decision tree classifier is better for my proposed system.

In our system we have Initially take three classes:

- Light
- Medium
- Deep

C) *Suggestion:*

The system will suggest to you what to wear to flatter your body shape and colouring and make easier to create visual balance and color harmony in your look.it is best to choose clothes which were designed with you and your skin color in mind. The system recommends the color which flatter you by creating color harmony with your personal colouring

Light

Best colours to wear: Lavender, seafoam green, blush, soft yellow, mint green, coral, ivory, peach

Medium

Olive	Purple	Mustard
Cranberry	Forest Green	Royal Blue
Pink		

Best colours to wear: Olive, Purple, Mustard, Cranberry, Forest Green, Royal Blue, pink

Deep

Jewel Tones	White	Fuchsia
Yellow	Royal blue	Blush

Best colours to wear: Jewel tones, white, fuchsia, yellow, royal blue, blush

IV. RESULT AND ANALYSIS

[A] Result: The output below is shows detection of facial features and also shows skin color and system will suggest color according your personal colouring.

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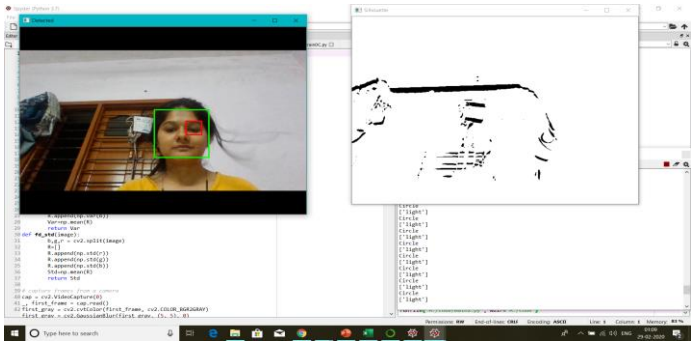

D) Comparative analysis of classifiers:

i) Comparative study:

Table. 1 Comparative analysis of classifiers

Classifier	Accuracy	Precision	Recall
Decision Tree	90.83	0.90	0.90
KNN	88.33	0.88	0.88
Naïve Bayes	76.66	0.78	0.74
LDA	76.66	0.76	0.75
SVM	85.83	0.84	0.84
RF	77.5	0.82	0.74

ii) Analysis graph:

Accuracy: In measurement of a set, accuracy refers to closeness of the measurements to a specific value

accuracy = (correctly predicted class / total testing class) × 100%

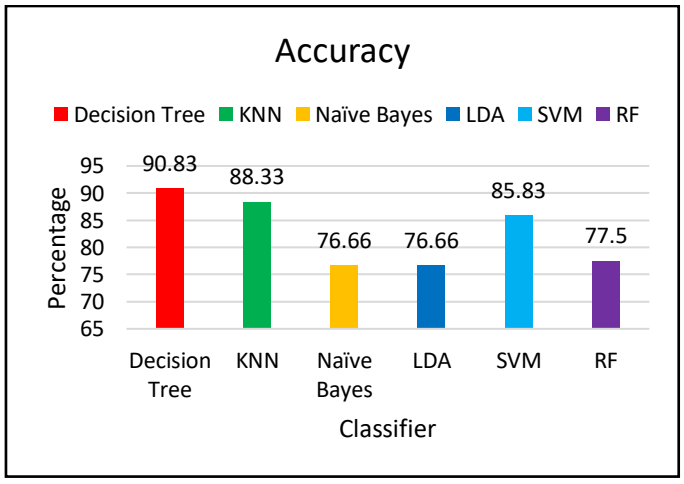

Fig. 6 Graphical illustration of accuracy of classifier per percentage

Precision: Precision is to measure the quality of our predictions only based on what our predictor claims to be positive.

precision = True positive / (True positive + False positive)

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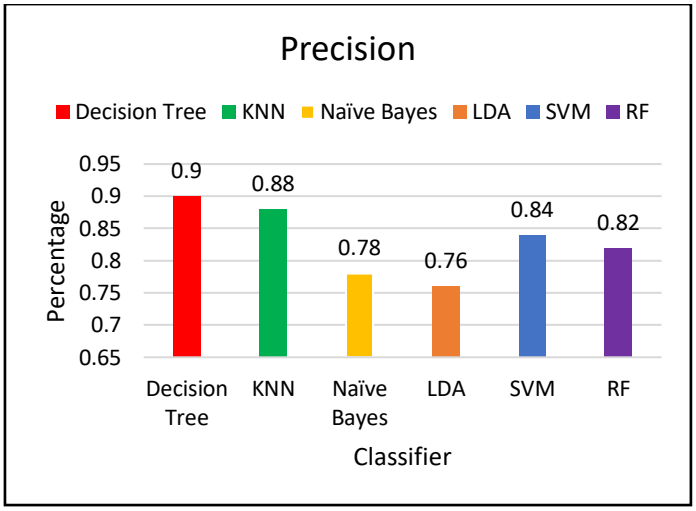

Fig.7 Graphical illustration of precision of classifier per percentage

Re-call: Recall is defined as the number of true positives over the number of true positives plus the number of false negatives.

recall = True positive / (True positive + False negative)

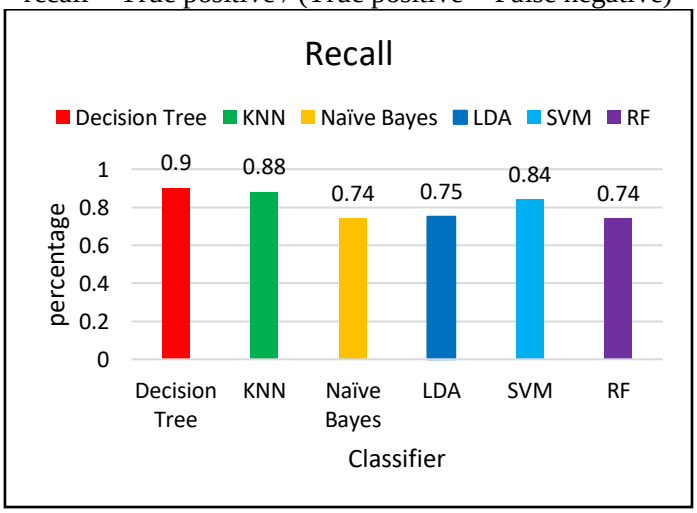

Fig. 8 Graphical illustration of Recall of classifier per percentage

CONCLUSION

In this research, present methodology uses for image-based virtual try-on system, to synthesize the try-on video given a customer real-time video with arbitrary clothes and a clothes product image. Also study about different representation for body feature extraction approach. Comparative study show that the facial parts features can better keep the pose and shape of the customer, while in machine learning methods Decision tree give 90.83% accuracy for suggestion of clothes based on facial feature. So, in future if work with these approaches can gives batter outcomes in virtual try on system.

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