Painting Style of Texture for Virtual Dressing Room using Convolutional Neural Network

Chaithra Chandrappa Barki[1], Kanchana[2], Harshitha Meti[3], Akshitha[4], Mr.Sudesh Rao [5]

[1234] U.G. Student , Dept. of CSE, Srinivas School of Engineering, Mukka, Mangalore, Karnataka, India

[5] Assistant Professor, Dept. of CSE, Srinivas School of Engineering, Mukka, Mangalore, Karnataka, India

---***---

Abstract-*With recent advance in web technology, any online shopping websites are emerged. Despite its advantage, however, online shopping presents certain drawbacks. One drawback is that it's going to be difficult for an individual to see how a given article would look if worn by that person-owing to the rich variation body size and shape, hair and complexion, etc., within the human population. Testing the fitness of garments is very important for both customer and trader. Our approach consider how the chosen garment fitted the user's body and the way it'll be appear as if he/she in world. This was administered by identifying critical points on garment and user's body dimensions using image processing techniques. During this paper, an application for mitigating the virtual room was designed, implemented and tested along with this we are using portrait painting technique by maintaining the input photograph identity and detecting an equivalent dress for various age bracket persons.*

Keywords: NPAR, painting transfer VGG special constraints.

1.   1. INTRODUCTION

Due to rapid growth in technology, our day-to-day life is affected by many smart systems which facilitates our activities. For instance, online shopping is grew up very fast. Trying different clothes in shop is very time consuming and difficult activity as people nowadays are very busy. Online shopping offers them vast variety of options, best brands with attractive prizes. However, an issue for buying clothes online is that after ordering the cloth from online shopping it may or may not fit the customer. So, trying the cloths before purchasing is very important. So, Real time virtual dressing room is a concept where customer buy clothes without actually wearing it. The detection of user and the body parts is one of the main steps in creation of real time virtual dressing room system. Cloths with different colours and textures are provided by using the concept of painting style transfer of image.

Most of the researchers in previous work attempted several methods and procedures. But in our approach as the user stands in front of the camera, his sizes are measured in real time image mapping will occur.

2. LITERATURE REVIEW

This real-time virtual dressing room is a vibrant and useful topic and it has attracted many researchers. In [1], a method and system are provided to facilitate recognition of gestures representing commands to initiate actions within an electronic marketplace on behalf of a user. Spatial data about an environment external to a depth sensor may be received by an action machine. The action machine may generate a first model of a body of the user based on a first set of spatial data received at a first time, the first model being representative of a user of an electronic market place. The action machine may then generate a second model of the body of the user based on a second set of spatial data received at a second time, the second model being representative of the user, a processor module configured to determine that the difference between the first and second models corresponds to a gesture by the user, the gesture representing a command to initiate an action within the electronic marketplace on behalf of user.

In [2], a virtual dressing room application using the Microsoft Kinect sensor was introduced. Here user is extracted from the video stream by using depth and user label data provided by the Kinect sensor, register the cloth model with the Kinect tracking data, and detect skin to adjust the order of layers. An average percentage of overlap between the user and the cloth models of 83.97% is reported.

In [3]. A new technology for producing 3D clothes, with realistic behaviour, providing users with an opposite feel for the garment's details is presented. The entire process starts from the creation of the virtual bodies (either male or female) using standard measurements, which form the basis for garment modelling. Using the splines, the 2D garment patterns are created and then seemed together around virtual human body, providing the initial shape. A simulation is made using the seemed garment by applying the physical parameters based on real fabric properties. Once the garment has been created, a real time platform, which has been embedded inside the web browser, is used as an interface to the internet. Web interface's ability is extended add interactivity and the ability to dynamically change the textures, clothes, body measurements, animation sequences and certain features of virtual environment.

In [4]. Garment modelling which is based on creating virtual bodies by using standard measurements was presented. The 2D garment pattern are created by using splines then seemed around virtual human body to provide the initial shape. The simulation was made by applying physically parameters based on real fabric properties to get the seemed garment. After the garment creation, a web browser-embedded in real time platform was used as interface to the internet.

In [5]. A mobile application was presented. The application enables online clients to see a clothing item will look on them before purchasing it. The client downloads the application on his or her mobile. After that the user will be prompted for a series a series of questions about the body size, shape and skin tone. Once such data is entered by the client, the application guides the client to the clothes that fit his or her body.

3. EXISTING SYSTEM

This system is naturally limited by how well the color transfer from the content image on to the style image works. The color distribution often cannot be matched perfectly leading to a mismatch between the colors of the output image and that of the content image Although head portraits are popular in traditional painting and have shown their effectiveness in locally transferring the colour distributions of the example paintings. They have some problem dependencies between the luminance and the color channels are lost in the output image. This is particularly apparent for styles with prominent brushstrokes. Colors are no longer aligned to strokes. That means a single brushstroke can have multiple colors, which does not happen in real paintings. In comparison, when using full style transfer and color matching the output image really consists of strokes. Although this eliminates ghosting of impact of alignment, they have limitations of being error-prone mainly due to sift flow. However, it fails when there is a strong misalignment between the input photograph and example paintings. This limitation can be generated by different head poses or from hair mismatch.

Disadvantages –

- This painting style do not have any application or do not grab attention by any photography application.
- They have some problem dependencies between the luminance and the color channels are lost in the output image.
- The color distribution often cannot be matched perfectly leading to a mismatch between the

colors of the output image and that of the content image.

4. PROPOSED SYSTEM

As painting style transfer for head portraits that is only applicable for morphological faces and artistic images. So, we extended our project by real time virtual dressing room system. Cloths with different colours and textures are provided by using the concept of painting style transfer for images.

In this system, camera continuously captures the image of the user and displayed on the desktop screen. Then the user is extracted from that image by using some algorithms. Then the user is allowed to select the cloth model from the given database.

Using the lower body detection algorithm is shoulder points are detected and positioned the cloth model on the user body. Then, scale the cloth model as required by using Euclidian distance between body joints and distance of the user from camera. Then, superimposition of the cloth model takes place on the user's image and displayed on the screen.

Virtual mirrors are also known as virtual dressing rooms however not much work has been done on attempting the problem of color change and texture projection for shirts that we are after. Successful project is virtual mirror this however was extremely on the constraints it posed on the user who was using the system. The system required a yellow shirt be worn and that there be texture on the shirt in the region where the texture had to be changed. This texture would not be applicable a plain any colored shirt.

Advantages –

- It is used to make right choice for the size of cloths without wearing it actually.

- It provides a platform for experimenting different cloth styles.

- Main advantage is that the precious time of the customer is saved by this virtual machine.

- It reduces the human efforts for trying many cloths.

5. SYSTEM DESIGN

The VGG network architecture was introduced by Simonyan and Zisserman . It is a very Deep Convolution Networks for Largescale Image Recognition. The network

Is characterized by its simplicity using a 3 x **3** convolutional layers stacked on top of every other in increasing depth. VGG 16 Convolutional neural network consist of 13 convolutional layer, 5 maximum pooling layers and 3 dense layer which sums up to 21 layers but only 16 weight layers. Convo1 has number of filters as 64 while Convo2 has 128 filters while Convo4 and Convo5 has 512 filters.
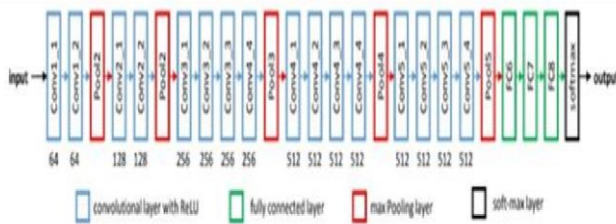

Figure 1: Architecture of VGG-16 Convolutional Network

The above figure shows the Architecture of VGG 16 Convolutional Network. It consists of 4 layers. They are, convolutional layer with ReLU, fully connected layer, max pooling layer and soft-max layer.

Lower Body Detection Algorithm –

Lower body detection is completed by using Haar Classifiers. Haar Classifier is employed to detect the human during a moving vedio ;feature like eye detection, face detection, upper body detection. . Haar Classifier are instructed with the assistance of negative and positive samples of images and saved as . xml files . Haar Cascades is Haar Classifier one among the function. Some cascades utilized in OpenCv to detect human are Haar Cascade full body, Haar Cascade lower body, Haar Cascade upper body, Haar Cascade front face etc. Haar cascade uses the Region of Interest (ROI) for detecting lower body.

This limitation can be generated by different head poses or from hair mismatch**.**

Disadvantages –

- This painting style do not have any application or do not grab attention by any photography application.
- They have some problem dependencies between the luminance and the color channels are lost in the output image**.**
- The color distribution often cannot be matched perfectly leading to a mismatch between the colors of the output image and that of the content image.

4. PROPOSED SYSTEM

As painting style transfer for head portraits that is only applicable for morphological faces and artistic images. So, we extended our project by real time virtual dressing room system. Cloths with different colours and textures are provided by using the concept of painting style transfer for images.

In this system, camera continuously captures the image of the user and displayed on the desktop screen. Then the user is extracted from that image by using some algorithms. Then the user is allowed to select the cloth model from the given database.

Using the lower body detection algorithm is shoulder points are detected and positioned the cloth model on the user body. Then, scale the cloth model as required by using Euclidian distance between body joints and distance of the user from camera. Then, superimposition of the cloth model takes place on the user's image and displayed on the screen.

Virtual mirrors are also known as virtual dressing rooms however not much work has been done on attempting the problem of color change and texture projection for shirts that we are after. Successful project is virtual mirror this however was extremely on the constraints it posed on the user who was using the system. The system required a yellow shirt be worn and that there be texture on the shirt in the region where the texture had to be changed. This texture would not be applicable a plain any colored shirt.

Advantages –

- It is used to make right choice for the size of cloths without wearing it actually.

- It provides a platform for experimenting different cloth styles.

- Main advantage is that the precious time of the customer is saved by this virtual machine.

- It reduces the human efforts for trying many cloths.

5. SYSTEM DESIGN

The VGG network architecture was introduced by Simonyan and Zisserman . It is a very Deep Convolution Networks for Largescale Image Recognition. The network Is characterized by its simplicity using a 3 x **3** convolutional layers stacked on top of every other in increasing depth. VGG 16 Convolutional neural network consist of 13 convolutional layer, 5 maximum pooling layers and 3 dense layer which sums up to 21 layers but only 16 weight layers. Convo1 has number of filters as 64 while Convo2 has 128 filters while Convo4 and Convo5 has 512 filters.
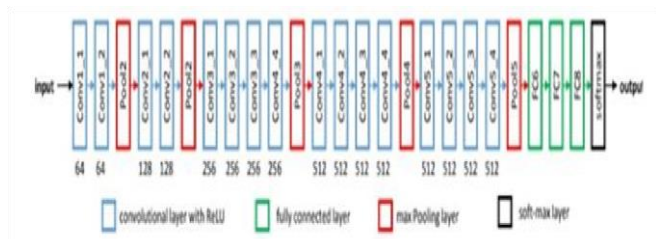
Figure 1: Architecture of VGG-16 Convolutional Network

The above figure shows the Architecture of VGG 16 Convolutional Network. It consists of 4 layers. They are, convolutional layer with ReLU, fully connected layer, max pooling layer and soft-max layer.
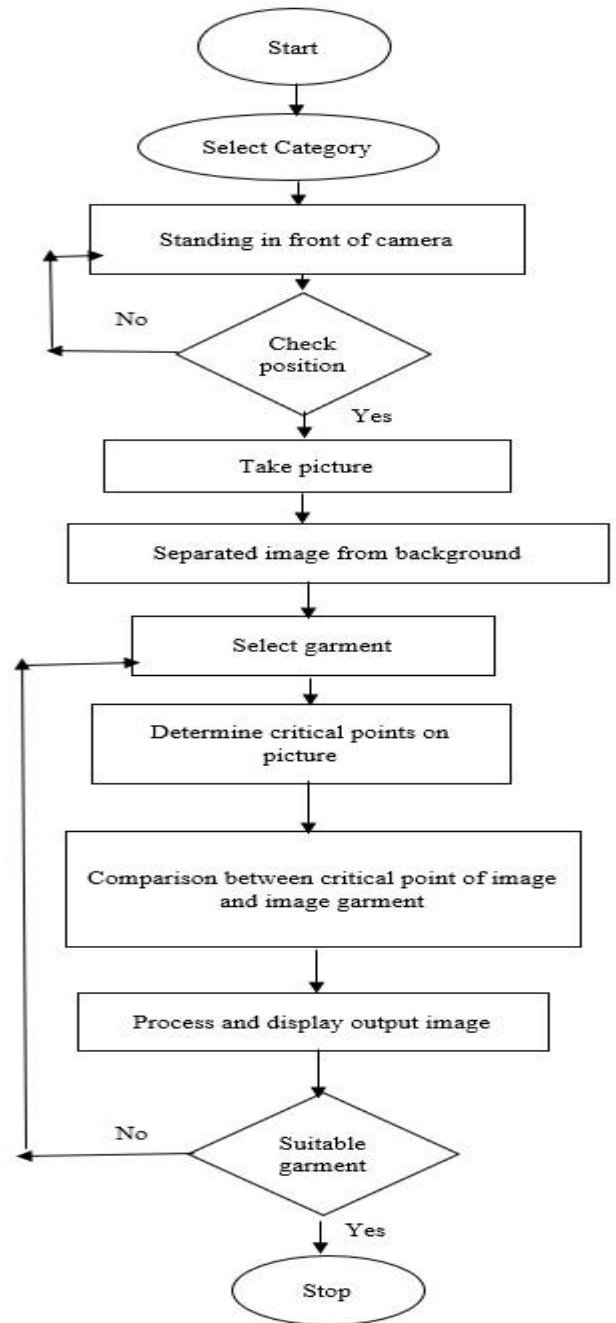
Lower Body Detection Algorithm –

Lower body detection is completed by using Haar Classifiers. Haar Classifier is employed to detect the human during a moving vedio ;feature like eye detection, face detection, upper body detection. . Haar Classifier are instructed with the assistance of negative and positive samples of images and saved as . xml files . Haar Cascades is Haar Classifier one among the function. Some cascades utilized in OpenCv to detect human are Haar Cascade full body, Haar Cascade lower body, Haar Cascade upper body, Haar Cascade front face etc. Haar cascade uses the Region of Interest (ROI) for detecting lower body.

Frame differencing identifies the moving body from reference and current frame region of interest draws bounding box on moving object such as lower body. After drawing the bounding box we get the ROI image which we show in our separate window. After getting the separate window we apply dress on that window. So lower body detection algorithm using haar classifier is very efficient to use.

Face Detection Algorithm –

Face detection algorithm is used for checking whether the given input image contains any human face, and if face is present, returning the location of the face in image. Face is an important thing for identifying presence of people. Here we are using face detection algorithm using haar classifier. The haar like feature is formed using two or more rectangles and easily scaled by maximizing and minimizing size of the pixels. This haar feature is used for face detection.
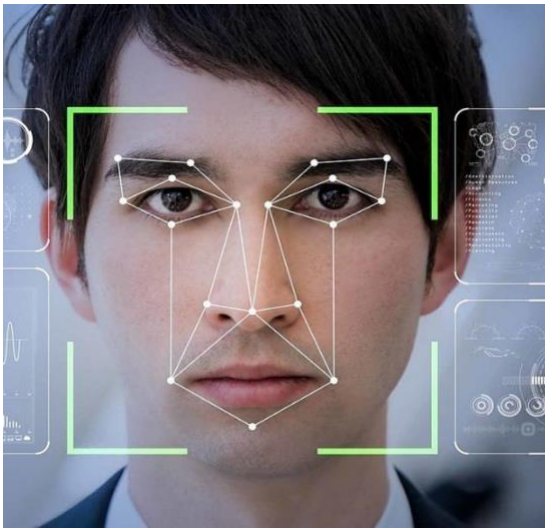
PROCESSING FLOW:

Figure 3 : Using Face Detection Algorithm

The application approach is to replace the body image by garment mesh surfaces through garment image, based on the points taken from front view. The application with the help of the customer will carry out process of trying clothes fast and easy ,and selecting the best for him/her consequently.

6. METHODOLOGY AND IMPLEMENTATION

Euclidian Formula for image detection –

The Euclidian distance formula is used to find the distance between camera and the customer. This Euclidian distance formula is used for scaling the cloth model on the customer's image. If the distance between the customer and the camera is large then scaling will be minimized and if the distance between customer and the camera is small then scaling will be maximized. Euclidian distance formula is given as:

$$\text{Distance } ((x, y), (a, b)) = \sqrt{(x-a)^2+(y-b)^2}$$

Suppose x and y are coordinates of camera. Similarly a and b are coordinates of customer.

The registration can be done after filling the form. Admin needs to login before performing any personal information of the user. Then the user can functions with admin name and password. After login login through username and password. A web page is opened provided with many options like Home, Users, Category, Sub Category, Product, Edit Product and Logout.

Admin can check the details of users with the users option which has the details of all the users who have logged in. Admin can add the different categories using Category option. Admin also adds subcategories with Subcategory option. Admin then adds different products with their price and with their image along with their description by clicking on Products option.

Then the admin will click submit button if he/she completes filling data and selects reset button if he/she want to reset the data. If there is any changes needed to make with the product category, subcategory or the product itself Admin can make it by selecting Edit option and he can also select Delete option if he/she wants to delete the product.
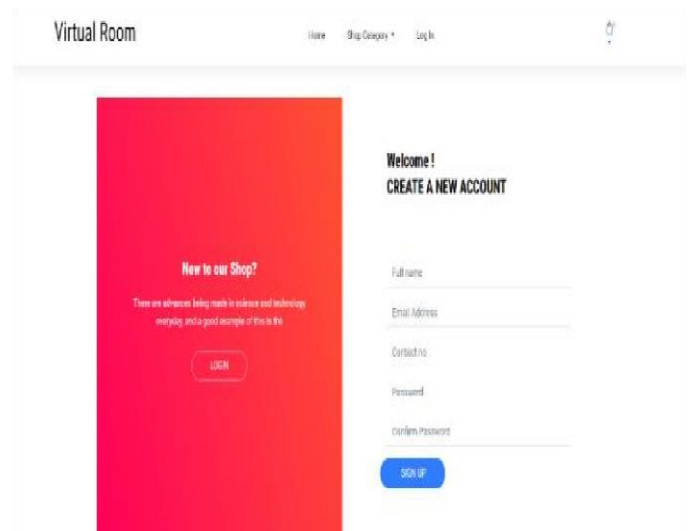

Figure 4: User Details

The registration can be done after filling the form. Admin needs to login before performing any personal information of the user. Then the user can functions with admin name and password. After login login through username and password. A web page is opened provided with many options.
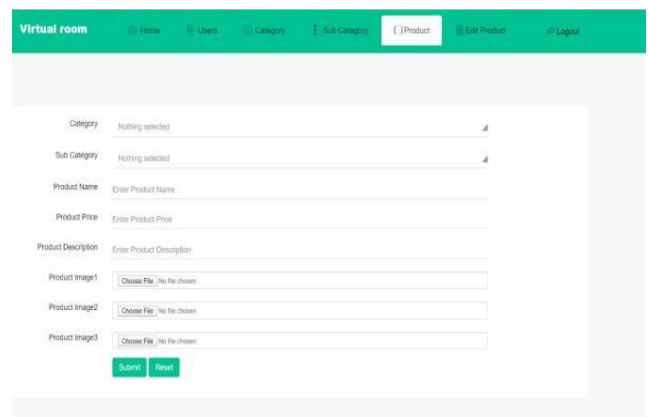

Figure 5.Admin details

User is provided with freedom to go through different categories and subcategories and their choice of products. If they wish to buy a particular product then they needs to register before buying.
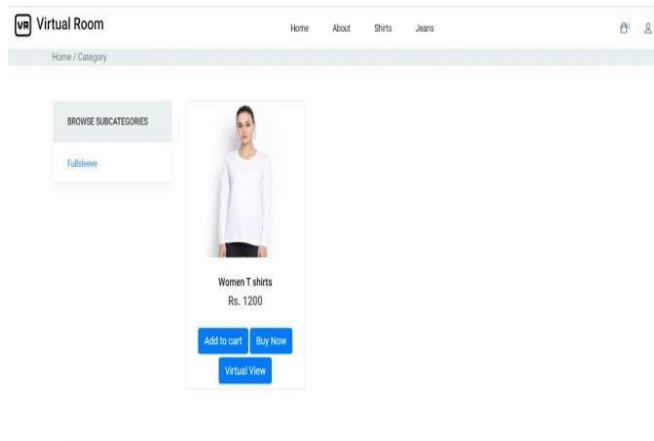

Figure 6: User Details

User can try out the product selected by them using the web camera interface developed and they can also opt for different range of sizes of clothes. Finally they can place order by clicking on the respected option provided.
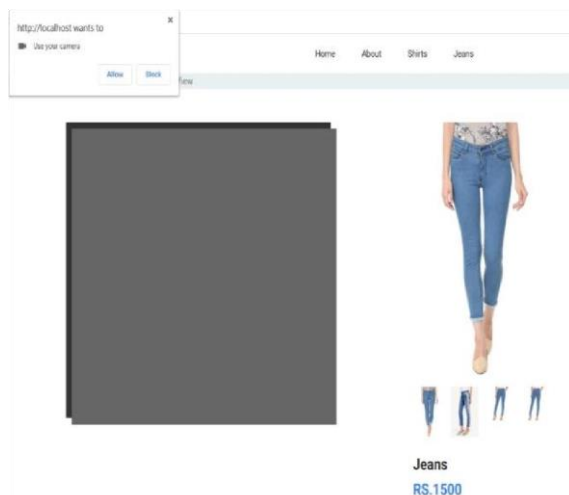

Figure 7: Add to cart

The process of building a convolutional Neural Network always involves four major steps.
Step-1: Convolution
Step-2: Pooling
Step-3: Flattening
Step-4: Full connection
CNN is that the extension for the Convolutional Neural network. We'd like to make the new file and save it with a '.py' extension. Here '.py' is that the extension for python file. We'd like to import all the required keras packages using which we are going to build our CNN and confirm that each package is installed properly. There are two ways of using keras , i.e. Using Tensorflow backend and by using Theano backend.

#importing the keras libraries and packages
from keras. models import Sequential
from keras. layers import Conc2D
from keras. layers import MaxPooling2D
from keras. layers import Flatten
from keras. layers import Dense

In line 1, we've imported Sequential from keras. Models, to initialize our neural network model as a sequential network. There are two basic ways of initializing a neural network, either by a sequence of layers or as a graph. In line 2, we've imported Conv2D from keras. layers, this is often to perform the convolution operation i.e the primary step of a CNN, on the training images. Since we are performing on images, which a basically 2 Dimensional arrays, we are using Convolutional 2-D. In line 3, we've imported MaxPooling2D from keras. layers, which is employed for pooling operation. For building the neural network, we are employing a Maxpooling function. There are different types of pooling operations like Min   Pooling, Mean Pooling, etc. In line 4, we've imported Flatten from keras. layers, which is employed for Flattening. Flattening is that the process of converting all the resultant 2-demesional arrays into one long continuous linear vector. and eventually in line 5, we've imported Dense from keras. layers, which is employed to perform the complete connection of the neural network **,** which is that the step 4 within the process of building a CNN.

7. CONCLUSION

For implementing the real time virtual room different technologies, frameworks and algorithms were used. This application can be used by any non-technical person. This application is flexible and look-real cloth model for user to wear. It is an easy control, user-friendly and fashionable body-motion based GUI for user. Many interesting and useful functionalities for customer is added in our application. One positive service this application provides specially to females is that they do not have to enter a changing room to try clothes.

REFERENCES

[1]   Higgins, K. R., Farraro, E. J., Tapley, J., Manickavelu, K., & Mukherjee, S. (2018). *U.S. Patent No. 9,898,742*. Washington, DC: U.S. Patent and Trademark Office.

[2] Isıkdogan, F., & Kara, G. (2012). A real time virtual dressing room application using kinect. *CMPE537 Computer Vision Course Project.*

[3] Korszun, H. A. (1997). *U.S. Patent No. 5,680,528.* Washington, DC: U.S. Patent and Trademark Office.

[4] Protopsaltou, D., Luible, C., Arevalo, M., & Magnenat-Thalmann, N. (2002). A body and garment creation method for an Internet based virtual fitting room. In *Advances in Modelling, Animation and Rendering* (pp. 105-122). Springer, London.

[5] Steermann, M. C. (2014). U.S. Patent Application No. 14/215,649.

[6] Kjærside, K., Kortbek, K. J., Hedegaard, H., & Grønbæk, K. (2005). ARDressCode: augmented dressing room with tag-based motion tracking and real-time clothes simulation. In Proceedings of the central european multimedia and virtual reality conference.

[7] Martin, C. G., & Oruklu, E. (2012). Human friendly interface design for virtual fitting room applications on android based mobile devices. *Journal of Signal and Information Processing*, *3*(04), 481.

Akshitha is a final year Student of Computer Science Department, SSE, Mukka, Mangalore.

Mr. Sudesh Rao is an Assistant Professor of computer science Department. He have 5 years of experience in teaching in SSE, Mukka, Mangalore.

BIOGRAPHIES

Chaithra Chandrappa Barki is a final yearStudent of Computer Science Department, SSE, Mukka, Mangalore.

Kanchana is a final year Student of Computer Science Department, SSE, Mukka, Mangalore.

Harshitha Meti is a final year Student of Computer Science Department, SSE, Mukka, Mangalore.