

EE 604: Digital Image Processing

Course Projects

Please read the instructions carefully:

- Here is the [link](#) for selecting projects.
- The weightage is 15%.
- The spreadsheet is comment only. So please add your name in the comment section next to the project you would like work on. Each project should have maximum two presenters.
- The project allocation is on **first-come-first-serve basis**.
- Once a project is claimed by a group (or an individual) (i.e. there are existing comments in column 'B' and 'C'), you are **not** allowed to overwrite it. In case such a situation is noted, the individuals violating it will be allotted a project of our choice. Also, each group (or individual) can claim only **one** project.
- The deadline for choosing your project and hence commenting on the spreadsheet is 11:59 PM on 7th March. Failing to do so, we will take the liberty to form groups at random and assign projects on our own volition. It is highly advised to contact the TAs and discuss the project topic(s), either before or after choosing.
- Presentations will be scheduled on 9th-10th March. The final groups and the respective projects will be announced along with the presentation timings on 8th March.
- The final evaluation of completed project will be done tentatively in the 2nd week of April (announcements will be made 2 week in advance).
- Each group will get 5 minutes for the presentation. You can decide if one or both of you will present. Please keep your presentation compact. Your presentation should cover your approach for the problem statement and your tentative plan of execution.
- Proper credit(s) must be given if you are using part(s) of some other work in your project. In case of plagiarism, **zero marks** will be assigned.

1. **Developing your own face filter application:**

Make an application using MATLAB GUI which will receive an image as user input, detect the face of the subject in the image and apply any kind of filter on it. Demonstration must be done with portrait images and easily distinguishable subjects in the image. (For example, Snapchat filters)

2. **Changing the background of the subject in an image:**

Develop an application using MATLAB GUI which will receive two input images from the user, crop/segment the subject/person in the first image and incorporate the subject in the second image. The purpose is to change the background of the subject, which is a very popular application of Photoshop.

3. **Head-pose editor:**

Develop an application using MATLAB GUI which will receive the image of an individual as input, detect the face/head and be able to turn the face/head slightly in all four directions according to user input (make four keys in the GUI to input which direction to turn the head).

4. **Background extraction:**

From a small video clip (with a static background scene and moving objects), separate out the static background from the frames. Input will be a video clip and output will be a single image of the background scene.

5. **Smile manipulation:**

Develop a MATLAB GUI application which will take the portrait image of an individual and change his/her smile/lips according to user input. Some functionalities that you may incorporate are- changing colour and texture of the lips, increasing the height or width, stretching or compressing, moving the position of the lips, etc. (Incorporate any two functionalities)

6. **Eye tracking in a real-time video:**

Develop an eye-tracking application which will take the real-time video as an input through webcam and in the video frame, mark the position at which the eye of the subject is looking at.

7. **Object speed estimation:**

Given a video as an input, the objective is to estimate the speed a moving object. Demonstration must be done using a simple/monochrome background with one moving object in it.

8. **Real-time detection of moving objects in a video:**

The application will take the real-time video accessed from the webcam and detect the moving objects.

9. **Background Blur:**

Develop a MATLAB GUI application which will take the image of an individual as a subject and blur the background. (Read on Aperture Priority Mode of cameras)

10. **Facial hair editor:**

Develop a MATLAB GUI application which will incorporate at least two functionalities of facial hair editing in portrait images. Some common functionalities are- Removing beard, adding different beard style(s), adding different hair style(s), hair colour change, etc.

11. **Double Exposure Photography:**

Develop an application which will take two images as user input- a portrait image of an individual and a scenery, and merge the two creating a double exposure effect. (Read on Double Exposure effect).

12. **Modelling a terrain using MATLAB:**

Take a satellite image of a terrain with high diversity (mountains and valleys) and develop a 3D representation of that terrain. The input should be the image of the terrain and output should be the 3D surface plot describing that terrain. (Sample images will be provided).

13. **Hand gesture controlled application:**

Develop any application in MATLAB GUI (can be a simple calculator having only two operations) which will be hand gesture controlled using real time data from the webcam.

14. Cartooning of an Image:

Input will be any image and the output will be turned into a cartoon image.

15. Creating face caricatures:

Given the image of the face of an individual, the goal is to create caricatures of the face. Caricature is a comical representation highlighting the distinct features of the face of that individual.

16. Human Action recognition using Image Processing:

Develop an application to recognize any two human actions namely 'walking', 'jogging', 'running', 'hand waving', and 'hand clapping'. The input must be a real time video accessed through computer webcam.

17. Blood vessel segmentation in noisy angiograms:

The goal is to segment the blood vessels from the angiogram which will be given as an input. The output should be a binary image of only the blood vessels. (Input images will be provided).

18. Human Iris segmentation and analysis:

The MATLAB GUI application will take the image of an individual and segment out the iris from the eye and present a colour analysis of the same (Percentage of blue, black, brown, gray, green, red).

19. Human Iris segmentation and editing:

The MATLAB GUI application will take the image of an individual and segment out the iris from the eye and add a functionality to change the colour to any of the mentioned colours: blue, black, brown, gray, green, red, which would be provided as input.

20. Image Steganography:

Develop a MATLAB GUI which will incorporate two different functions for hiding information in the image. The hidden information can be text or small images. The target is to digitally watermark the images which can be extracted for verification. Create two separate UIs- one for encoding and one for decoding.

21. Haze/fog removal from images:

The MATLAB GUI application must take input of an image of a hazy or foggy scene and give the clear image as output. The level of haze/fog must be moderate so as the background information is not lost in the original image.

22. Fingertip detection in a video:

The objective is to create an application which will detect the tips of the finger in a video clip. (Sample videos will be provided for testing and development).

23. Measure the Dimension of an Object within an Image:

Like circles diameter, squares side.

24. 3D Image Reconstruction from Multiple 2D Images:

Reconstruction 3D images from 2D images.

25. Target Detection:

Detection of a target image in a given image according to maximization of Cross Correlation.

26. Extraction of Text from Images:

Extract text from given input images.

27. Counting Fingers:

In a given image count the number of fingers.

28. Face Emotion Recognition:

Recognition of facial expression (Like anger, disgust, fear, happiness, sadness, surprise) during a video sequence.

29. Panoramic image stitching:

For a given pair of images perform image stitching using SIFT/ SURF features.

30. Clouds segmentation:

In a given image segment clouds.

31. Dimension Determination:

Auto detect dimensions of object in an image, w.r.t. a reference object. The dimension of the reference object is known.

32. Face Detection and Manipulation:

Face detection and blurring it post detection to provide anonymity for users in a video chat.

33. Selective Motion Blur:

Write an algorithm to perform selective motion blur on an input image.

34. Content Based Image Resizing:

Implement content based image resizing. For reference check, Seam Carving.

35. Counting Overlapping Coins:

Using segmentation algorithm detect and extract the count of coins in a given image that are touching and/or overlapping.

36. Camscanner Application:

Using geometric transformations(warping, resizing) on an image, convert image containing text book with background to Image of only text book.

37. Scanning and Grading an OMR sheet:

Implement an algorithm to scan OMR sheet, evaluate it and print the results.

38. Evaluate Distance Between Objects:

Evaluate distance between objects in a given input image.

39. Shadow Removal Application:

The objective is to remove shadows or non-uniform illumination from faces in a portrait. Develop a MATLAB GUI which will take an image of an individual with shadow cast over the face and the expected output is the image with the face uniformly illuminated or shadows removed.

40. Video Clipping:

The objective is to develop a MATLAB GUI which will be able to run a video which will be given as an input. The application should be able to clip a part of the video and run the clipped part after the action. The area to be clipped should be rectangular and the user must be able to draw it freely.