First name: Ashwath Sreedhar

Last name: Halemane

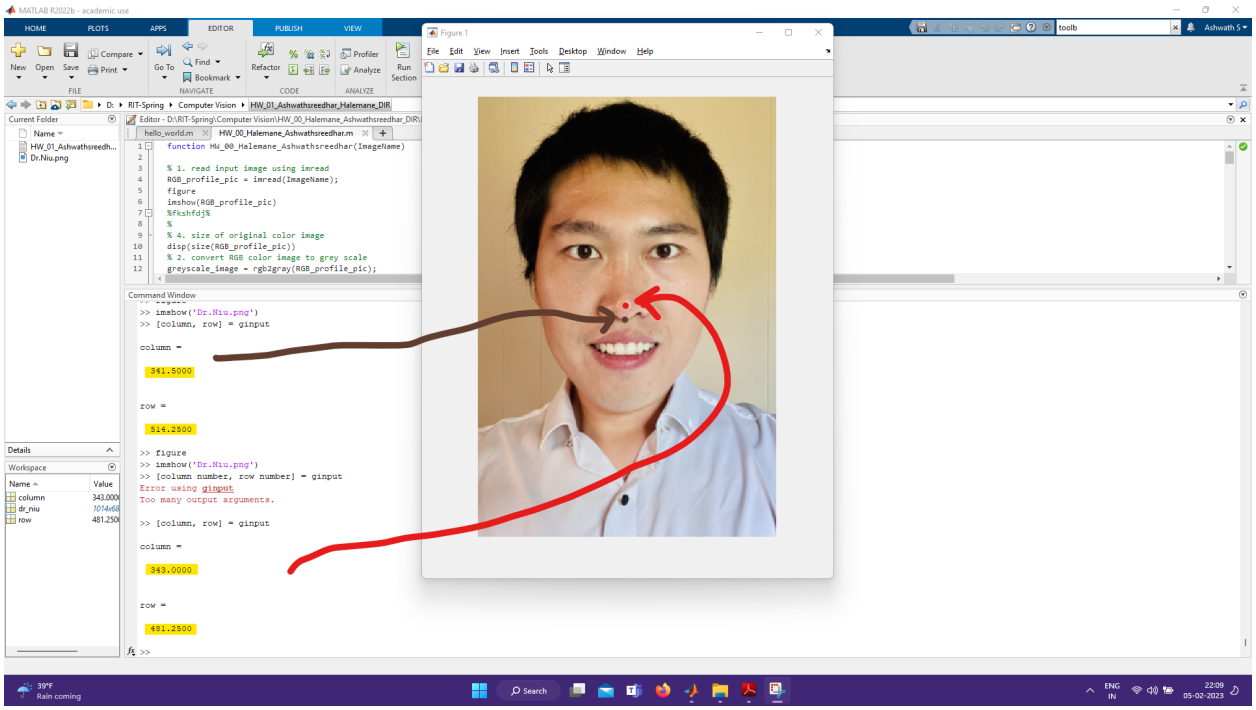
To run,

>> HW_01_Ashwathsreedhar_Halemane('my_profile_pic.jpeg')

Q1.

```
>> ver
-----------------------------------------------------------------------------------------------------
MATLAB Version: 9.13.0.2126072 (R2022b) Update 3
MATLAB License Number: 364896
Operating System: Microsoft Windows 11 Pro Version 10.0 (Build 22000)
Java Version: Java 1.8.0_202-b08 with Oracle Corporation Java HotSpot(TM) 64-Bit Server VM mixed mode
-----------------------------------------------------------------------------------------------------
MATLAB                                                Version 9.13        (R2022b)
Image Processing Toolbox                              Version 11.6        (R2022b)
>>
```

Q2.

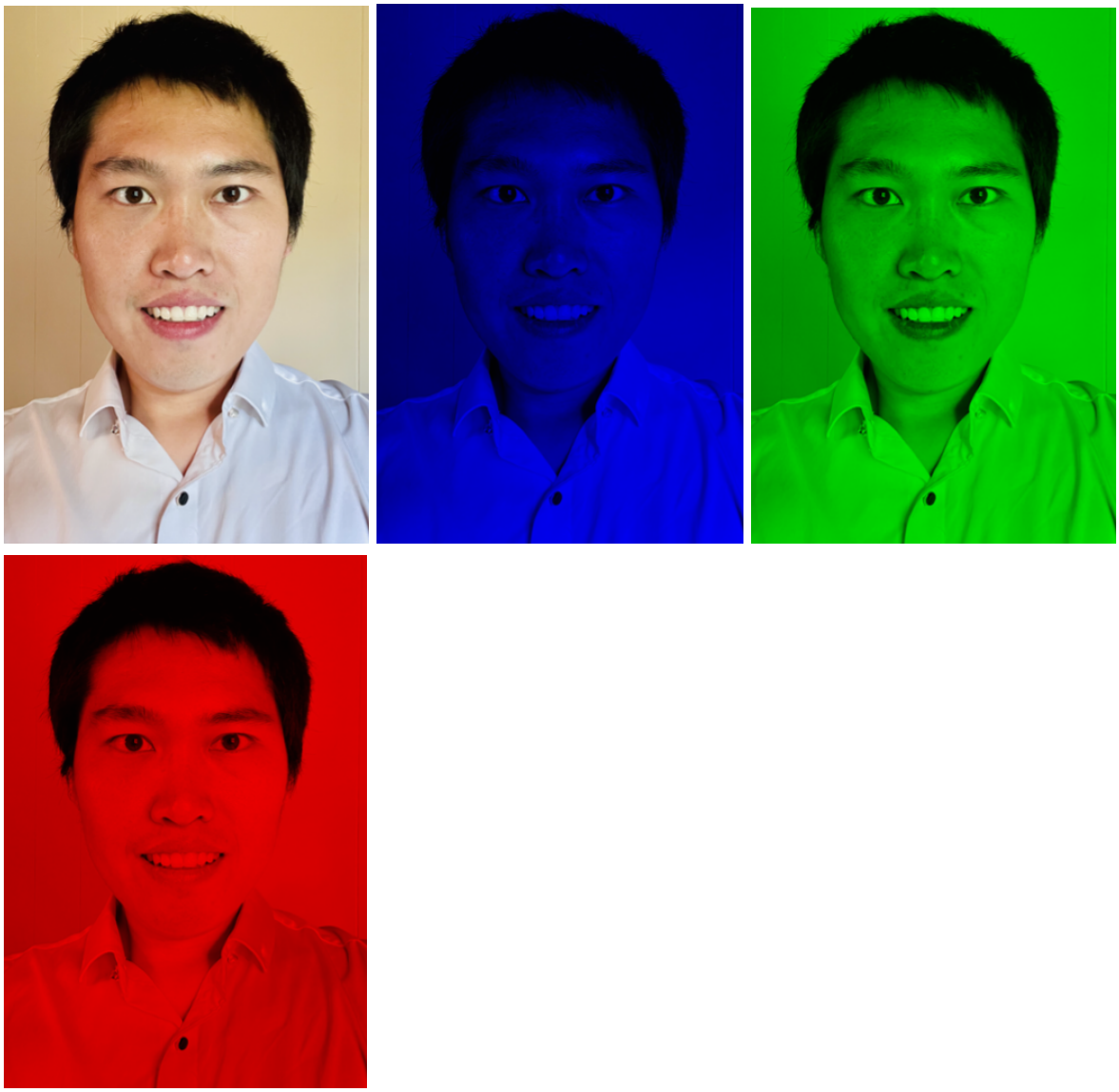


Question. 3. We want to create a grayscale version of Dr. Niu. Instead of doing that, we might use just one channel.
Look at each separate red, green, and blue color channel individually. Which channel has the **WORST** quality? What is wrong with it? What do you notice in this channel? What kinds are artifacts do you notice? If nothing, just say, everything looks good.

Answer:

Observation:

The **blue** channel was too dark and made the image hard to process by sight, and the green and red channel images had more white pixels compared to the blue channel. The reason being the original image carries similar features, hence the matrices(channel in our case) when manipulated appear this way. Apart from this, the image looks good.



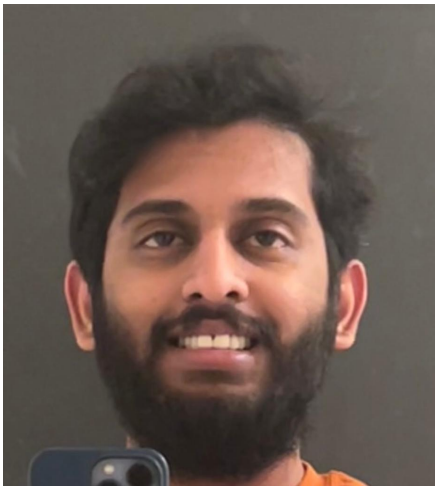
Q. 4

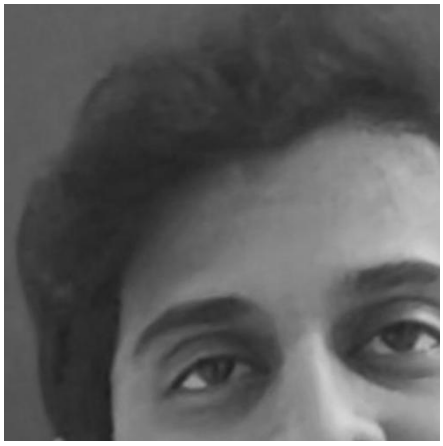
Having an image of yourself, with your head tilted, looks more dynamic. The image looks like there is motion involved. The tilt draws the eyes into the image. So, using an image of YOU. Convert it to grayscale, using the green color channel. Then rotate the image

so that the face is going up to the right. Then, using a program, crop a square chunk out of the image. Save it to disk with the name "HW01_Dynamic_<your_firstname>_<your_lastname>.jpg". (use imwrite()).

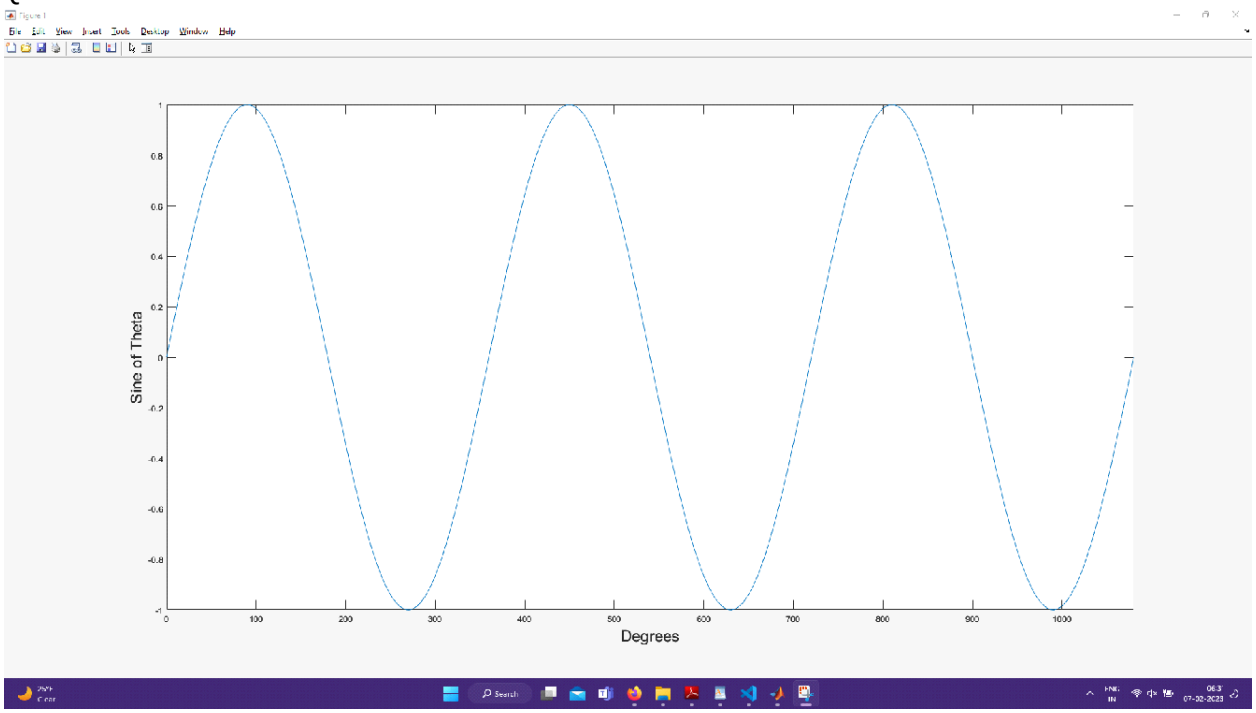
Put a copy of your result in you your *.pdf writeup.

CSCI 631 Foundations of Computer Vision
Homework 1



Q. 5



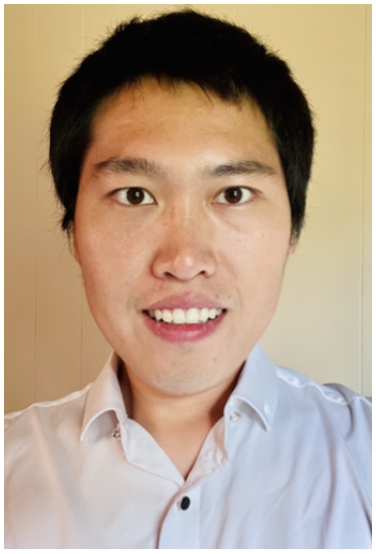
Q. 6

Conclusion:

In this homework, I became more familiar with using Matlab command prompt, to run commands to query more about Matlab and its details like version, license information, toolboxes installed, and so on. Later, I understood how to extract the coordinates from an input device like a mouse, using functions like ginput(Graphical input from mouse, source help ginput). After fiddling with this function, I learned that we could draw a canvas(using figure), then show the image(using imshow(image_name)) and later call ginput which presents a mouse pointer on the displayed image, once the arrow is clicked, the row and column values are returned to the command prompt. I later understood that we can convert an image in RGB to greyscale using channels and noticed a few observations on Dr.Niu's image(as answered in Q3 of HW_01). I converted my profile picture into greyscale just using the green channel of the image(similar to HW_00 to extract color channel).

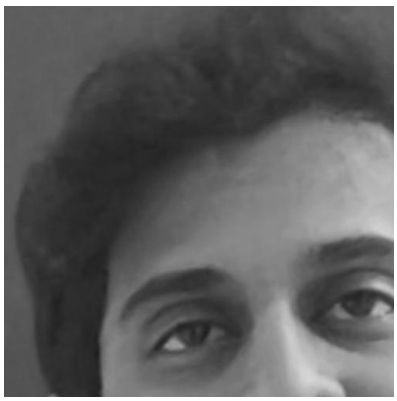
```
red_channel_from_concat = cat(3, dr_niu(:,:,1), ones(size(dr_niu(:,:,2))), ones(size(dr_niu(:,:,2))))
figure
imshow(red_channel_from_concat)
help imwrite
imwrite('Dr.Niu_red_channel.png')
help imwrite
imwrite(red_channel_from_concat,'dr_niu_red_channel_with_other_unit_channel.png');
red_channel_from_concat = cat(3, ones(size(dr_niu(:,:,1))), dr_niu(:,:,2), ones(size(dr_niu(:,:,3))))
blue_channel_from_concat = red_channel_from_concat
imwrite(blue_channel_from_concat,'dr_niu_blue_channel_with_other_unit_channel.png');
green_channel_from_concat = red_channel_from_concat
imwrite(green_channel_from_concat,'dr_niu_green_channel_with_other_unit_channel.png');
blue_channel_from_concat = red_channel_from_concat
blue_channel_from_concat = cat(3, ones(size(dr_niu(:,:,1))), ones(size(dr_niu(:,:,2))),dr_niu(:,:,3) )
imwrite(blue_channel_from_concat,'dr_niu_blue_channel_with_other_unit_channel.png');
% observation, the blue channel was too dark and made the image hard to process by sight, and the green and red channel had more white pixel compared to blue channel, the reason is due t...
my_profile_pic = imread('my_profile_pic.jpeg')
concatenated_image = cat(3, dr_niu(:,:,1),dr_niu(:,:,2), dr_niu(:,:,3))
figure
imshow(concatenated_image)
imwrite(concatenated_image,'concatenated_image.png');
%since the concatenated image has unit ones's blue and one's green in their red channel image, there are few vertical extra pixels
my_profile_green_channel = my_profile_pic(:,:, 2);
figure
imshow(my_profile_green_channel)
imwrite(my_profile_green_channel,'my_profile_green_channel.png');
help imrotate
right_titled_profile_pic = imrotate(my_profile_green_channel, 20)
figure
imshow(right_titled_profile_pic)
right_titled_profile_pic_2 = imrotate(my_profile_green_channel, 10,'bilinear','crop')
figure
imshow(right_titled_profile_pic_2)
imwrite(right_titled_profile_pic_2,'right_tilted_profile.png');
size_of_tilted = size(right_titled_profile_pic_2)
HW_01_Dynamic_Ashwathsreedhar_Halemane = right_titled_profile_pic_2(round(size_of_tilted(1)/4):round(size_of_tilted(1)/1.3333), round(size_of_tilted(1)/6):round(size_of_tilted(1)/2));
figure
imshow
imshow(HW_01_Dynamic_Ashwathsreedhar_Halemane)
```

While working with Dr.Niu's image, I extracted the red channel with one's elements in the green and blue channels to see how it impacts the image and when I concatenated back all three channels I notice the image had a few thin vertical lines due to one matrix on the green and blue channel.



I later went on to implement extracting a square chunk of the image using imcrop function which takes image to cropped and rect as parameters, where rect can be of 4 parameters [xmin ymin

size of rectangle size of rectangle], where xmin ymin could be considered as from where the image is cropped, in our case, since we are extracting square, size of rectangle must be equal. As the homework doesn't specify any details of cropping, I went ahead to crop from 100, 100 as xmin and ymin respectively with 500 as size of rectangle. I used imwrite to save the image.



```
>> HW_01_Dynamic_Ashwathsreedhar_Halemane = imcrop(right_titled_profile_pic_2, [100 100 500 500]);
>> figure
>> imshow(HW_01_Dynamic_Ashwathsreedhar_Halemane)
>> size(HW_01_Dynamic_Ashwathsreedhar_Halemane)

ans =

   501   501
```

I then went ahead to understand how to plot a sine wave in Matlab, where x is from 0 to 1080(3*360) and y = sind(x) (Sine of argument in degrees, source help sind). Once the sine wave is plotted, I added labels on X and Y axis and finally made sure the graph fits both on X and Y axis using 'axis tight' command, producing the desired output.

Finally, I explored exportgraphics function to save the plotted sine wave by using gca(source help gca Get handle to current axis.) and passing gca as a parameter as follows.

```
23    x = 0:1080;
24    y = sind(x);
25    plot(x,y)
26    axis tight;
27    xlabel('Degrees', 'Fontsize', 18 );
28    ylabel('Sine of Theta', 'FontSize', 18 );
29    ax = gca;
30
31    exportgraphics(ax, 'sine_wave.png');
32
```