PES UNIVERSITY
(Established under Karnataka Act No. 16 of 2013)
100 Ft. Road, BSK III Stage, Bengaluru – 560 085

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

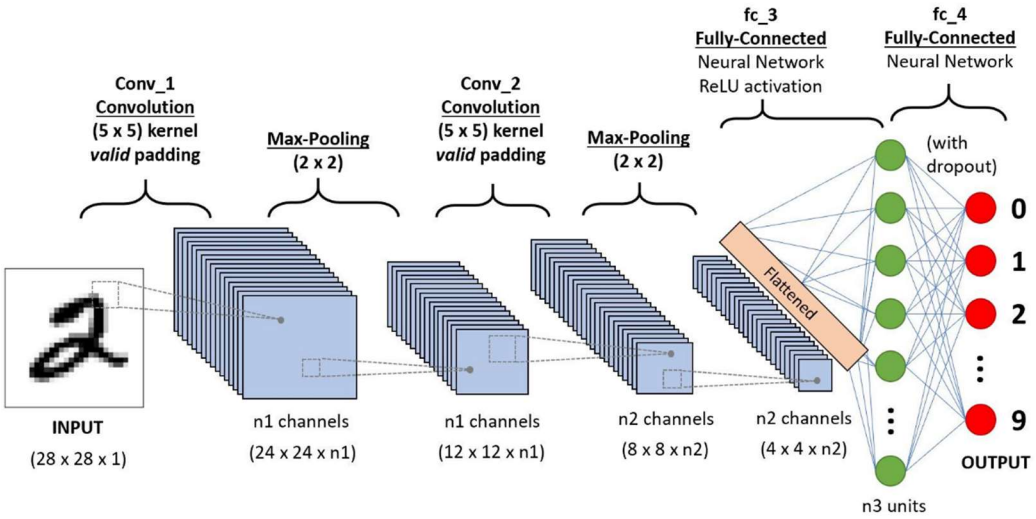
Course Title: Image Processing and Data Visualization Using MATLAB		
Course code: -UE19CS257B		
Semester: 4th sem	Branch: CSE & EE	Team Id: 47
SRN: PES1UG19CS172	Name: GURU KIRAN H M	
SRN: PES1UG19EE011	Name: ANIRUDH D	
SRN: PES1UG19CS051	Name: AMAR PRAKASH PATIL	

PROJECT REPORT

Problem Statement: **FOOD CALORIE DETECTION USING MATLAB.**

Objectives: In this project we recognize and classify the input image using classification algorithm and multi-class classification to its appropriate class and the label of the class which has the name of the food item and number of calories it provides is displayed.

Description: Measuring daily food consumption is one of the challenges in health management. In this project, we estimate energy intake that is calorie intake based on food pictures taken, we try to process and classify the image to detect the type of food and use the information to estimate the number of calories in the food. The image of the food item is classified by using classification algorithms and its corresponding label which has the name of the food item and the number of calories it provides is displayed. Deep learning which is artificial intelligence imitates the brain in recognizing, classifying, creating patterns, and decision making.
We use alexnet which is a convolutional neural network (CNN) that helps in training the machine in classifying and recognizing the images.



The convolutional neural network has made its mark in object detection, recognition, and classification. It mainly has three layers involved which are the convolutional layer, pooling layer, and fully connected layer. convolutional layer extracts the features from the input image some sets of filters are used and some pixel operations are done to extract these features, pooling layer which is also known as downsampling layer helps in reducing the features extracted in case of large data set and keeps all the important features extracted from the image, there are different type of pooling methods like max pooling, average pooling and sum pooling the best pooling method will be used appropriately as per the requirements, the output of this layer is sent to a flattering layer where pixels in matrix form are converted into a single vector form, this later helps fully-connected layer which has all the coefficients of a particular node, follows a layer of SoftMax for probability distribution to classify and recognize the appropriate class and label it. Stochastic gradient descent with momentum (SGDM) Stochastic gradient descent is an optimization algorithm often used in machine learning applications to find the model parameters that correspond to the best fit between predicted and actual outputs. It's an inexact but powerful technique it is used to train the machine with an initial learning rate of 0.001s with a maximum of 20 epochs which helps in training the machine with an algorithm to the whole data set for a maximum of 20 times and mini-batches are created which helps in training the machine effectively, with a maximum of 64 mini-batches. The trained network is then saved and loaded to test the input image classify, recognize and label it to its appropriate class. This helps in keeping count on calorie intake which helps in having a clear picture of the total number of calories taken in for the whole day and with this knowledge one can plan the appropriate diet and lead a healthier life.

New Concept Learnt (Explanation):

Deep learning which is artificial intelligence imitates the brain in recognizing, classifying, creating patterns, and decision making.

We use **alexnet** which is a **convolutional neural network (CNN)** that helps in training the machine in classifying and recognizing the images.

The **convolutional neural network** has made its mark in object detection, recognition, and classification. It mainly has three layers involved which are the **convolutional layer, pooling layer, and fully connected layer.**

Different types of classification and Multi-class classification.
Stochastic gradient descent with momentum (**SGDM**) to train machine, Stochastic gradient descent is an optimization algorithm often used in machine learning applications to find the model parameters that correspond to the best fit between predicted and actual outputs. It's an inexact but powerful technique and many more concepts have been learnt while doing this project, some of the key concepts learnt have been listed above.

Learning Outcome:

Very good experience and great knowledge in understanding of some of the key concepts that are taking the world by storm right now like Deep learning, Convolutional neural network, Alexnet were acquired. Immense knowledge on the different type of classification techniques, different layers in CNN, and different tools and functions that can be used in MATLAB were obtained.

Code:

Data collection

```
clc
clear all
close all
warning off
c=webcam;
x=0;
y=0;
height=500;
width=500;
bboxes=[x y height width];
temp=0;
while temp<=300
    e=c.snapshot;
    IFaces = insertObjectAnnotation(e,'rectangle',bboxes,'Processing Area');
imshow(IFaces);
filename=strcat(num2str(temp),'.bmp');
es=imcrop(e,bboxes);
es=imresize(es,[227 227]);
    imwrite(es,filename);
    temp=temp+1;
    drawnow;
end
clear c;
```

Training:

```
clc
clear all
close all
warning off
g=alexnet;
layers=g.Layers;
layers(23)=fullyConnectedLayer(21);
layers(25)=classificationLayer;
```

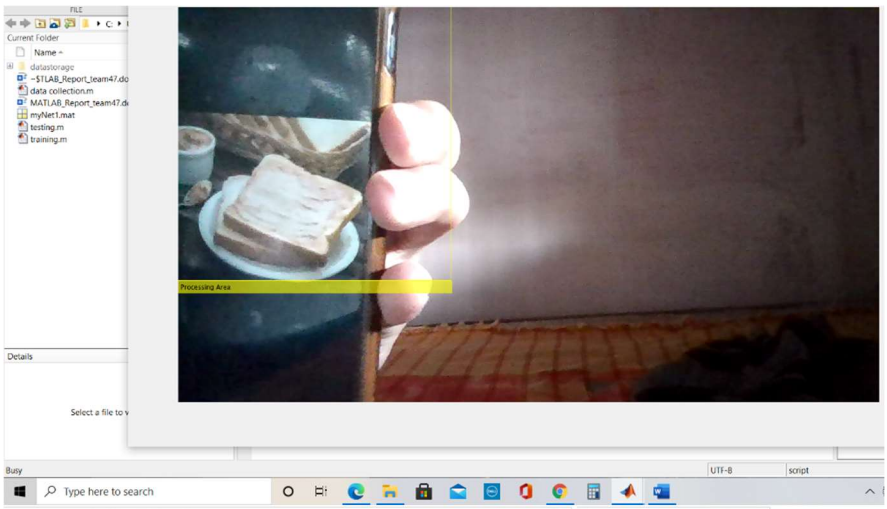
```
allImages=imageDatastore('datastorage','IncludeSubfolders',true,
'LabelSource','foldernames');
opts=trainingOptions('sgdm','InitialLearnRate',0.001,'MaxEpochs',20,'Mini
BatchSize',64);
myNet1=trainNetwork(allImages,layers,opts);
save myNet1;
```

Testing:

```
clc;
close all;
clear all
warning off
c=webcam;
load myNet1;
x=0;
y=0;
height=500;
width=500;
bboxes=[x y height width];
while true
    e=c.snapshot;
    IFaces = insertObjectAnnotation(e,'rectangle',bboxes,'Processing Area');
es=imcrop(e,bboxes);
    es=imresize(es,[227 227]);
    label=classify(myNet1,es);
    imshow(IFaces);
    title(char(label));
    drawnow;
end
```

<u>Output Screenshots:</u>

Data collection: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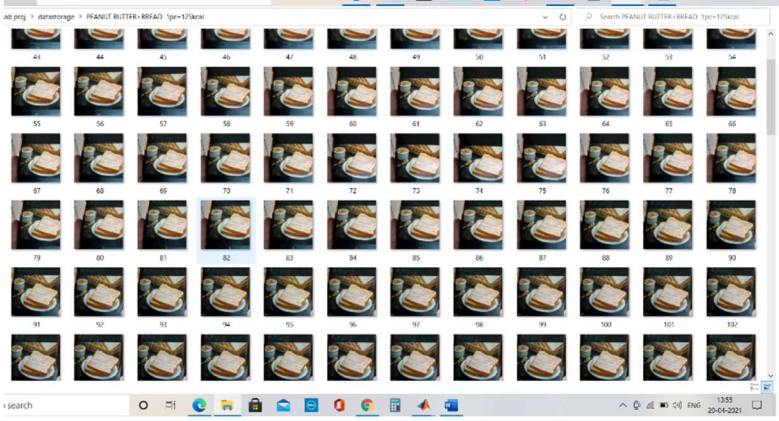
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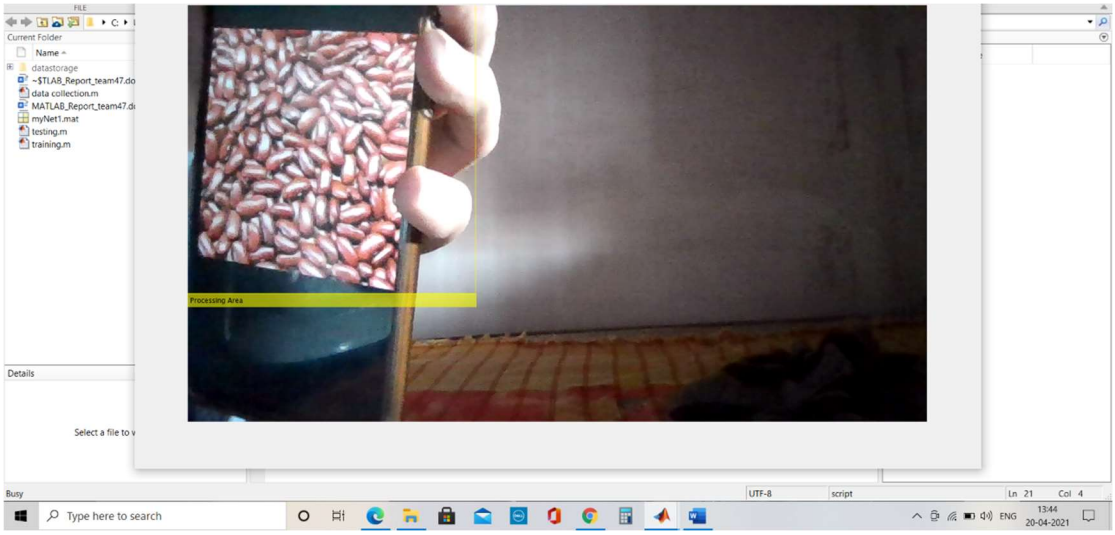
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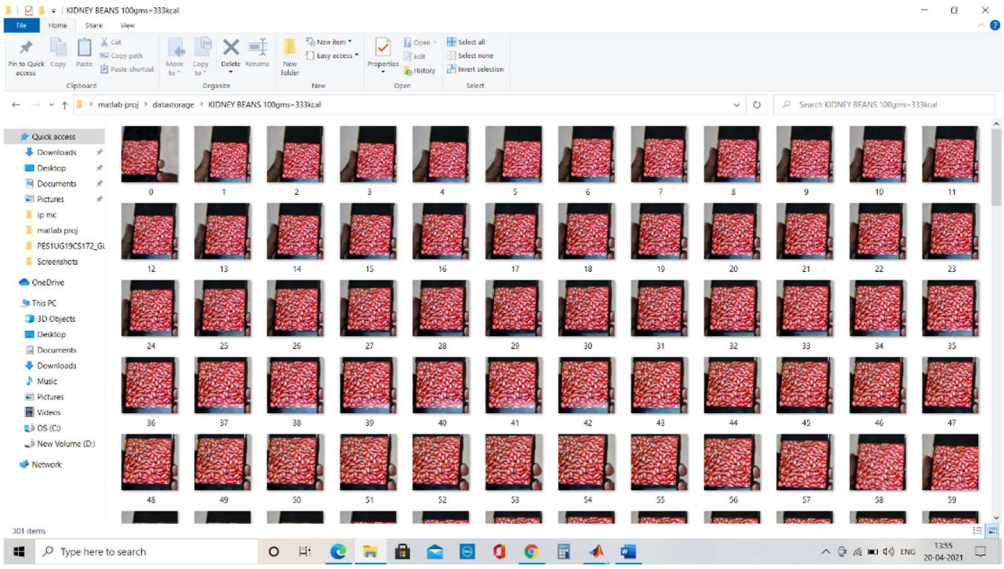
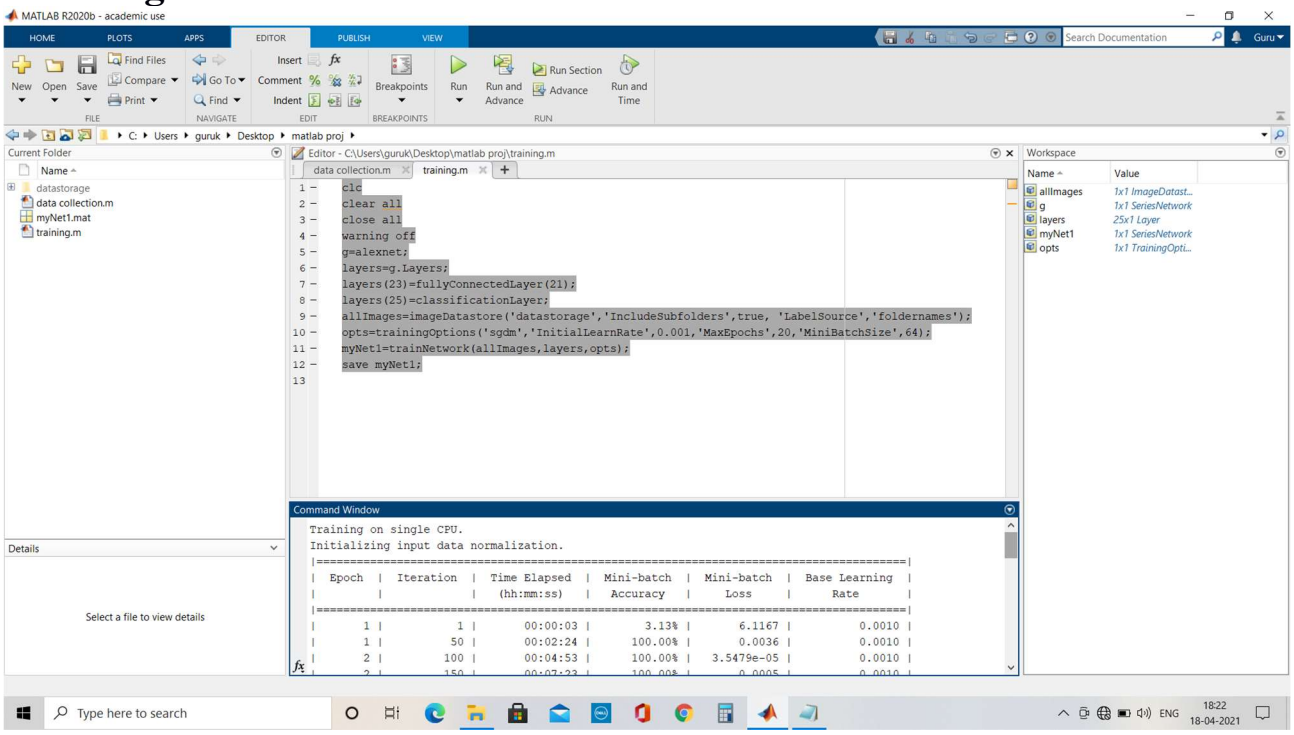


Training: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Name
datastorage
data collection.m
myNet1.mat
training.m
Editor - C:\Users\guruk\Desktop\matlab proj\training.m
data collection.m
training.m
clc
clear all
close all
warning off
g=alexnet;
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myNet1=trainNetwork(allImages,layers,opts);
save myNet1;
Workspace
Name
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allImages
1x1 ImageDatast...
g
1x1 SeriesNetwork
layers
25x1 Layer
myNet1
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Command Window
Training on single CPU.
Initializing input data normalization.
Epoch	Iteration	Time Elapsed (hh:mm:ss)	Mini-batch Accuracy	Mini-batch Loss	Base Learning Rate
1	1	00:00:03	3.13%	6.1167	0.0010
1	50	00:02:24	100.00%	0.0036	0.0010
2	100	00:04:53	100.00%	3.5479e-05	0.0010
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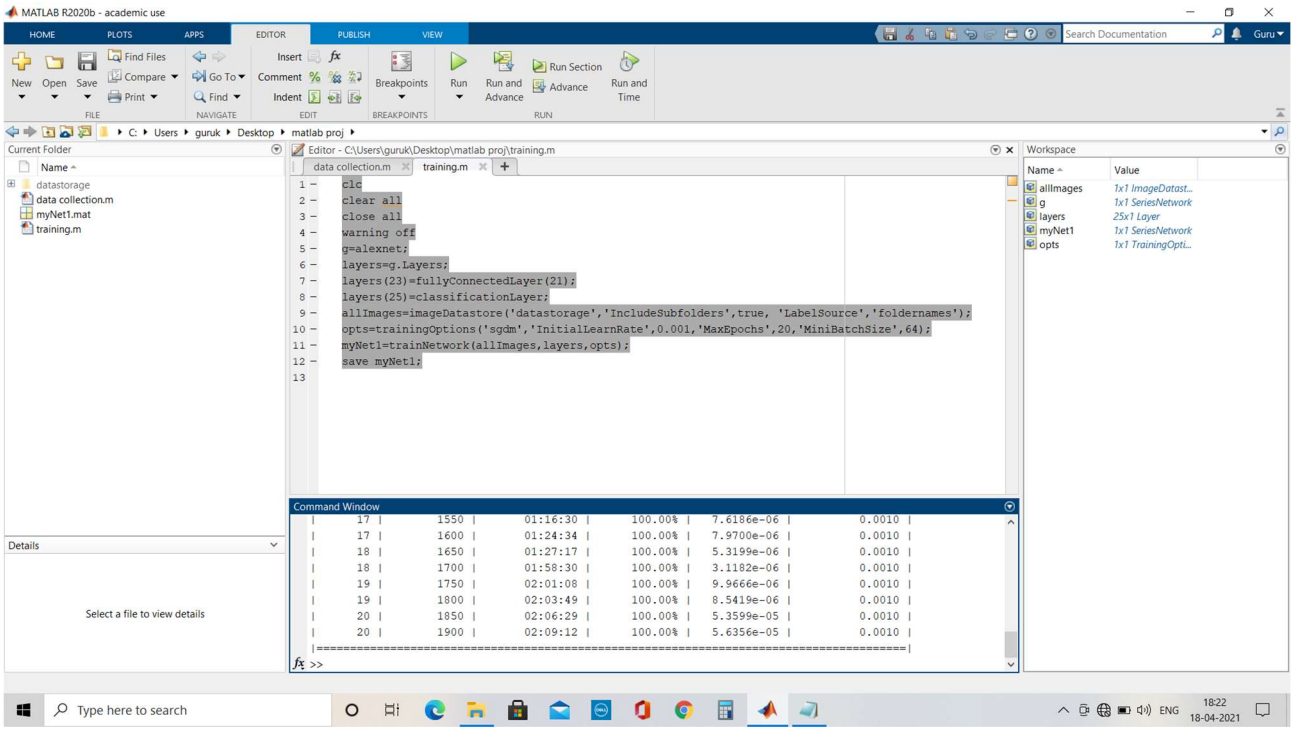
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datastorage
data collection.m
myNet1.mat
training.m
Editor - C:\Users\guruk\Desktop\matlab proj\training.m
data collection.m
training.m
clc
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save myNet1;
Workspace
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Value
allImages
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g
1x1 SeriesNetwork
layers
25x1 Layer
myNet1
1x1 SeriesNetwork
opts
1x1 TrainingOpti...
Command Window
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17 | 1600 | 01:24:34 | 100.00% | 7.9700e-06 | 0.0010 |
18 | 1650 | 01:27:17 | 100.00% | 5.3199e-06 | 0.0010 |
18 | 1700 | 01:58:30 | 100.00% | 3.1182e-06 | 0.0010 |
19 | 1750 | 02:01:08 | 100.00% | 9.9666e-06 | 0.0010 |
19 | 1800 | 02:03:49 | 100.00% | 8.5419e-06 | 0.0010 |
20 | 1850 | 02:06:29 | 100.00% | 5.3599e-05 | 0.0010 |
20 | 1900 | 02:09:12 | 100.00% | 5.6356e-05 | 0.0010 |
Details
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18-04-2021

Testing:

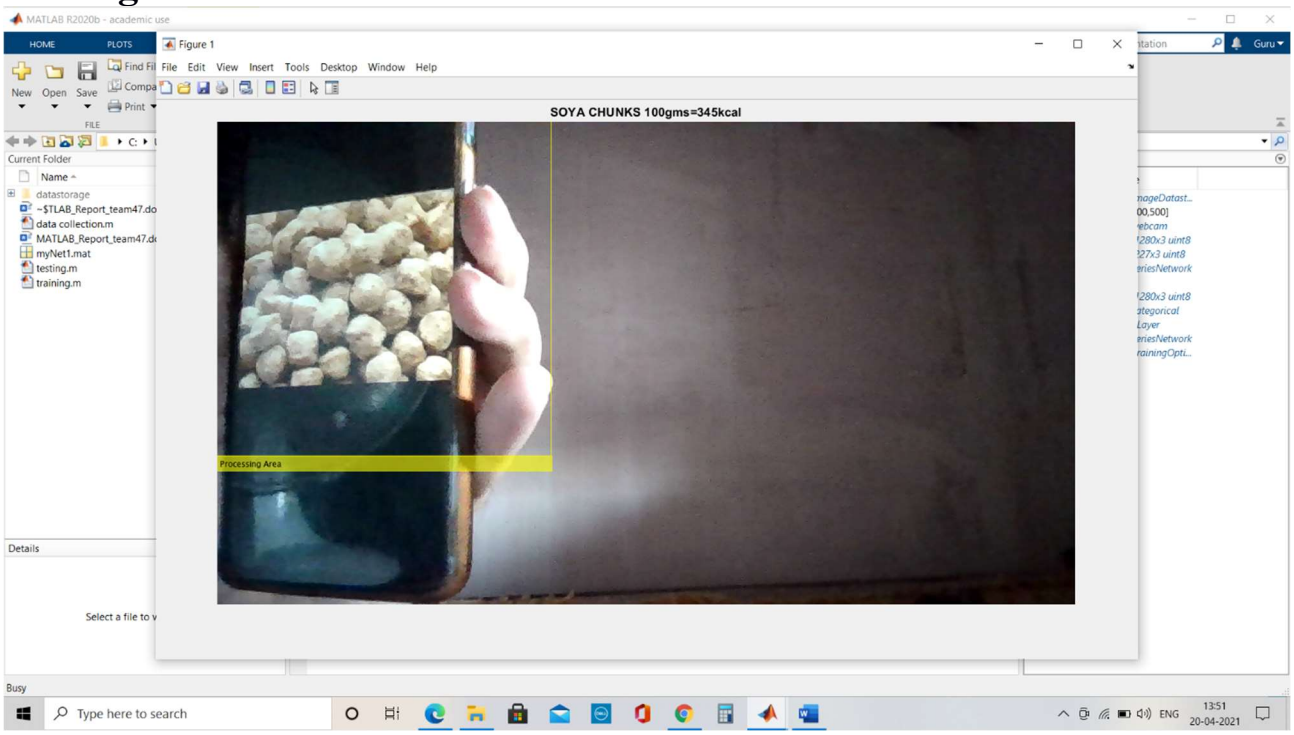
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Figure 1
File Edit View Insert Tools Desktop Window Help
SOYA CHUNKS 100gms=345kcal
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Current Folder
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datastorage
~$TLAB_Report_team47.do
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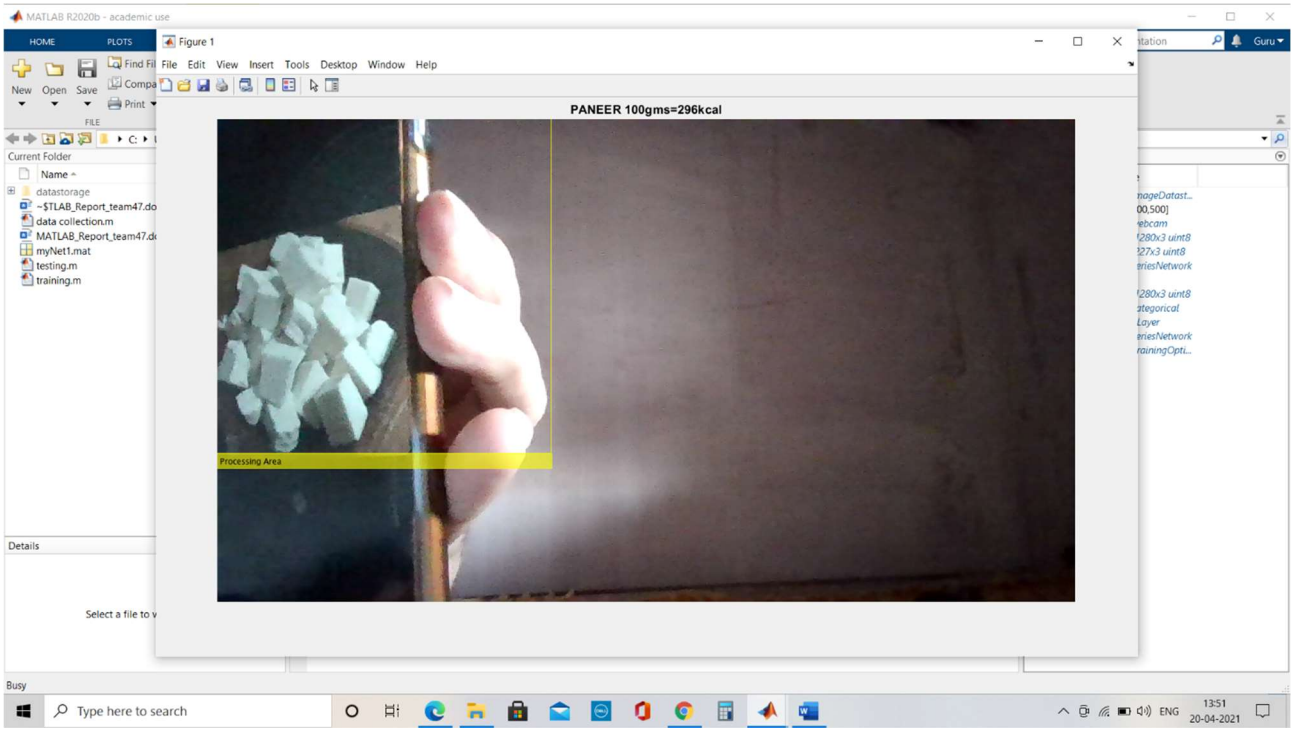

Name and Signature of the Faculty: