A
Project Report
On
"Gesture Classification Web App"

Prepared by

Mr.Jeet Makadiya(18DCE050)
Mr.Dhrumil Mehta(18DCE056)
Mr.Deep Mendapara(D19DCE145)
Mr.Nirmit Patel(D19DCE150)

Under the guidance of

Prof. Khushi Patel

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5th Semester Software Group Project-III (CE352)

Submitted at

Department of Computer Engineering

Devang Patel Institute of Advance Technology and Research

At: Changa, Dist: Anand – 388421

October 2020

CERTIFICATE

This is to certify that the report entitled **"Gesture Classification Web App"** is a bonafied work carried out by **Mr. Jeet Makadiya (18DCE050), Mr. Dhrumil Mehta (18DCE056), Mr. Deep Mendapara (D19CE145), Mr. Nirmit Patel (D19DCE150)** under the guidance and supervision of **Assistant Prof. Khushi Patel** for the subject **CE352-Software Group Project-III** (CE) of 5th Semester of Bachelor of Technology in **DEPSTAR** at Faculty of Technology & Engineering – CHARUSAT, Gujarat.

To the best of my knowledge and belief, this work embodies the work of candidate himself, has duly been completed, and fulfills the requirement of the ordinance relating to the B.Tech. Degree of the University and is up to the standard in respect of content, presentation and language for being referred to the examiner.

Prof. Khushi Patel
Assistant Professor
Department of Computer Engineering
DEPSTAR, CHARUSAT, Changa,
Gujarat.

Dr. Dweepna Garg
I/C Head of Department
Department of Computer Engineering
DEPSTAR, CHARUSAT, Changa,
Gujarat.

Dr. Amit Ganatra
Principal, DEPSTAR
Dean, FTE
CHARUSAT, Changa, Gujarat.

DECLARATION BY THE CANDIDATE

We hereby declare that the project report entitled **"Gesture Classification Web App"** submitted by us to Devang Patel Institute of Advance Technology & Research, Changa for Partial Fulfillment of the Requirements for the 5th Semester Software Group Project-III(CE352) from Faculty of Technology and Engineering,DEPSTAR-CHARUSAT under the guidance of Prof. Khushi Patel. I further declare that the work carried out and documented in this project report has not been submitted anywhere else either in part or in full and it is the original work, for the award of any other degree or diploma in this institute or any other institute or university.

Mr.Jeet Makadiya(18DCE050)

Mr.Dhrumil Mehta(18DCE056)

Mr.Deep Mendapara(D19DCE145)

Mr.Nirmit Patel(D19DCE150)

Prof. Khushi Patel

Assistant Professor

Department of Computer Engineering

DEPSTAR, Changa, Gujarat

ABSTRACT

Hand gesture recognition system received great attention in the recent few years because of itsmanifoldness applications and the ability to interact with machine efficiently through human computerinteraction. In this paper a survey of recent hand gesture recognition systems is presented. Key issues ofhand gesture recognition system are presented with challenges of gesture system. Review methods of recentpostures and gestures recognition system presented as well. Summary of research results of hand gesturemethods, databases, and comparison between main gesture recognition phases are also given. Advantagesand drawbacks of the discussed systems are explained finally.

ACKNOWLEDGEMENT

We take this opportunity to thank certain people without whom this endeavor would not have been possible. We would like to express our sincere gratitude to Head of the CE Department, Dr. Dweepna Garg and our project guide Assistant Professor Khushi Patel for constant encouragement, help and guidance without which this project would not have been completed.

Last but not the least, we express our heartiest acknowledgement to our parents, friends and colleagues who directly or indirectly helped us in completing the project.

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CHAPTER 1: PROJECT DEFINITION

- This is a machine learning based web application used to classify gesture from a webcam using transfer learning.

CHAPTER 2: DESCRIPTION

- This **"Gesture Classification Web App"** uses a model to classify and recognize different gestures. A model is trained on webcam data captured using a web interface. The model is then converted to a TensorFlow Lite model and used to classify gestures in a mobile application.

- We use a pretrained truncated MobileNet model and train another model using the internal MobileNet activation to predict upto 8 different classes from the webcam defined by the user.

- "index.html" can be opened directly inside a browser. No need to have a web server to run the web app.

CHAPTER 3: SOFTWARE & HARDWARE REQUIREMENTS

3.1 SOFTWARE REQUIREMENTS

- Visual Studio Code
- Web Browser(Chrome)

3.2 HARDWARE REQUIREMENTS

- Webcam
- 8GB RAM
- Processor core i5 8th Gen

CHAPTER 4:MAJOR FUNCTIONALITY

4.1 MODEL

- We use pretrained MobileNet model, using the internal activation (the output from an internal layer of MobileNet) as input to our new model. To do this we have two models on the page.
- One model is the pretrained MobileNet model that is truncated to output the internal activations.This model does not get trained after being loaded into the browser.
- Second model will take as input the output of the internal activation of the pretrained MobileNet model and will predict probabilities for each of the selected output classes which can be up, down, left, right, left click, right click, scroll up and scroll down. This is the model we'll actually train in the browser.
- By using the internal activation of MobileNet, we can reuse the features that MobileNet has already learned to predict the 1000 classes of ImageNet with a relatively small amount of retraining.

4.2 MODEL SPECIFICATIONS

- The base model being used here is MobileNet with a width of .25 and input image size of 224 X 224. The width and the input size can be varied.

4.3 HOW TO USE THE APP?

- Open index.html in your browser.
- Collect adequate samples for each of the required gestures by clicking on their icons.
- Set the parameters for training the model such as Learning rate, Batch size, Number of Epochs and Number of Hidden Units in the top sequential model.
- Click on Train button to train the model. Wait for sometime until the model is trained.
- Once the model is trained you can either choose to test or download the model. Upon downloading the model, totally 3 files will be generated which are weights manifest file (model.json), the binary weights file(model-weights.bin) and labels.txt for the chosen gestures.

CHAPTER 5:FLOW CHART

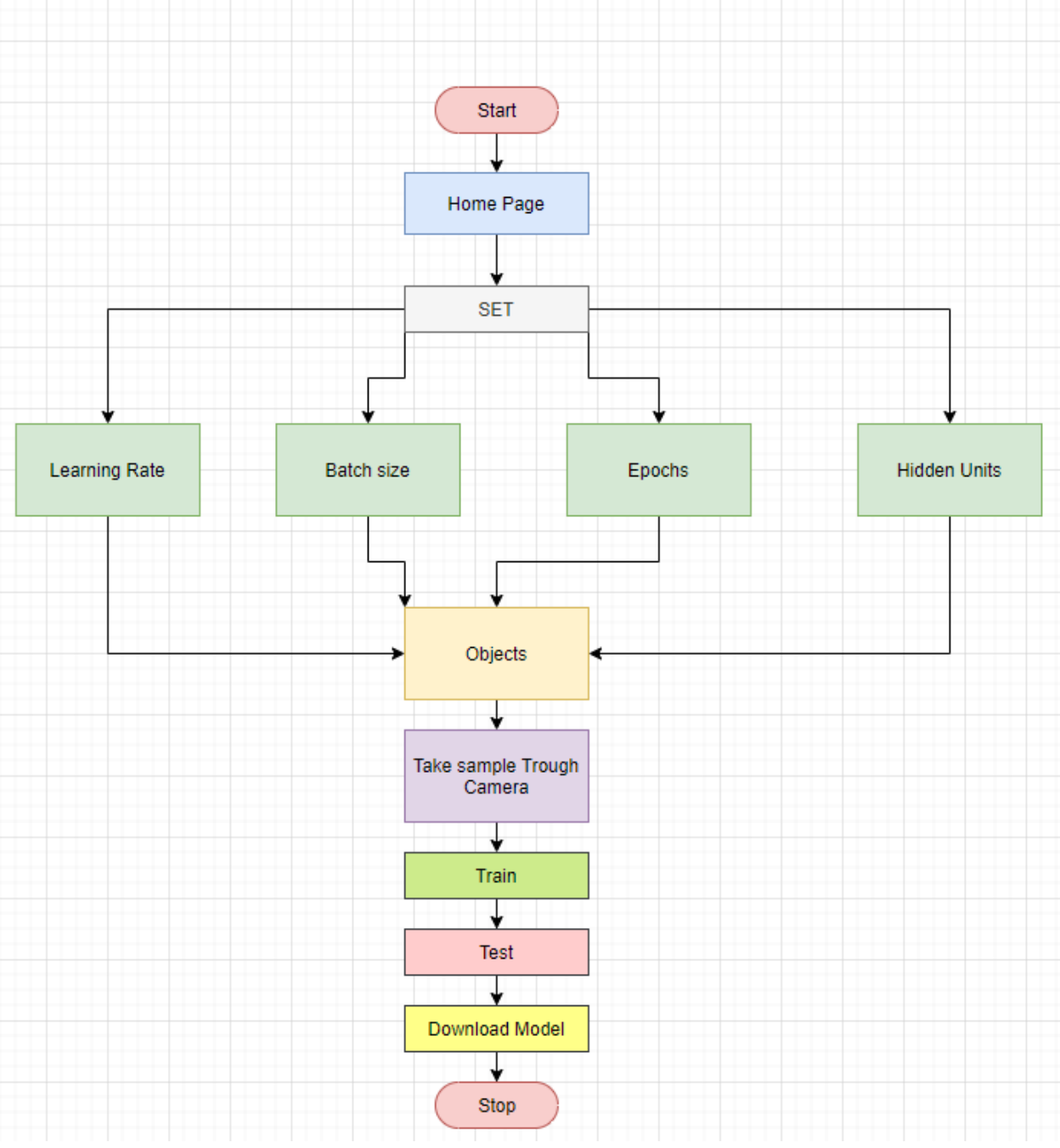

Fig 5.1 Flow Chart

CHAPTER 6:SCREENSHOTS

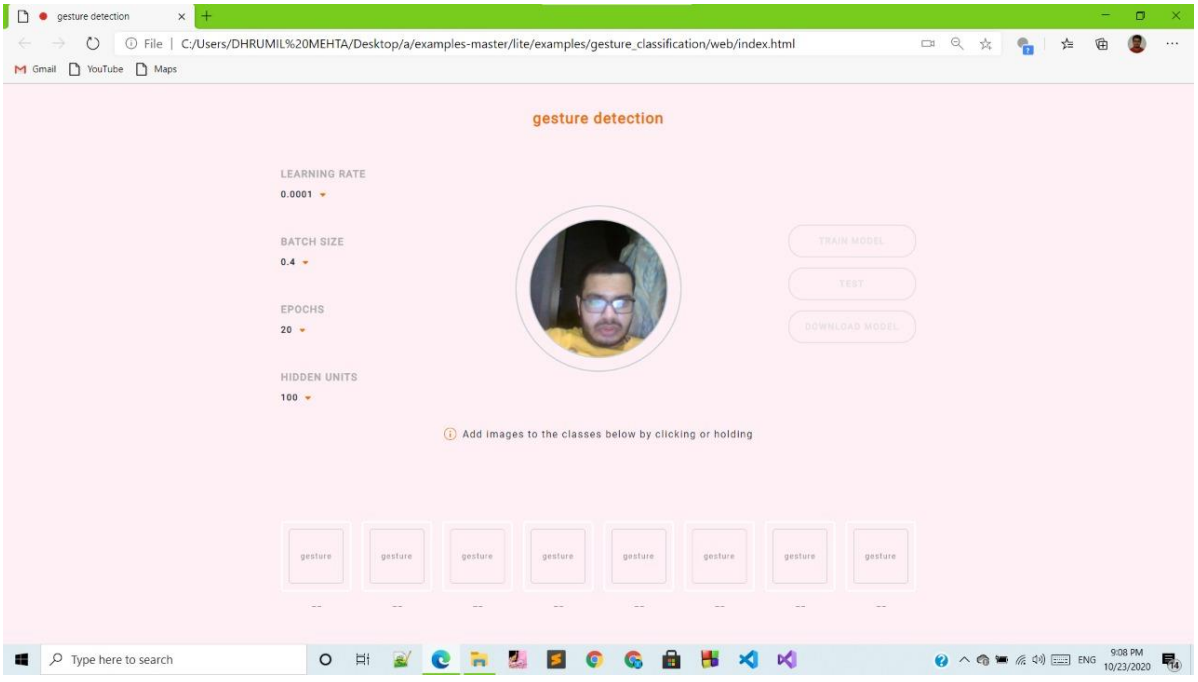

Fig 6.1 Web App UI

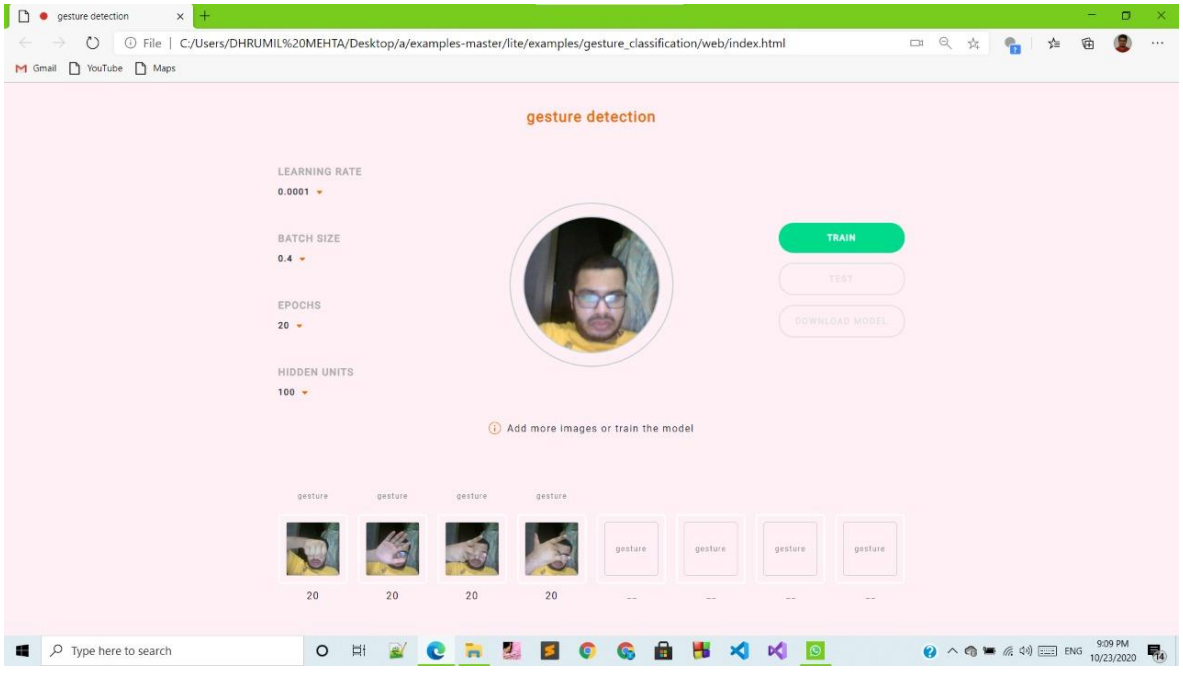

Fig 6.2 Model Training

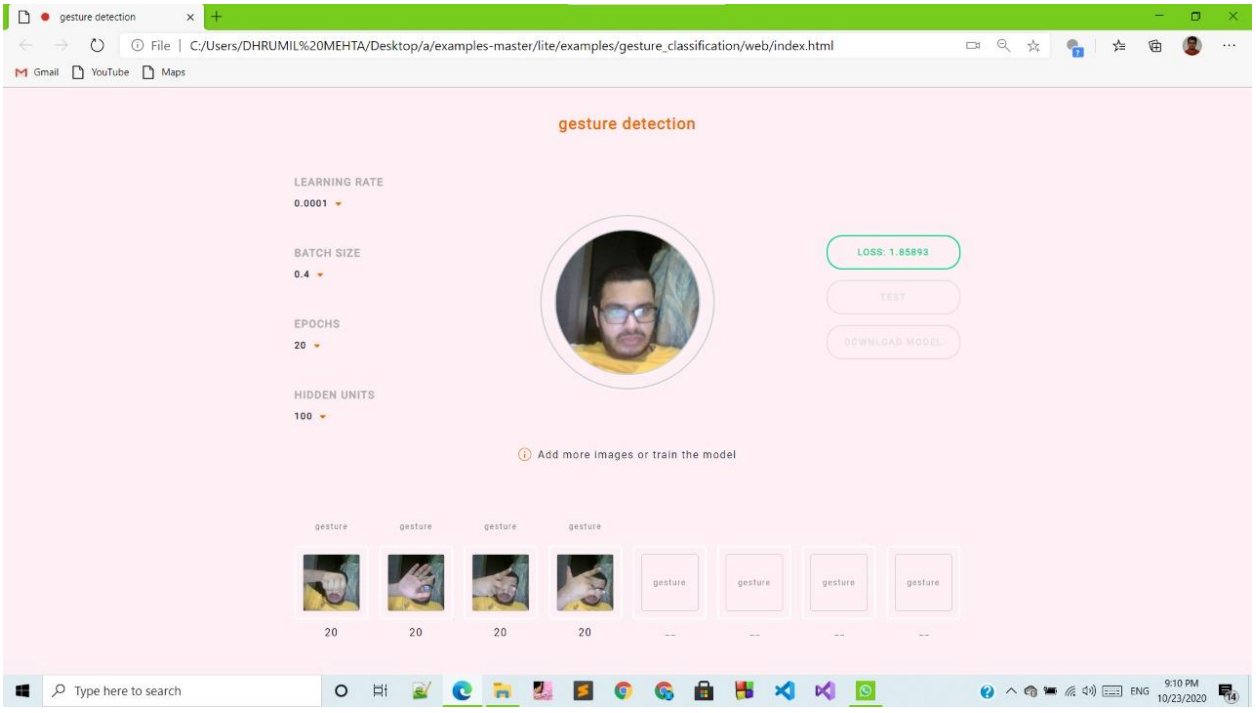
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Fig 6.3

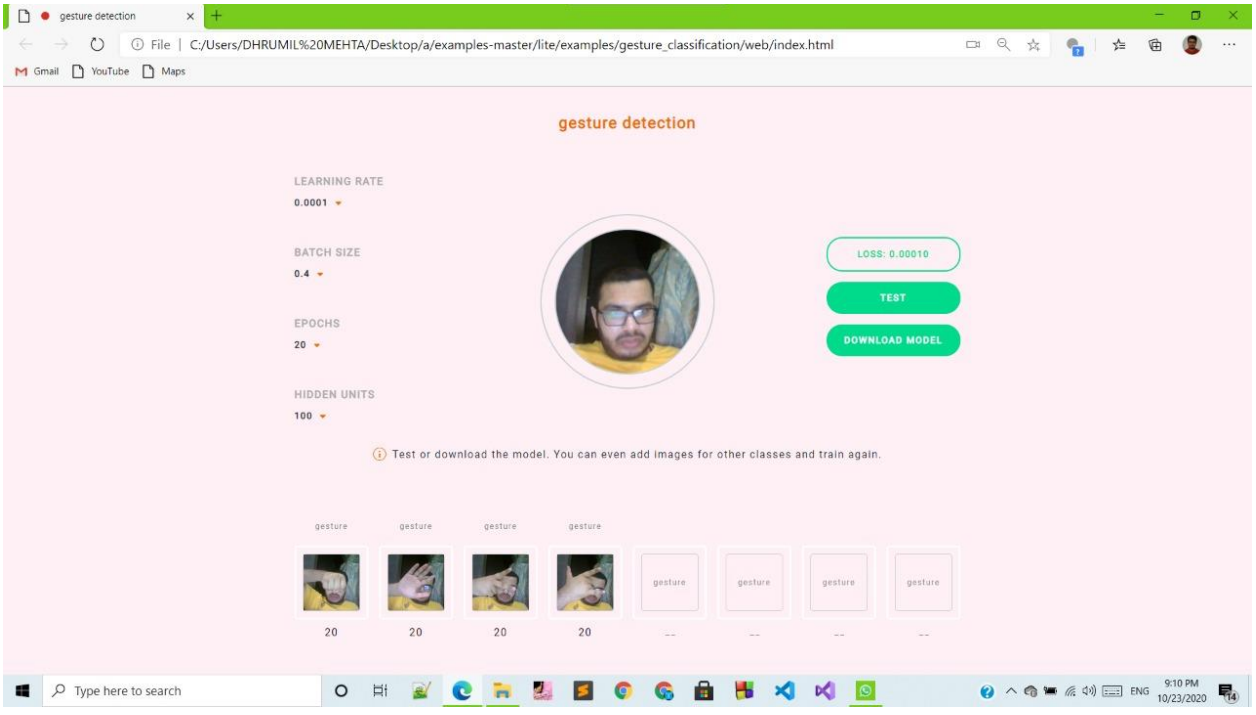
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Fig 6.4

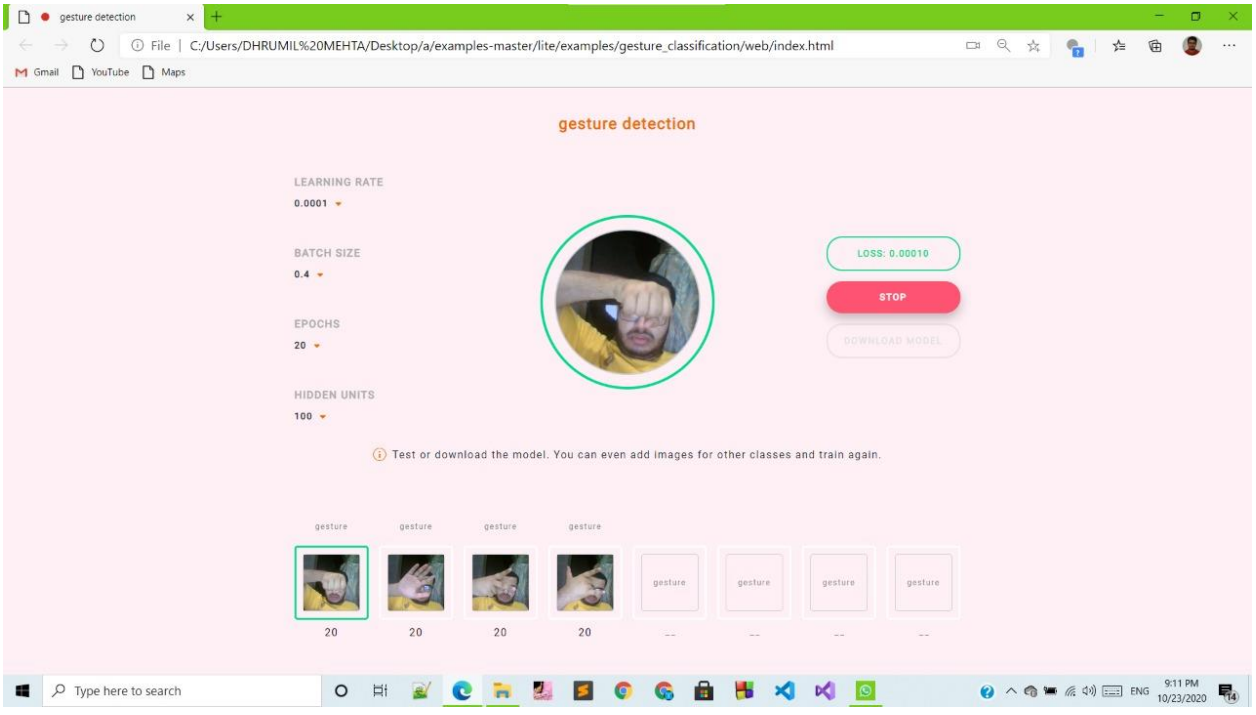
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Fig 6.5

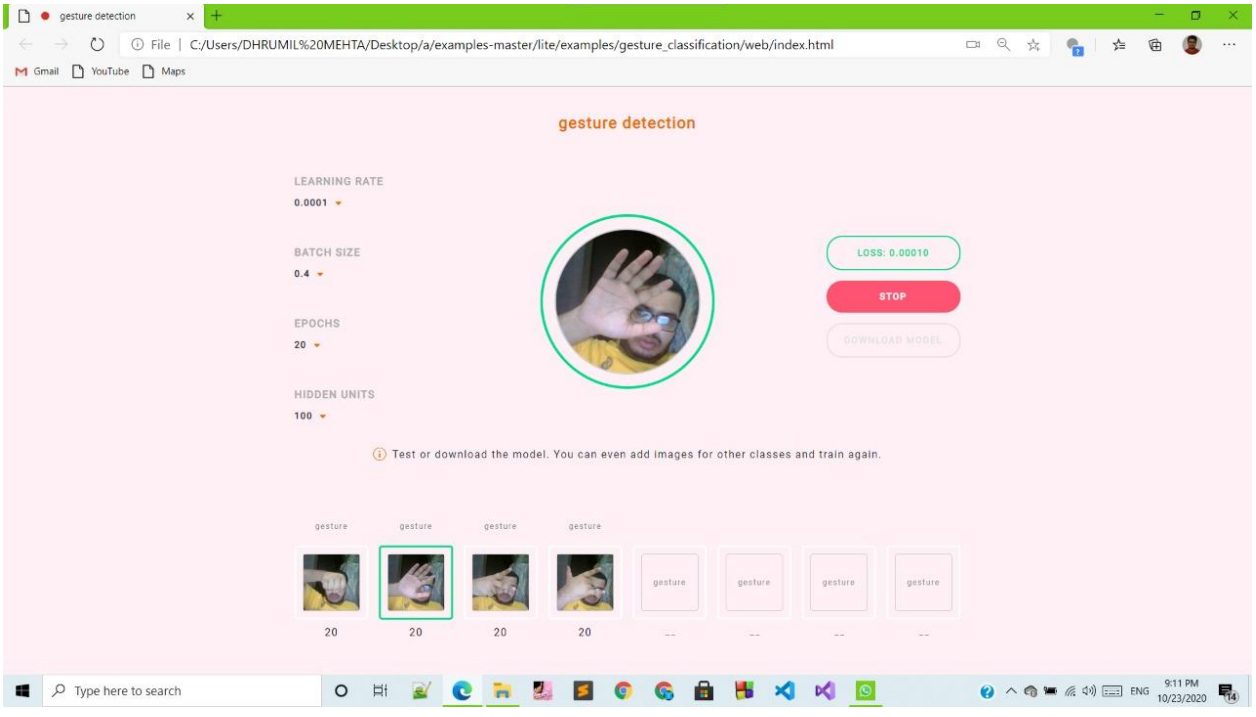
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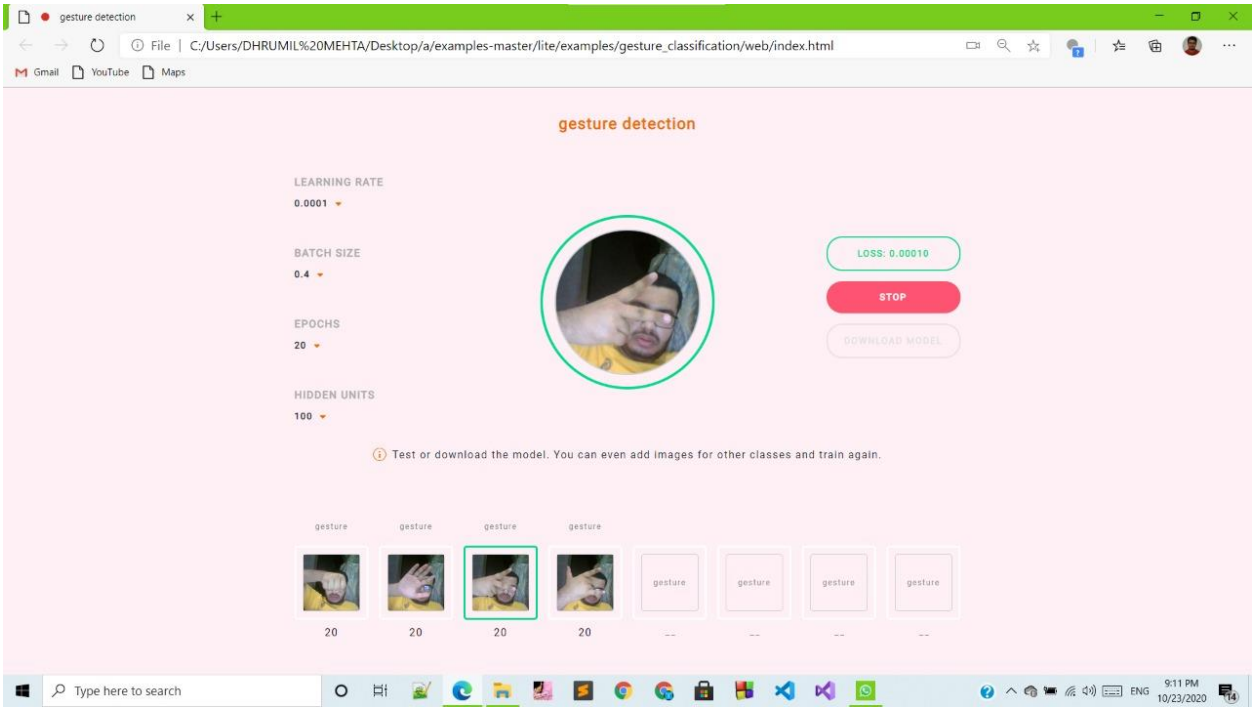
Fig 6.6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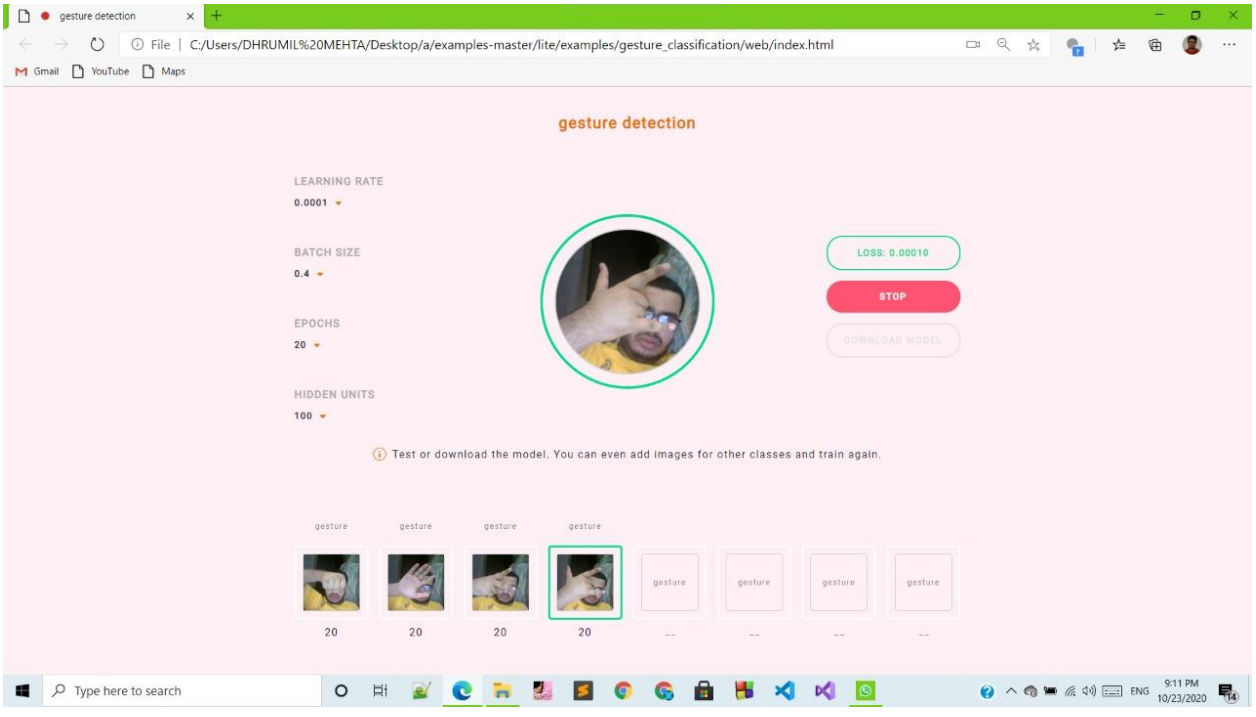
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Fig 6.8

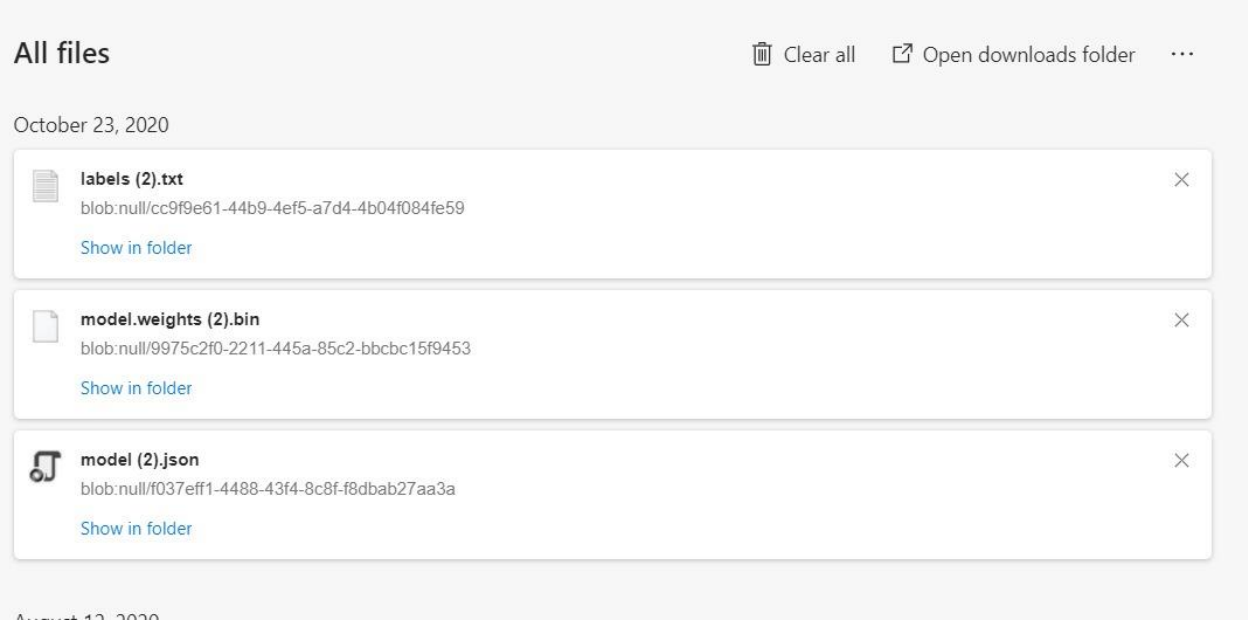

Fig 6.9 Model Downloaded

CHAPTER 7: LIMITATIONS

- Model download does not work in Firefox.
- It only train up to 8 different gestures.
- It requires Internet Connection.

CHAPTER 8:OUTCOMES

- We learn from this project about some libraries of javaScript.
- We also learn about some properties of css and html.
- We learn that how to train model using javascript.

CHAPTER 9:FUTURE ENHANCEMENT

- We will Create gesture detection android application using model which is trained by this web application.

CHAPTER 10:REFERENCES

[1] https://www.youtube.com/watch?v=9KqNk5keyCc

[2] https://cdn.jsdelivr.net/npm/@tensorflow/tfjs@VERSION

[3] https://colab.research.google.com/notebooks/intro.ipynb

[4] https://www.youtube.com/watch?v=FDUfaYsFQrc

[5] https://medium.com/swlh/hand-gestures-using-webcam-and-cnn-convoluted-neural-network-b02c47b3d5ab