MAJOR PROJECT REPORT

(Project Term January – May 2021)

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Lovely Professional University, Phagwara

January – May 2020

DECLARATION

We hereby declare that the project work entitled ("Real Time Hand Sign Recognition") is an authentic record of our own work carried out as requirements of Major Project for the award of degree of: Dual degree CSE diploma from Lovely Professional University, Phagwara, under the guidance of Mrs. Sweety Sehgal and Miss Amandeep Kaur Sandhu during January to May 2021.

(Signature of student)

(Signature of student)

(Signature of student)

(Signature of student)

(Signature of student)

Date:

This is to certify that the above statement made by the student is correct to the best of my

Knowledge and belief.

(Name, U.ID and Designation)

Faculty Mentor

ACKNOWLEDGEMENT

First and foremost, we would like to thank our Head Of Department of School of Polytechnic - Computer Science, Mrs. Sweety Sehgal who guided us through doing the project, provided us with invaluable advice, and helped us in such a difficult period, her willingness to motivate us contributed tremendously to the success of the project.

Also, we would like to convey our gratitude towards Miss Amandeep Kaur Sandhu, Faculty of School of polytechnic- CSE, who gave us necessary information and guidance for these projects.

Lastly, we would like to express our deep appreciation towards our classmates and our indebtedness to our parents for providing us the moral support and encouragement.

We would also like to thank everyone who extended their help, encouragement and moral support either directly or indirectly in our project work.

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PROFILE OF THE PROBLEM

In real-time, it is highly essential to have an autonomous translator that can process the images and recognize the signs very fast at the speed of streaming images.

Communication is one of the basic requirements for survival in society. Deaf and dumb people communicate among themselves using sign language, but normal people find it difficult to understand their language.

Due to recent advances in sensing technologies, such as time-of-flight and structured light cameras, there are new data sources available, which make hand gesture recognition more feasible. In this work, we propose a highly precise method to recognize static gestures from a depth data, provided from one of the above-mentioned devices.

Sign language recognition is a research area involving pattern recognition, computer vision. Sign language recognition is a comprehensive problem because of the complexity of the visual analysis of hand gesture and the highly structured nature of sign language.

Sign language and gesture recognition is an important problem in computer vision and machine learning and a fair amount of research has been done in this area. Due to advances in sensing technologies, there is a rapid progress in the robustness and quality of the solutions. Lately, a lot of work in static and dynamic gesture and pose recognition appeared.

LITERATURE SURVEY

Serial no.	Name	Overview
1.	Anna Diaz and Danial Hassan	This project is a first step towards building a possible sign language translator, which can take communications in sign language and translate them into written and oral language. Such a translator would greatly lower the barrier for many deaf and mute individuals to be able to better communicate with others in day-to-day interactions.
2.	Sahil Jain and KV Sameer Raja	"Snail Jain" and "K.V. Sameer Raja" from IIT, Kanpur also worked on this project. Their project aims at extending a step forward in this field by collecting a dataset from a deaf school, and then use various feature extraction techniques to extract useful information which is then input into various supervised learning techniques.

3.	Justin Chen of Stanford University	Our approach was to first create a data set showing the different hand gestures of the ASL alphabet that we wished to classify. The next step was to segment out only the hand region from each image and then use this data for unsupervised feature learning using an autoencoder, followed by training a SoftMax classifier for making a decision about which letter is being displayed.

PROPOSED SYSTEM

Gesture recognition remains a very challenging task in the field of computer vision and Human Computer Interaction (HCI). A decade ago, the task seemed to be almost unsolvable with the data provided by a single RGB camera.

Gesture recognition and sign language recognition has been a well-researched topic for American Sign Language (ASL), but few research works have been published regarding Indian Sign Language (ISL). But instead of using high-end technology like gloves or Kinect, we aim to solve this problem using state of the art computer vision and machine learning algorithms.

Many people are speech and/or hearing impaired, and they thus use hand gestures to communicate with other people. However, apart from a handful of people, not everyone is aware of this sign language and they may require an interpreter which can be inconvenient and expensive. This project aims to narrow this communication gap by developing a platform which can predict hand gestures in real time.

MODULE DESCRIPTION

- **PYTHON -** The main work of python is to create a dataset training a predefined CNN model on the captured dataset and predicting the data.

- **OpenCV-** For creating the dataset we get the live cam feed using OpenCV and create an ROI that is nothing but the part of the frame where we want to detect the hand in for the gestures.

- **TENSORFLOW-** Object detection API is used to detect the hand signs.

- **JUPYTER IDE-** To write and run the script of our platform using Jupyter notebook run using command prompt.

- **CUDA-** A parallel computing platform and application programming interface model created by Nvidia.

- **CUDNN-** It allows them to focus on training neural networks and developing software applications rather than spending time on low-level GPU performance tuning.

SOFTWARE REQUIREMENT ANALYSIS

Table 2: Software requirements.

DEVELOPMENT PLATFORM	PYTHON
OPERATING SYSTEM	WINDOWS 10
API	TENSORFLOW
DEPLOYMENT	ANACONDA PYTHON
ENVIRONMENT	JUPYTER IDE

SPECIAL REQUIREMENTS

PRE-TRAINED MODULE-

- Makes things easier and a lot faster to use.

CUDNN- NVIDIA

- There are many optimizers which help training module.

SCOPE OF THE MODULE

A dataset with more variation and a higher quality can really boost the accuracy of our current models. Also, we think that using more complex models like artificial neural networks or applying deep learning on the HOG vectors should improve the accuracy as they are capable of extracting richer information from these vectors. Increasing the levels of hierarchy with proper hierarchy levels created based on which nodes are being misclassified can result in improvement in accuracy, but we cannot surely claim that as suggested by multiplicative probability rule in our experiment with hierarchical classification.

We will be soon uploading the dataset we have collected on a cse server so that it can be used by some other group if they decide to work on the same problem. We hope that in future we or somebody else can add to this dataset and the problem of lacking dataset can be solved.

PROBLEM ANALYSIS

- Requires a lot of data and image set which took a lot of time to train in CNN.
- Requires a lot of knowledge about CNN to build and to configure the model.
- Training time must be large for getting the accurate result.
- The specification for running the programme must be very powerful.
- Many filters are used to separate the required result.
- Prediction has been done with lots of loss.
- Slow detection process.
- Required list of mathematical operations and algorithms to work upon.

DESIGN

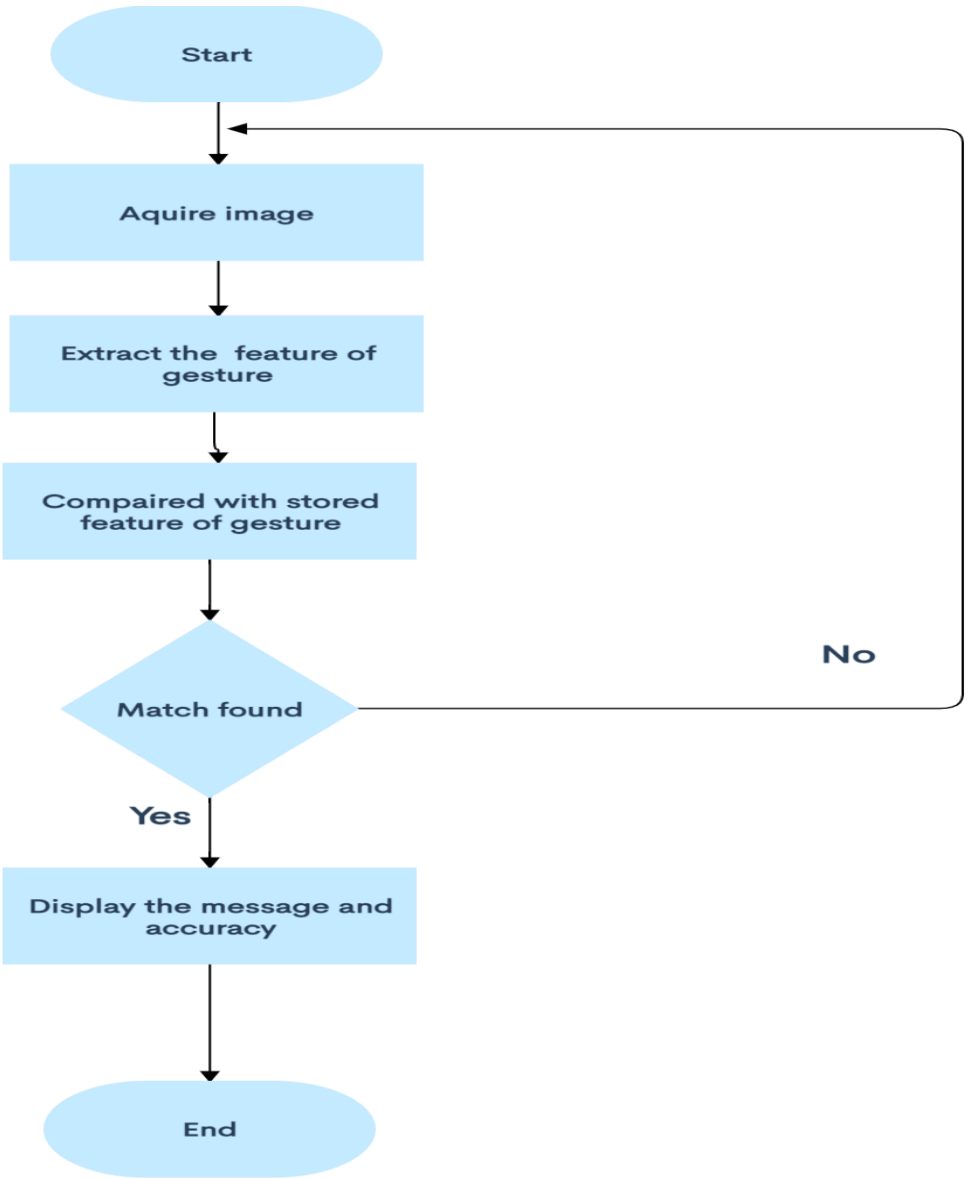

Fig 1: Flow chart of a model

CODE IMPLEMENTATION

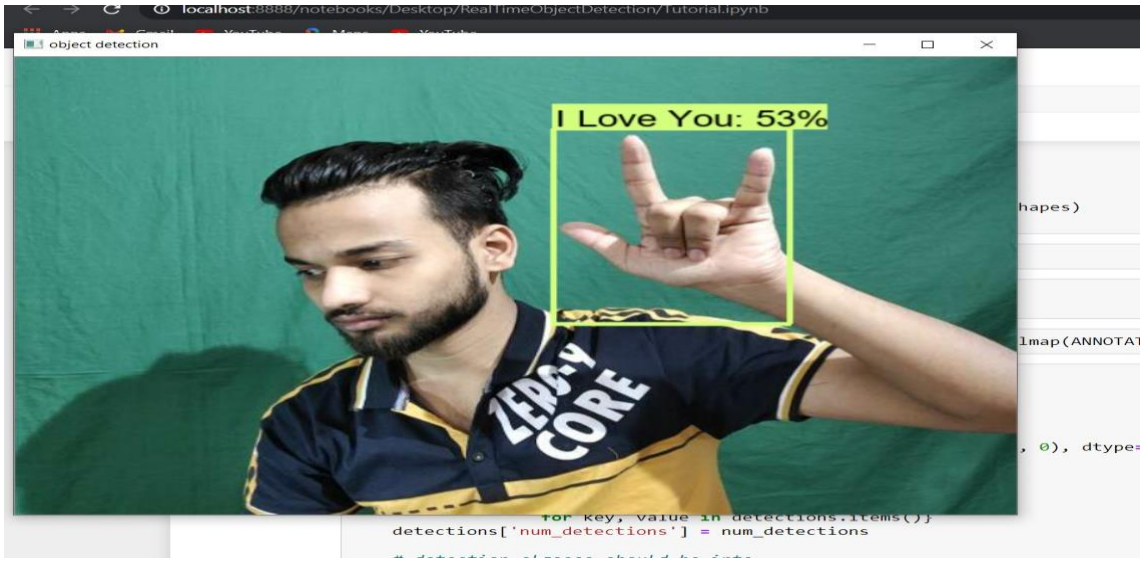

Fig 2: Implementation for “I LOVE YOU”

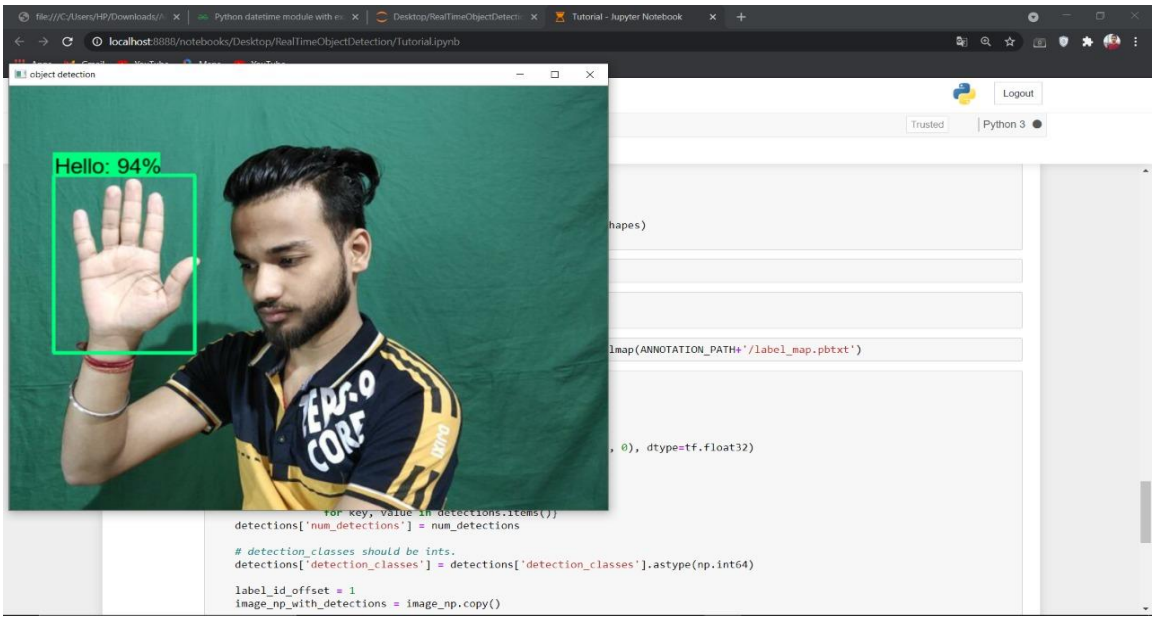

Fig 3: Implementation of “HELLO”

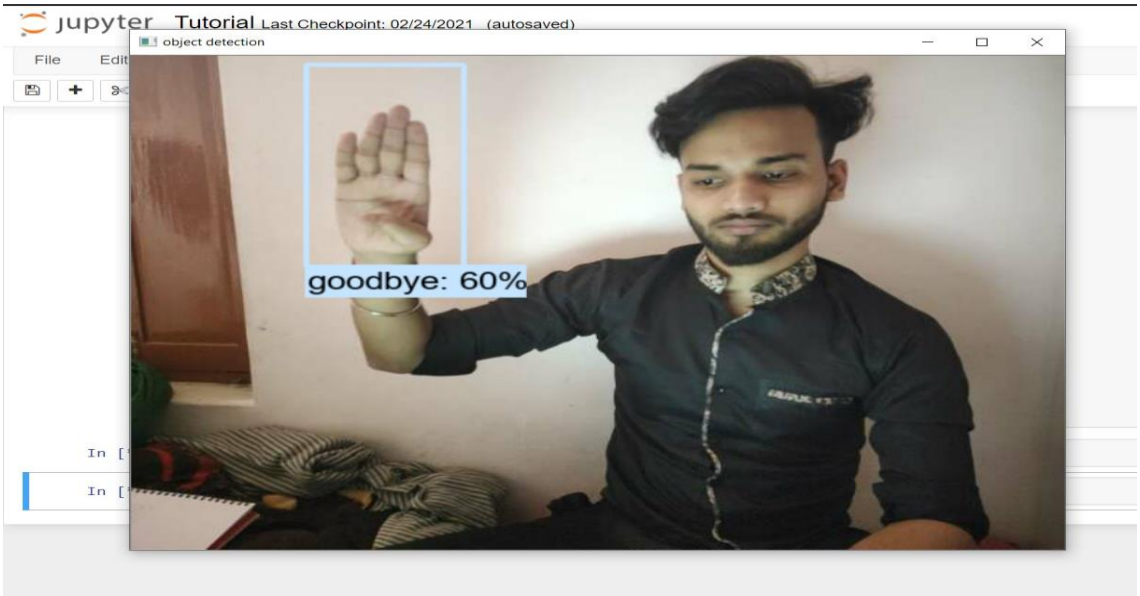

Fig 4: Implementation for “GOODBYE”

Personal dataset

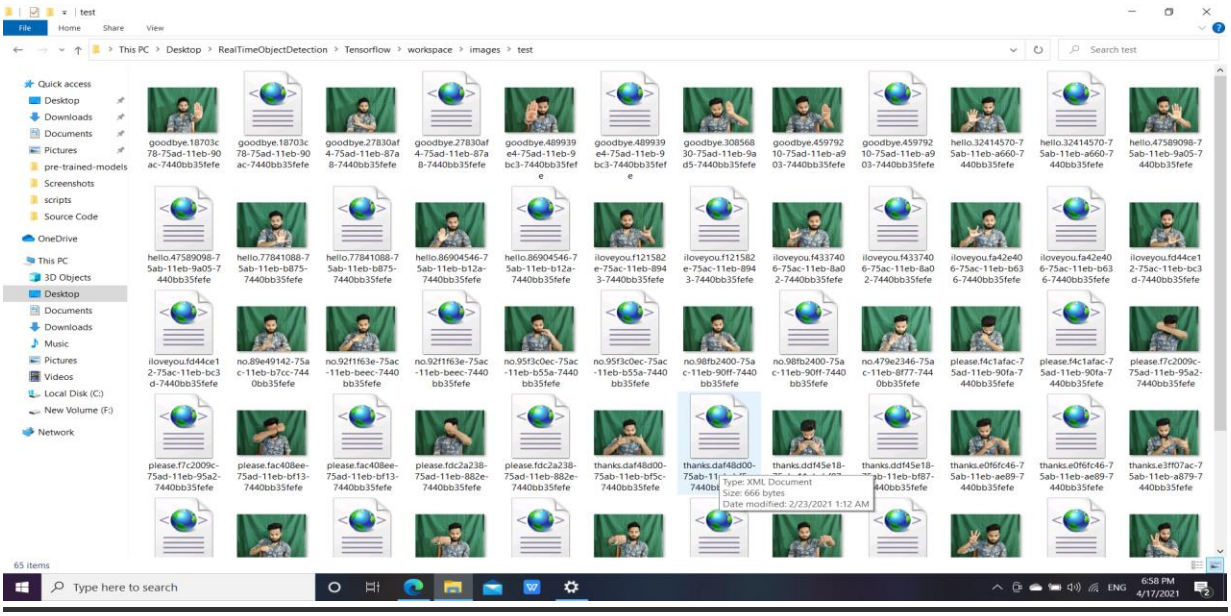

Fig 5: Image Dataset for different classes

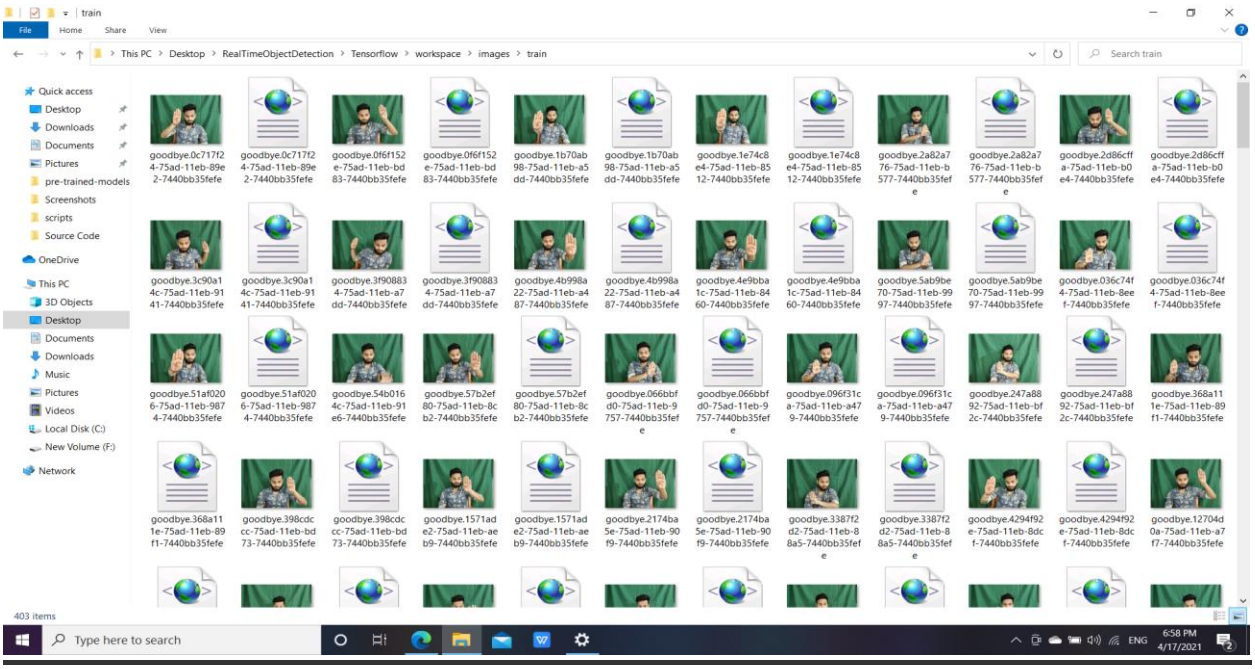

Fig 6: Image Dataset for different classes

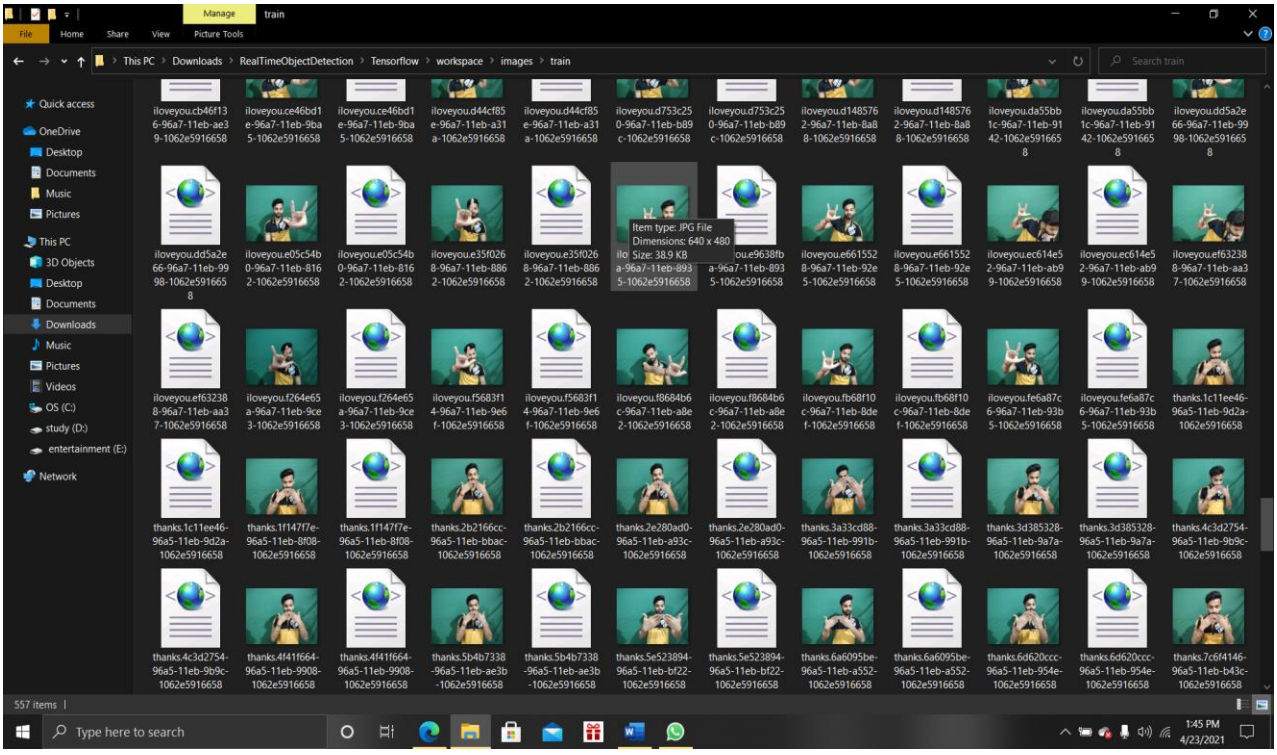

Fig 7: Image Dataset for different classes

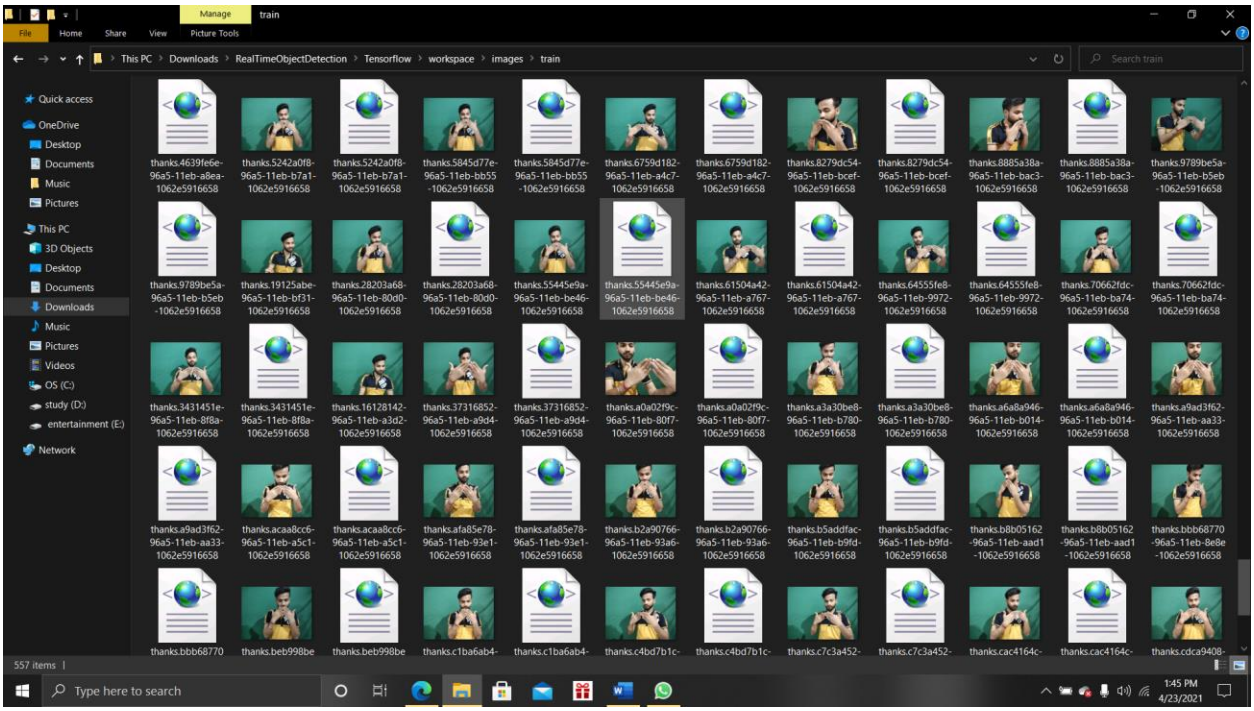

Fig 8: Image Dataset for different classes

Training

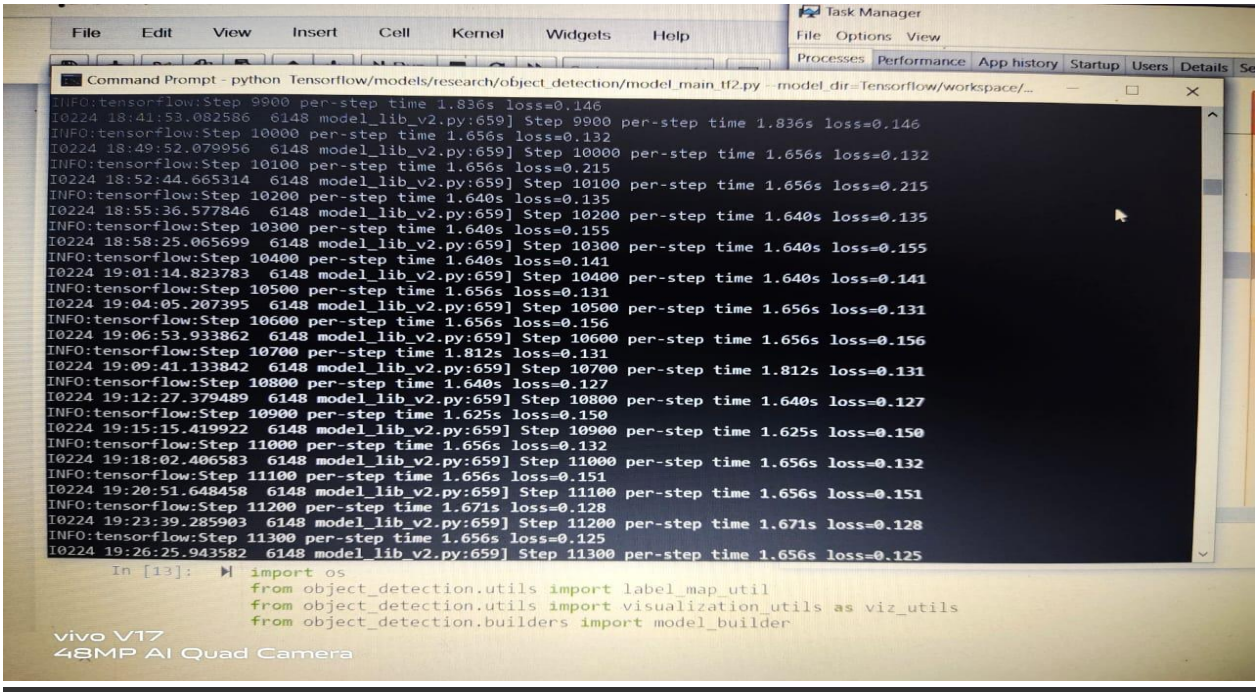

Fig 9: Image for training of the custom model

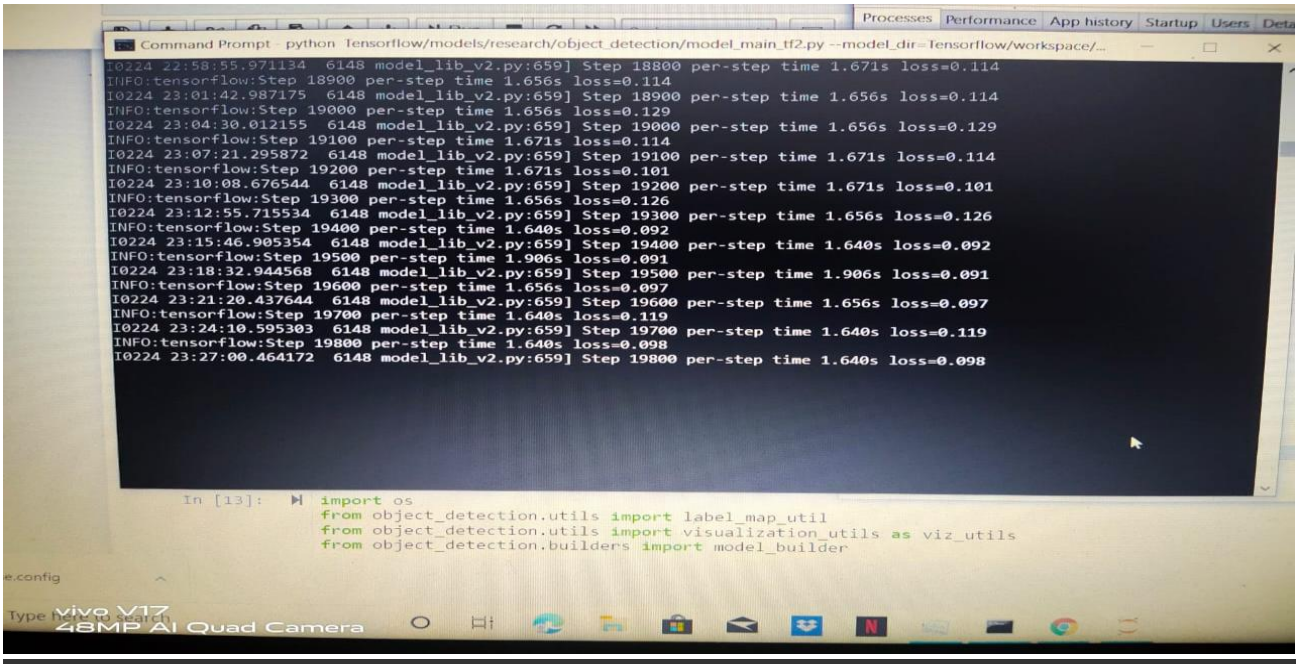

Fig 10: Image for training of the custom model

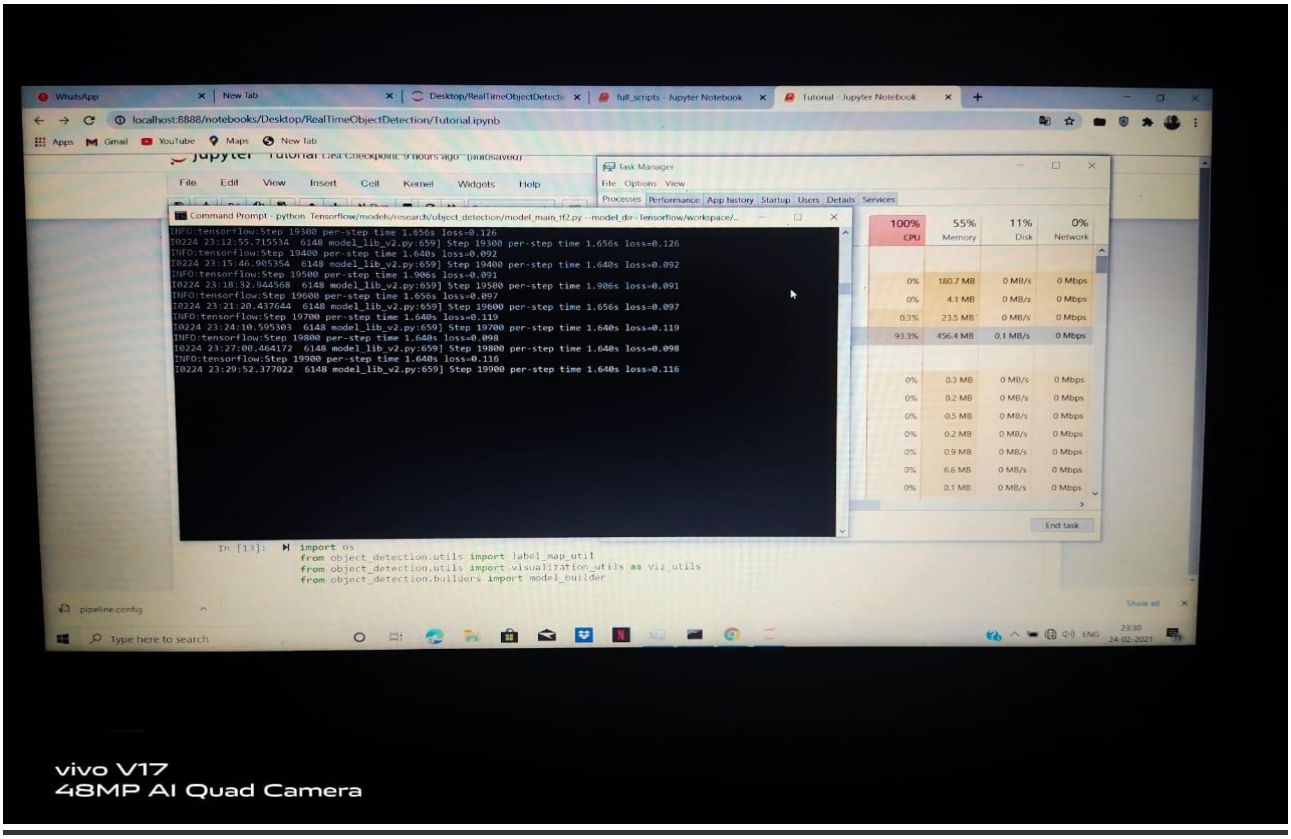

Fig 11: Image for training of the custom model

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