

**MACHINE LEARNING BASED EMOTION MEDIA  
PLAYBACK SYSTEM FOR PEOPLE WITH AUTISM**

Submitted in partial fulfillment of the requirements for the award of  
Bachelor of Technology degree in  
Information Technology

By

**ANVESH N (Reg No. 39120012)**

**BOOMESH M (Reg No. 39120016)**



**DEPARTMENT OF INFORMATION TECHNOLOGY  
SCHOOL OF COMPUTING**

**SATHYABAMA**

**INSTITUTE OF SCIENCE AND TECHNOLOGY  
(DEEMED TO BE UNIVERSITY)**

**Accredited with Grade “A” by NAAC | 12B Status by UGC | Approved by AICTE  
JEPPIAAR NAGAR, RAJIV GANDHISALAI,  
CHENNAI - 600119**

**MAY - 2023**



# **SATHYABAMA**

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with —All grade by NAAC

Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai – 600 119

[www.sathyabama.ac.in](http://www.sathyabama.ac.in)

## **DEPARTMENT OF INFORMATION TECHNOLOGY**

### **BONAFIDE CERTIFICATE**

This is to certify that this Project Report is the bonafide work of **Anvesh N (Reg No. 39120012)** **Boomesh M (Reg No. 39120016)** who carried out the Project Phase-2 entitled "**MACHINE LEARNING BASED EMOTION MEDIA PLAYBACK SYSTEM FOR PEOPLE WITH AUTISM**" under my supervision from November 2022 to May 2023.

Internal Guide

Dr. E. BRUMANCIA M.E., Ph.D.,

Head of the Department

Dr. R. SUBHASHINI M.E., Ph.D.,

Submitted for Viva voce Examination held on 10/05/2023

  
Internal Examiner  
External Examiner

### DECLARATION

I Anvesh N (Reg No. 39120012) here by declare that the Project Phase-2 Report entitled "MACHINE LEARNING BASED EMOTION MEDIA PLAYBACK SYSTEM FOR PEOPLE WITH AUTISM" done by me under the guidance of Dr. E. BRUMANCIA M.E., Ph.D., is submitted in partial fulfillment of the requirements for the award of Bachelor of Technology degree in Information Technology.

DATE: 10/05/2023

PLACE: Chennai



SIGNATURE OF THE CANDIDATE

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## ABSTRACT

Now-a-days Children with autism find it challenging to engage socially and become socially isolated. A common face may be recognized and a facial expression quickly understood. However, communication issues between kids with autism spectrum disorder (ASD) and their parents, teachers, and other youngsters are rather common. In this research, we offer a novel approach for detecting facial emotions during study time in children with ASD. Children are seen studying, using tablets, or computers, and the research monitors the child's facial expressions the whole time. For kids with autism spectrum disorders, this experiment suggests emotion detection (ASD). It is self-sufficient of the Python libraries Open CV and the Haar-cascade approach to forecast faces. On the other hand, most current techniques depend on the identification of people's facial expressions on social media platforms like Snapchat, which also employs facial recognition technology to identify facial emotions from those expressions. Here, a face is taken in real-time, and emotions are anticipated using facial expression recognition, in order to better include the children's social behavior (FER). As they often watch their faces and anticipate their emotions, the suggested approach helps to enhance the behavior of autistic youngsters. If the anticipated facial expression is one of happiness, we will use an AT mega microcontroller and a DF mini-Player to play them some interesting audio, which will keep them calm and aid in their interactive learning. Additionally, in order to determine their level of stress and track it online using Node MCU, we created and constructed a stress sensor based on Galvanic Skin Response (GSR) (ESP8266-12E Microcontroller unit). Since autistic children often study human facial expressions and attempt to mimic them, which has a significant impact on their understanding behavior, the suggested approach aids in improving the behavior of autistic children.

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## LIST OF ABBREVIATION

| ACRONYM | DESCRIPTION                        |
|---------|------------------------------------|
| CNN     | Convolutional Neural Network       |
| GSR     | Galvanic Skin Response             |
| IDE     | Integrated Development Environment |
| MCU     | Micro-controller unit              |

# CHAPTER 1

## INTRODUCTION

The ability to discern emotion from facial expressions is essential for successful social interaction, and the reverse may be true as well: social interaction, by increasing one's experience with expressive faces, may be necessary for the typical development of facial emotion recognition (FER) (Leppanen and Nelson 2006). It is therefore unsurprising that many individuals with an autism spectrum disorder (ASD), a grouping of disorders characterized by profound difficulties with social interaction, have demonstrated impairments in FER. Indeed, Kanner (1943) originally described autism as a 'disorder of affective contact,' and the current DSM-IV-TR diagnostic criteria for ASD include items related to deficits in identifying and processing emotion: "marked impairments in the use of multiple nonverbal behaviors, such as...facial expression..." and "lack of social or emotional reciprocity" (APA 2000). However, findings on FER in ASD are inconsistent: some studies have found intact FER in ASD, while others have found deficits. In this review, we attempt to account for contradictory findings in previous research and offer suggestions for how future research might address these discrepancies.

We searched for studies published through April 2010 that focused primarily on FER in ASD. To do so, we input the search terms "Autism," "autism spectrum disorder," or "ASD," "Face" or "facial," and "emotion" using the data-bases PubMed and Web of Science. Furthermore, we examined the references lists of the articles found through the above literature search in order to identify additional relevant studies. We did not include studies that examined only facial identity recognition or other non-affective facial processing.

Neurotypical kids can apprehend number one facial expressions together with happiness and unhappiness thru 3 to 4 months but it takes as a lot as 7 months to react and replicate the emotions of others one of the essential diagnostic features of autism spectrum disease is the presence of sensory deficits and dysregulation as a stop end result you can have problem studying terms including body language inflections and expressions directed at human beings no matter the truth that autistic kids battle to understand feelings some research have verified that each autistic youngsters and adults can learn how to recognize and interpret emotions in addition

research indicates that dependent sports can assist autistic kids become greater adept at recognizing the emotions of others.

## **1.1 OVERVIEW**

The main objective of this system is to capture an image in real-time and then recognize whether it is a human face using the Computer Vision technique. After detecting the human faces from an image, and observing the facial expressions using Deep Neural Network and If the Predicted facial Emotion is happy, then we will play some Rhymes Audio to teach Autism Children in efficient Manner using Python Audio API.

## **1.2 PROBLEM STATEMENT**

Kids With Autism have Common Problems like Social Anxiety or extreme fear of new people, crowds and social situation, which becomes very difficult to teach something pertaining to their education, Based on Experts the Best way to Help them learn something is through AV (Audio-Visual), We are Focused to Provide a solution to kids with Autism using this solution.

## CHAPTER 2

### LITERATURE SURVEY

In Omar et.al [1], Autism, often known as autism spectrum disorder (ASD), refers to a wide variety of developmental disorders that affect behavior, speech, and social interaction. The development of smart gadgets and software has given rise to a number of practical methods for dealing with this sickness quickly and efficiently. Even though all people should get a basic education, the autistic community still faces several challenges when using a conventional method. ICT-based learning software designed for autistic children is affected by interaction issues, such as how autistic children may interact with the program or equipment. The goal of this research is to provide a functional, transportable, and user-friendly interactive learning tool tailored to the needs of autistic children in order to help them get a head start in school. The device has a pressure-sensitive keypad to provide autistic children a simple and adaptable way to engage. To analyze the tool's efficiency and usefulness, a laboratory setting is also used to examine it.

In Wodka et.al [2], Autism is a condition of neurological development that is marked by limited and repetitive behavior, as well as poor social interaction and communication. It often comes with the following three symptoms: difficulty communicating, difficulty interacting with others, and limited interests and repetitive behavior. Infants with autism pay less attention to social cues, smile and glance at others less often, and react to their own name less.

In DeFilippis et.al [3], Toddlers with autism deviate more glaringly from social expectations; for instance, they make less eye contact, take fewer turns, and are unable to communicate with basic gestures like pointing. The hypothesis being that autistic children fail to understand metaphorical concepts and take reality for what it is without attaching a secondary thought to it. Many researches have indicated that creation of a phenomenon about a “neumenon” was the biggest challenge to the teacher.

In Hwang et.al [4], For social interactions, faces are very important. Our identities, objectives, and emotional states may all be seen on our faces. Children and adults with autism spectrum disorders (ASD) have difficulty with their ability to identify faces,

although other individuals can do so without much thinking. Studies have revealed that children with ASD do not naturally orient and attention to faces in the surroundings, in contrast to children who are generally developing. Children with ASD often ignore the eyes while focusing on a face, making it more probable that they may overlook clues about a person's identity and emotional condition. Additionally, ASD youngsters often break down a face into its component pieces (such as the eyes, nose, and mouth) rather of combining the many elements into a whole recollection of the face. It is not unexpected that children with autism would find it challenging to participate in daily interactions that primarily rely on the perception of facial signals if they lack the foundational abilities necessary for face processing. ASD children's face processing abilities have recently been enhanced by computer-based techniques like the Face Expertise Training and Let's Face It! (LFI!) software. These programs make the assumption that deliberate practice may teach and enhance the perceptual abilities required for face recognition. These programs' outcomes have been shown to be successful in teaching children with ASD how to detect face identification. Additionally, the advancement of cutting-edge technology, including touch screen tablets and virtual reality headsets, holds promise for enhancing the processing of facial expressions in kids with ASD.

In Islam et.al [5], In this study, we offer a deep learning model that can accurately categorize kids as either healthy or maybe autistic with 94.6% of the time. Patients with autism often suffer socially, with repeated actions, and with verbal and nonverbal communication. Even if the condition is thought to be hereditary, testing a child's behavior and facial traits results in the most precise diagnoses. Patients share a set of distinctive facial malformations, making it possible to diagnose a kid's condition only by looking at a photograph of the youngster. While there are different methods and models utilized for both face analysis and autism classification separately, our solution combines these two concepts to enable classification in a more effective and affordable way. In order to accomplish feature extraction and picture classification, our deep learning model combines Mobile Net with two thick layers. 3,014 photos, equally divided between those of autistic children and those of control subjects, are used for training and testing the model. Only 10% is used for actual testing, while the remaining 90% is put to good use in the training process. We suggest that autism can be accurately diagnosed with only a photo based on our accuracy. In addition,

other illnesses could be equally detectable.

In Castillo et.al [6], As a result of technological advancements, several automated teaching technologies are currently employed with autistic children. Applied Behavior Analysis (ABA) training is one of the most popular treatments for kids with autism spectrum disorder (ASD). It targets a wide array of skills, from talking and studying to socializing and moving around more effectively. The purpose of this piece is, therefore, to design and develop a gaming app with the express intent of helping autistic children improve their cognitive skills. A puzzle game, an object detection game, and a road crossing game make up the gaming application, which was developed utilizing IoT and ABA techniques. With the help of this program, it is possible to save and track a child's cognitive progress through time (as measured by gaming scores). A light-weight evaluation research was conducted, and the results showed that the suggested game application is suitable, efficient, and helpful for autistic children to enhance their cognitive abilities.

In Shahbodin et.al [7], In order to assist learning and enhance the quality of life for kids with autism spectrum disorder, we put into practice and assess the effectiveness of a novel system based on Internet of Things (IoT) and peer-to-peer (P2P) technology (ASD). Smart technologies like laptops and tablets with touch screens have a strong appeal to and ability to inspire many autistic youngsters. With the use of these assistive technological tools, autistic children are encouraged to engage, make decisions, and communicate with their parents about their interests, needs, thoughts, and sometimes even feelings. To monitor the kids and establish P2P communication between kids, parents, and therapists, our system employs the JXTA-Overlay platform and the Smart Box gadget. Many different visual systems, such as objects, pictures, realistic drawings, line drawings, and words, may be used with many different kinds of technology, so long as the youngster can readily grasp the visual representation. Our suggested approach may be used to teach students vocabulary, numeracy, and other life skills. Using research sessions with kids who have been diagnosed with ASD, we assessed the impact of our method. According to the trial findings, our program teaches new skills to children with ASD, and the Smart Box improves students' focus while they are learning.

In N.I. of Mental Health et.al [8], Health care is benefiting and relying more and more

on apps that connect to the Internet of Things (IoT). A knowledge-based intelligent system is created and enhanced by this study (KBS). It helps with early autism diagnosis in kids. In addition to the systems, it enables these individuals to obtain medical attention as quickly as is practical. Notification of the usage of an Internet of Things service for delivering brief messages to authorities in the field of medicine (SMS). The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) has received approval as a diagnostic resource for mental disorders. In order to send SMS messages to the child's parents that contained a diagnostic of their condition, the Internet of Things (IoT) technology was deployed. The method is also built on a web application that has all the helpful information for parents. It is used to each subsequent diagnosis of a patient. The method was tested on a group of autistic children, and the results supported the physicians' diagnosis.

## **2.1 INFERENCES FROM LITREATURE SURVEY**

We come to know that there is a compelling need for solution for kids with autism our aim is to develop an education-based platform based on the facial emotion of the kid which helps the kid to learn and understand things interactively. We are using CNN Algorithm to identify Facial Emotion and if the kid is happy, we will play rhymes which will help them to understand quickly and if the child is sad, we will be playing encouraging audio to uplift their mind.

## **2.2 OPEN PROBLEMS IN EXISTING SYSTEM**

There are manual solutions for the kids to learn which takes a long process for them to understand and it becomes difficult for the teachers to handle and train them to overcome this problem we are developing an education-based platform based on the facial emotion of the kid which helps the kid to learn and understand things interactively. We are using CNN Algorithm to identify Facial Emotion and if the kid is happy, we will play rhymes which will help them to understand quickly and if the child is sad, we will be playing encouraging audio to uplift their mind.

## **CHAPTER-3**

### **REQUIREMENT ANALYSIS**

#### **3.1 RISK ANALYSIS OF THE PROJECT**

Since there is almost nil hardware is required the cost of the concept comes down and there are no electric kind of equipment's involved which reduces the risk of shock and other handling being this a compelling need and also implemented at a low cost this concept becomes feasible to the user.

#### **3.2 SOFTWARE REQUIREMENTS SPECIFICATION DOCUMENT**

The way we create software today has changed dramatically the last 30 years, from the childhood of personal computers in the early 80s to today's powerful devices such as Smartphones, Tablets and PCs. The Internet has also changed the way we use devices and software. We still have traditional desktop applications, but Web Sites, Web Applications and so- called Apps for Smartphones, etc. are dominating the software market today. We need to find and learn Programming Languages that are suitable for the New Age of Programming. We have today several thousand different Programming Languages today. I guess you will need to learn more than one Programming Language to survive in today's software market.

#### **Python - IDE**

Python is an open source and cross-platform programming language, that has become increasingly popular over the last ten years. It was First released in 1991. Latest version is 3.7.0. CPython is the reference implementation of the Python programming language. Written in C, CPython is the default and most widely-used implementation of the language.

Python is a multi-purpose programming language (due to its many extensions), examples are scientific computing and calculations, simulations, web development (using, e.g., the Django Web framework), etc.

Python is an object-oriented programming language (OOP), but you can use Python in basic application without the need to know about or use the object- oriented features in Python.

## CHAPTER 4

### EMOTION MEDIA PLAYBACK SYSTEM FOR PEOPLE WITH AUTISM

Face recognition comes under the domain of Computer Vision which is an approach to identify and recognize images. Currently, they are being applied to various applications to solve real-world problems in many fields such as industries, manufacturing, healthcare, etc., for public security, marketing, banking, etc. Social media platforms have advanced algorithms capable to perform various functionalities in facial recognition to attract a wider user base.

The main objective of this system is to capture an image in real-time and then recognize whether it is a human face using the Computer Vision technique. After detecting the human faces from an image, and observe the facial expressions using Deep Neural Network and If the Predicted facial Emotion is happy, then we will play some Interesting Audio to them using AT mega Microcontroller and DF mini-Player, which will keep them relax and will help them to learn. Along With that we have designed and built a stress detector using Galvanic Skin Response (GSR).

For this objective, we have to calculate the different conductance of the skin when a person is under stress or when not using Galvanic Skin Response (GSR) device.

This proposed system helps to improve Autism children behavior as they often observe their facial expressions and predict facial emotion. If the Predicted facial Emotion is happy, then we will play some Rhymes Audio to teach Autism Children in efficient Manner using Python Audio API.

- we will be using Haar Cascade model to detect the frontal facial features
- We will be using Facial Expression Model File for Facial Emotion Recognition
- We will be using CNN algorithm (Convolution Neural Network) to predict the Facial Emotion
- If the Facial Emotion is sad, we will play Encouraging audio feedback Like clapping sound
- If the Facial Emotion is Happy then we will be playing Rhymes which will be based on the facial Emotion.

## 4.1 PROJECT MANAGEMENT PLAN

Module 1: Implementing Facial Emotion Model File.

Module2: Implementing Haar cascade.

Module3: Implementing CNN Algorithm.

Module 4: Segregating Emotions.

Module 5: Integrating Audio File.

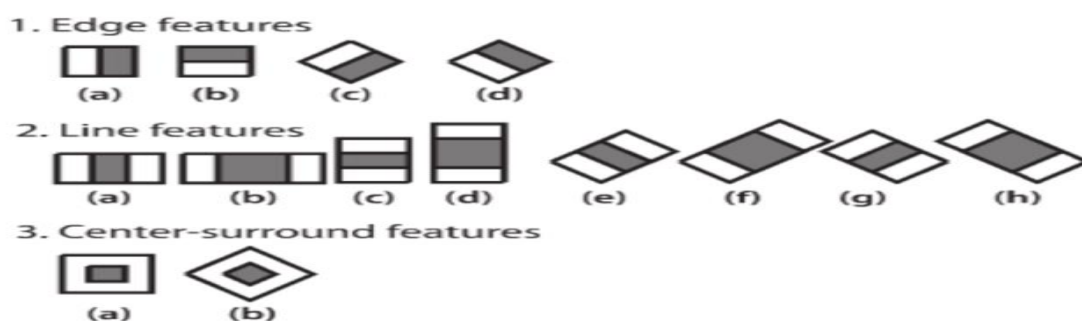
Module 6: Implementing Hardware components.

Module 7: Software Programming & Testing.

## 4.2 SELECTED METHODOLOGY OR PROCESS MODEL

### 4.2.1 Haar Cascades

A sequence of rescaled “square-shaped” functions which together form a wavelet family or basis. It is based on the Haar Wavelet technique to analyze pixels in the image into squares by function. This uses machine learning techniques to get a high degree of accuracy from what is called “training data”. This uses “integral image” concepts to compute the “features” detected. Haar Cascades use the Ada boost learning algorithm which selects a small number of important features from a large set to give an efficient result of classifiers.

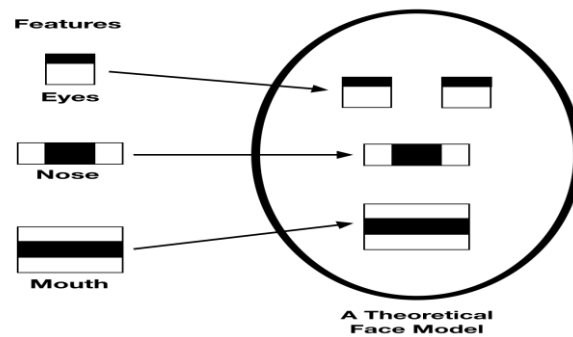


**Fig: 4.2.1 Haar Cascades**

- **Face Detection** determines the location and sizes of human faces in arbitrary (digital) images.
- In **Face Recognition**, the use of Face Detection comes first to determine and isolate a face before it can be recognized.

### 4.2.2 Feature Extraction

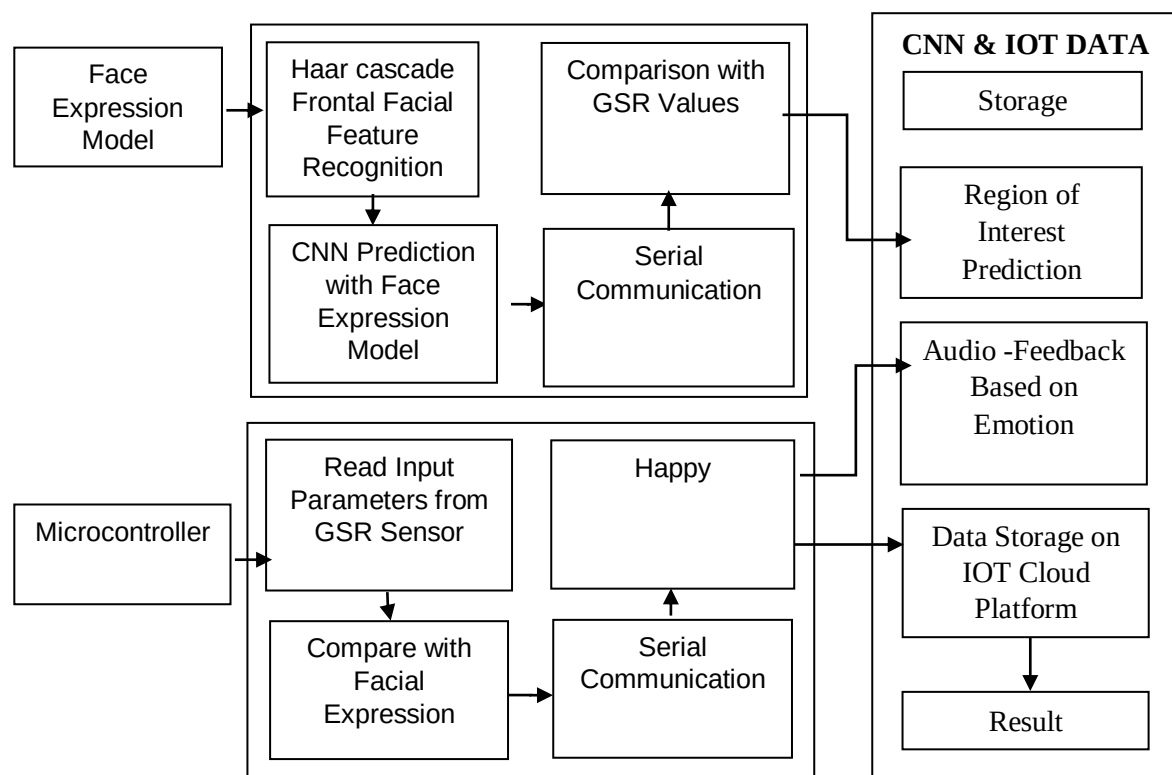
Haar Cascades use machine learning techniques in which a function is trained from a lot of positive and negative images. This process in the algorithm is feature extraction



**Fig: 4.2.2 Feature Extraction**

- In feature extraction, the algorithm uses training data to best identify features that it can consider a face.
- The training data used in this project is an XML file called:  
haarcascade\_frontalface\_default.xml

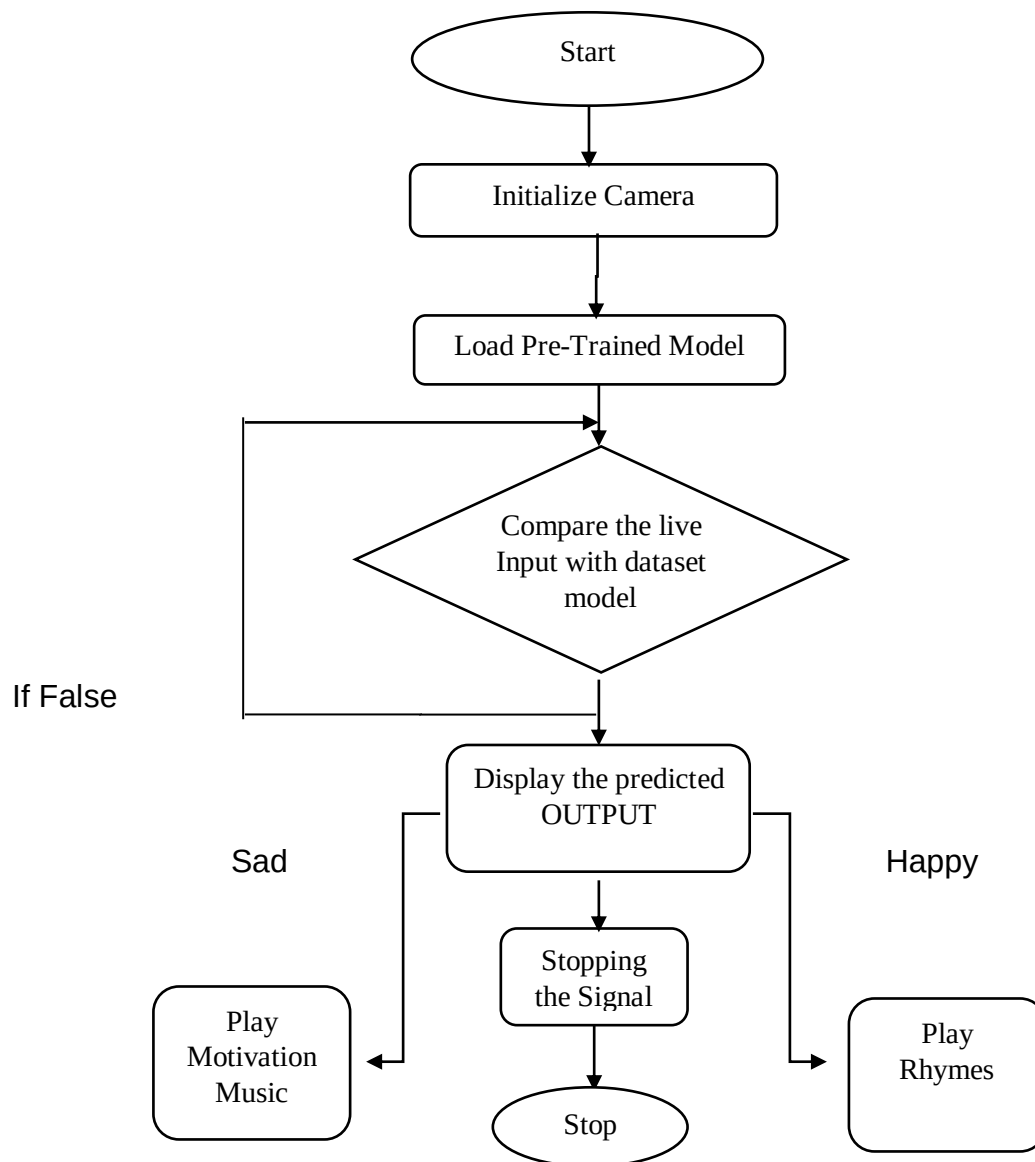
### 4.3 SYSTEM ARCHITECTURE



**Fig: 4.3 System Architecture**

#### 4.4 DESCRIPTION OF SOFTWARE FOR IMPLEMENTATION AND TESTING PLAN OF THE PROPOSED MODEL/SYSTEM

The main objective of this system is to capture an image in real-time and then recognize whether it is a human face using the Computer Vision technique. After detecting the human faces from an image, and observing the facial expressions using Deep Neural Network and If the Predicted facial Emotion is happy, then we will play some Rhymes Audio to teach Autism Children in efficient Manner using Python Audio API.



**Fig: 4.4 Description of Software for Implementation and Testing Plan of the Proposed Model/System**

#### **4.5 TRANSITION/ SOFTWARE TO OPERATIONS PLAN**

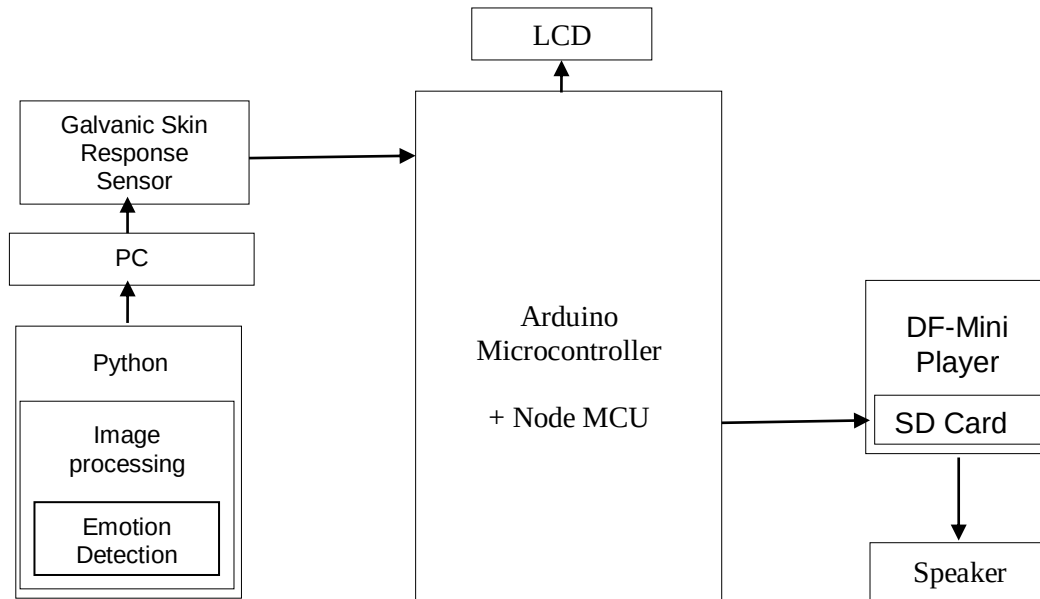
To Implement the Operations, we will be using Python Software to Prove our Concept at a Proof-of-concept level where Face will be shown in front of the camera, Emotion is detected based on the model file and output audio is implemented based on the facial emotion.

## CHAPTER 5

### IMPLEMENTATION DETAILS

#### 5.1 DEVELOPMENT AND DEPLOYMENT SETUP

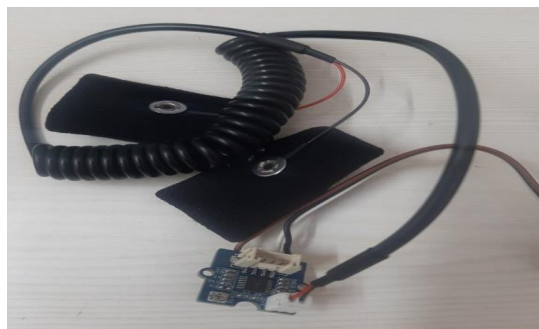
##### 5.1.1 BLOCK DIAGRAM OF HARDWARE COMPONENTS



**Fig 5.1.1 Block Diagram of Hardware Components**

##### 5.1.2 GALVANIC SKIN RESPONSE

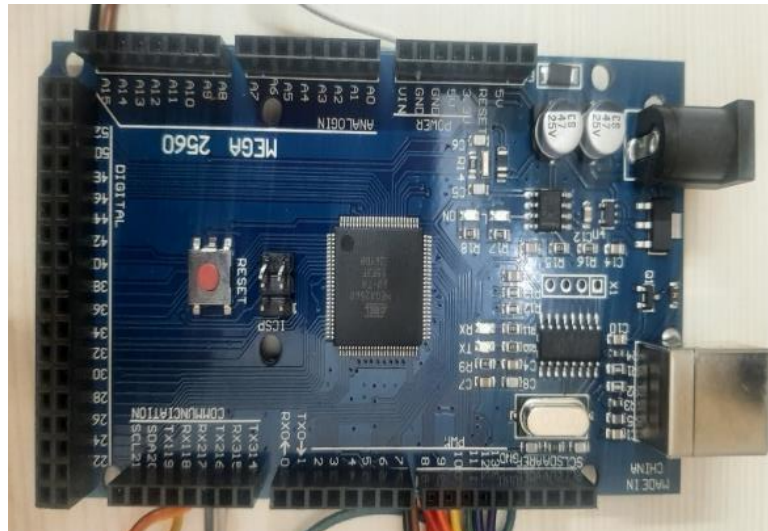
GSR stands for galvanic skin response and it is a method of measuring the electrical conductance of the skin. Strong emotions can cause stimulus to your sympathetic nervous system, resulting more sweat being secreted by the sweat glands. Grove - GSR allows you to spot such strong emotions by simply attaching two electrodes to two fingers on one hand. It is an interesting gear to create emotion related projects like sleep quality monitor.



**Fig 5.1.2 Galvanic Skin Response**

### 5.1.3 ARDUINO IDE

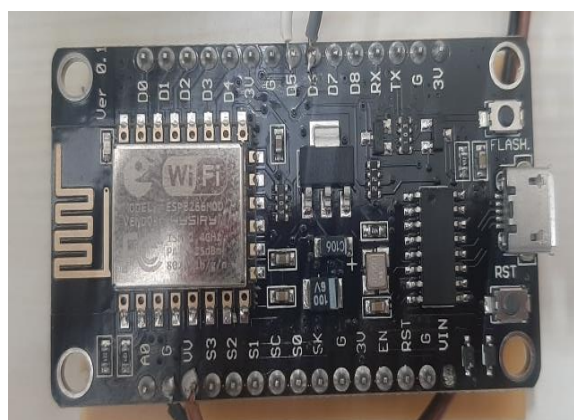
The Arduino Integrated Development Environment – or Arduino Software (IDE) – contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.



*Fig 5.1.3 Arduino IDE*

### 5.1.4 NODE MCU

Node MCU is an open source IOT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from express if Systems, and hardware which is based on the ESP- 12 module. The term “Node MCU” by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the e Lua project, and built on the Express if Non-OS SDK for ESP8266.



*Fig 5.1.4 Node MCU*

Node MCU was created shortly after the ESP8266 came out. On December 30, 2013, Express Systems began production of the ESP8266. The ESP8266 is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, [citation needed] widely used in IOT applications (see related projects). Node MCU started on 13 Oct 2014, when Hong committed the first file of node MCU-firmware to GitHub. Two months later, the project expanded to include an open-hardware platform when developer Huang R committed the Gerber file of an ESP8266 board, named devkit v0.9. Later that month, Tuan PM ported MQTT client library from Contiki to the ESP8266 SoC platform, and committed to Node MCU project, then Node MCU was able to support the MQTT IOT protocol, using Lua to access the MQTT broker. Another important update was made on 30 Jan 2015, when Devsaurus ported the u8glib to NodeMCU project, enabling NodeMCU to easily drive LCD, Screen, OLED, even VGA displays.

## 5.5 LIQUID CRYSTAL DISPLAYS

Liquid crystal displays (LCDs) have materials which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered form similar to a crystal. An LCD consists of two glass panels, with the liquid crystal material sandwiched in between them. The inner surface of the glass plates is coated with transparent electrodes which define the character, symbols or patterns to be displayed. Polymeric layers are present between the electrodes and the liquid crystal, which makes the liquid crystal molecules to maintain a defined orientation angle.



***Fig 5.1.5 Liquid Crystal Displays***

## 5.6 DF Player

The DF Player Mini is a small and low-price MP3 module with a simplified output directly to the speaker. The module can be used as a stand-alone module with attached battery, speaker and push buttons or used in combination with an Arduino UNO or any other with RX/TX capabilities.



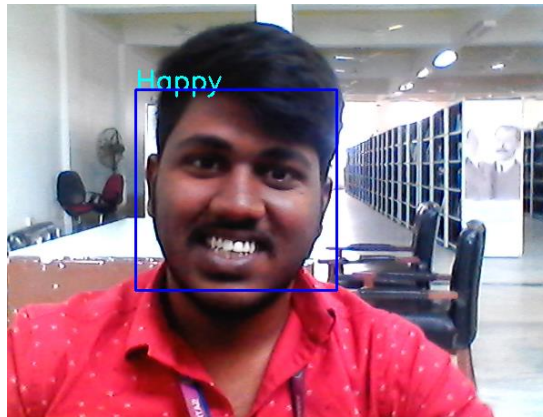
*Fig 5.1.6 DF Player*

## CHAPTER 6

### RESULTS & DISCUSSION

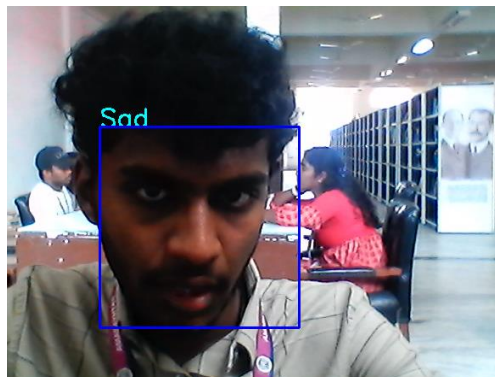
#### 6.1 RESULTS

When the project is processing software is used to predict the facial expression is happy or sad. The hardware is used to predict the emotion use of galvanic skin response (GSR) Sensor the way of sweat it will be displaying the value (Below 80 the emotion is Happy), (Above 80 the emotion is Sad), compare the emotion use of Node MCU while the both emotions are same it will display LCDisplay in digital with alphabet and it will play the Rhyme or motivation speech based on the emotion.



***Fig 6.1.1 Happy Face***

HaarCascade frontal facial feature recognition a face Expression by using of CNN algorithm.



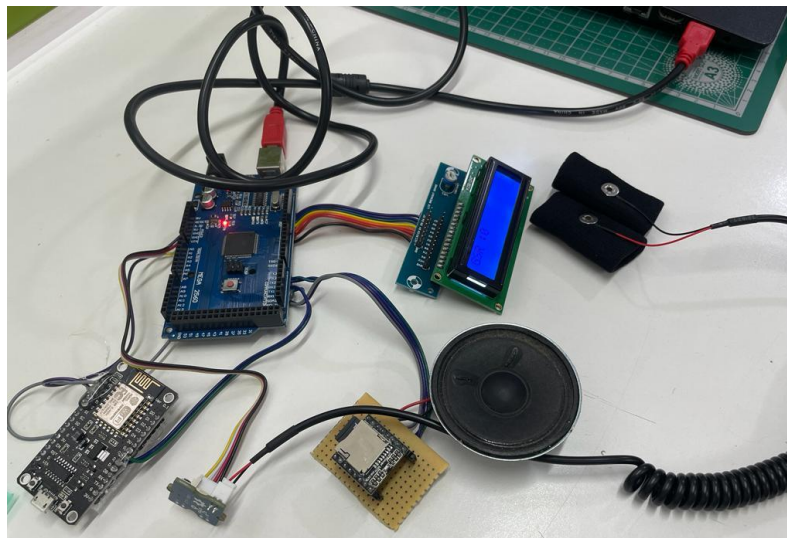
***Fig 6.1.2 Sad Face***

HaarCascade frontal facial feature recognition a face Expression by using of CNN algorithm.



***Fig 6.1.3 LIQUID CRYSTAL DISPLAY***

This LCD display is used to display the observe GSR value and Face emotion of the autism people.



***Fig 6.1.4 COMPLETE HARDWARE CIRCUIT***

Arduino IDE is connected to the pc for getting the face expression, GSR is connected to the Arduino IDE getting the information the way of sweat. Arduino IDE connected to the Node MCU. Node MCU is an IOT software it used to store the datasets. Node MCU segregate the collected GSR value and Face expression, passing to the Arduino IDE, Arduino IDE display the gathered data in the LCD display, at the same time DF Player will play the Rhyme or Motivation speech based on the emotion.

## **CHAPTER 7**

### **CONCLUSION & FUTURE WORK**

#### **7.1 CONCLUSION**

In summary, this work has explored the possibility of embedding conventional therapy modules into assistive technologies. This step is important in helping ASD children learn effectively and to help lessen therapist's workload in order for them to be able to focus more on the child themselves. For researchers, this study has offered for additional data and insight into how technologies, even games can be assistive in nature and with therapeutic uses. Simple devices such as these may not always be immediately recognized as assistive technology, but it is able to help therapists by providing an alternative to conventional therapy and data-taking.

#### **7.2 FUTURE WORK**

In order to address the aforementioned limitations, in the future, we plan to conduct randomized controlled trials with larger sample sizes. The scope of C31 may also be extended to include other tasks, such as response to joint attention, triadic play, and imitation leading to a more comprehensive intervention environment for children with ASD.

## REFERENCE

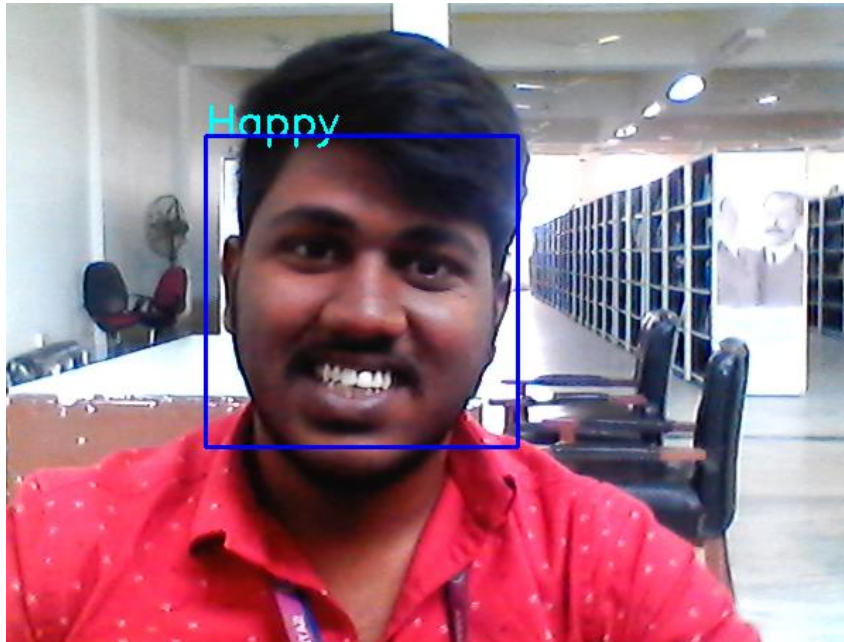
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- [4] Zaki, Tarannum & Islam, Muhammad Nazrul & Uddin, Md & Tumpa, Sanjida Nasreen & Hossain, Md & Anti, Maksuda & Hasan, Md. (2017). Towards Developing a Learning Tool for Children with Autism. 10.1109/ICIEV.2017.8338597.
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## APPENDIX

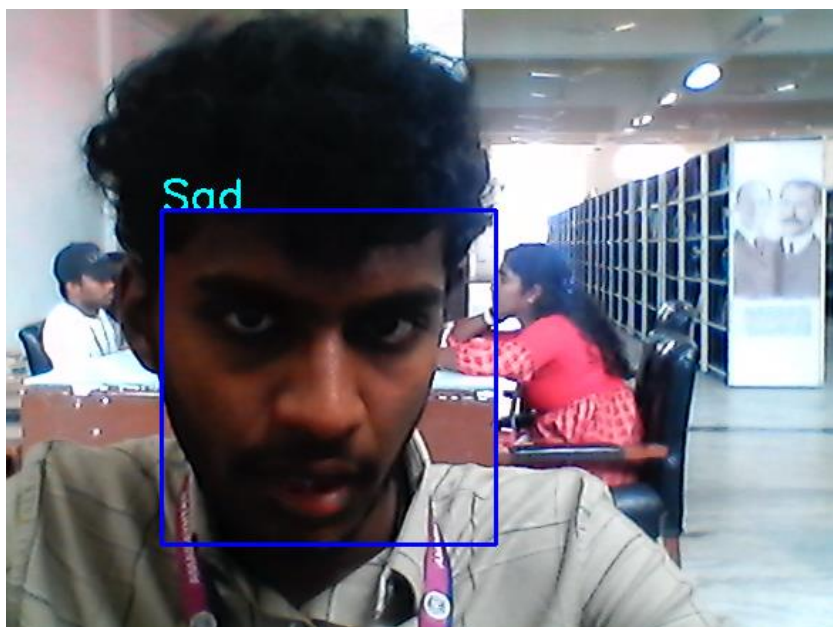
### A. SCREEN SHOTS

#### SEGREGATE THE FACE EMOTION

##### a) HAPPY FACE



##### b) SAD FACE

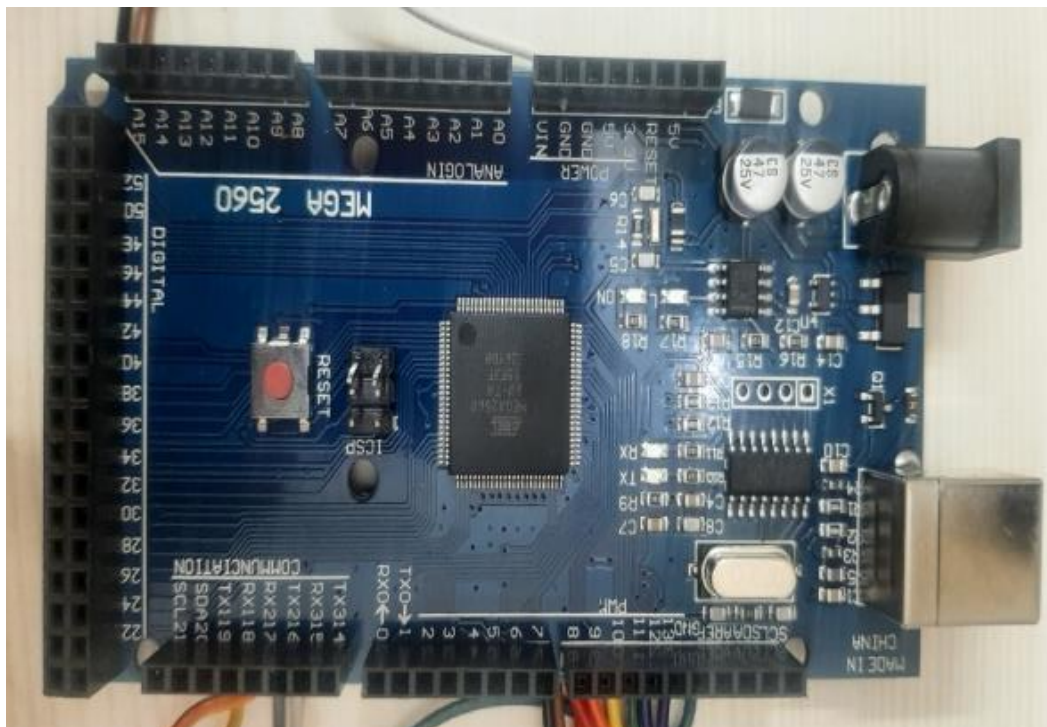


## HARDWARE COMPONENTS

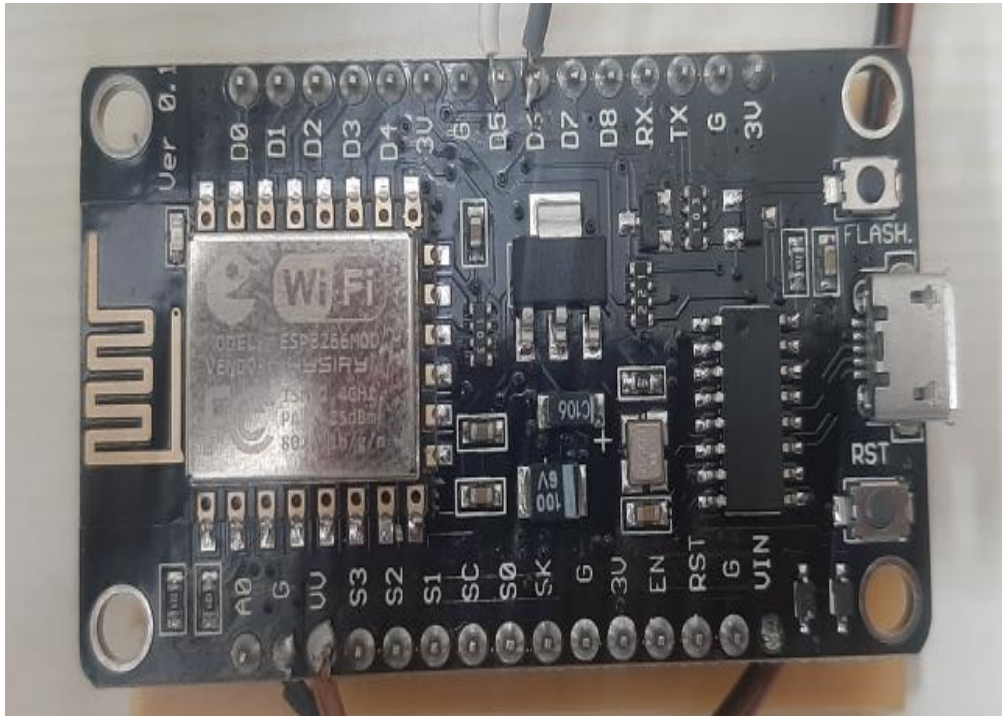
### a) GALVANIC SKIN RESPONSE



### b) ARDUINO IDE



**c) NODE MCU**



**d) LIQUID CRYSTAL DISPLAY**



**e) DF PLAYER**



## B. SOURCE CODE

### CAMERA

```
import cv2
cap = cv2.VideoCapture(0)
while (1):
    #Read the frame
    ret, frame = cap. Read ()
    if ret==True:
        #frame = cv2.flip(frame,1)
        #Show the frame
        cv2.imshow('frame', frame)
        k = cv2.waitKey(1) & 0xff # Press 'ESC' for exiting video
        if k == 27:
            break
    else:
        break
# Release everything if job is finished
cap. release ()
cv2.destroyAllWindows()
```

## FACE

```
import cv2
import os
cam = cv2.VideoCapture(0)
cam.set(3, 640) # set video width
cam.set(4, 480) # set video height
face_detector = cv2.CascadeClassifier('haarcascade_frontalface_default.xml')
print ("\n [INFO] Initializing face detection. Look the camera and wait ...")
while (True):
    ret, img = cam.read ()
    img = cv2.flip(img, 1) # flip video image vertically
    gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
    faces = face_detector.detectMultiscale (gray, 1.3, 5)
    for (x, y, w, h) in faces:
        cv2.rectangle(img, (x, y), (x+w, y+h), (255,0,0), 2)
        cv2.imshow('image', img)
    k = cv2.waitKey(1) & 0xff # Press 'ESC' for exiting video
    if k == 27:
        break
# Do a bit of cleanup
cam.release ()
cv2.destroyAllWindows()
```

## EMOTION BASED TEACHING

```
import cv2
from Model. Model import FacialExpressionModel
import NumPy as np
import time
from audio player import Audio Player
rgb = cv2.VideoCapture(0)
facec = cv2.CascadeClassifier('Model/haarcascade_frontalface_default.xml')
font = cv2.FONT_HERSHEY_SIMPLEX
found = set ()
def __get_data_():
    """
    __get_data__: Gets data from the Video Capture object and classifies them
    to a face or no face.
    returns: tuple (faces in image, frame read, grayscale frame)
    """
    _, fr = rgb. Read ()
    fr=cv2.flip(fr,1)
    gray = cv2.cvtColor(fr, cv2.COLOR_BGR2GRAY)
    faces = facec. detect Multiscale (gray, 1.3, 5)
    return faces, fr, gray
def start_app (CNN):
    count_h=0
    count_s=0
    while True:
        faces, fr, gray_fr = __get_data_ ()
        for (x, y, w, h) in faces:
            fc = gray_fr [y: y+h, x:x+w]
            roi = cv2.resize(fc, (48, 48))
            pred = CNN. predict_ emotion (Roi [np. new axis: np. new axis])
            cv2.putText(fr, pred, (x, y), font, 1, (255, 255, 0), 2)
            cv2.rectangle(fr, (x, y), (x+w, y+h), (255,0,0),2)
            if(str(pred)=='Happy'):
```

```

        count_h+=1
        count_s=0
        print ("Happy ", count_h)
        if(count_h>=5):
            count_h=0
            Audio Player("rhy.mp3"). play(block=True)
    El if(str(pred)=='Sad'):
        count_s+=1
        count_h=0
        print ("Sad ", count_s)
        if(count_s>=5):
            count_s=0
            Audio Player("rhythmic_clapping.wav"). play(block=True)
    else:
        count=0
        count_h=0
        count_s=0
    if cv2.waitKey(1) == 27:
        break
    cv2.imshow('Autism', fr)
    cv2.destroyAllWindows()
    rgb. Release ()
if __name__ == '__main__':
    model = FacialExpressionModel ("Model/face_model.json",
    "Model/face_model.h5")
    start_app(model)

```

## EMOTION BASED TEACHING COMBINE WITH HARDWARE

### IMPLEMENTING SEVERAL EMOTIONS IN CAMERA

```
from tensorflow.keras.models import model_from_json
import numpy as np

class FacialExpressionModel(object):
    EMOTIONS_LIST = ["Angry", "Disgust",
                     "Fear", "Happy",
                     "Sad", "Surprise",
                     "Neutral"]

    def __init__(self, model_json_file, model_weights_file):
        # load model from JSON file
        with open(model_json_file, "r") as json_file:
            loaded_model_json = json_file.read()
            self.loaded_model = model_from_json(loaded_model_json)
        # load weights into the new model
        self.loaded_model.load_weights(model_weights_file)
        print("Model loaded from disk")
        self.loaded_model.summary()

    def predict_emotion(self, img):
        self.preds = self.loaded_model.predict(img)
        return FacialExpressionModel.EMOTIONS_LIST[np.argmax(self.preds)]

if __name__ == '__main__':
    pass
```

## FACE

```
import cv2
import tensorflow
from Models.model import FacialExpressionModel
import numpy as np
import time
rgb = cv2.VideoCapture(0)
facec = cv2.CascadeClassifier('Models/haarcascade_frontalface_default.xml')
font = cv2.FONT_HERSHEY_SIMPLEX
found = set ()
def __get_data_():
    """
    __get_data__: Gets data from the Video Capture object and classifies them
    to a face or no face.
    returns: tuple (faces in image, frame read, grayscale frame)
    """
    _, fr = rgb.read()
    fr = cv2.flip(fr, 1)
    gray = cv2.cvtColor(fr, cv2.COLOR_BGR2GRAY)
    faces = facec.detectMultiScale(gray, 1.3, 5)
    return faces, fr, gray
def start_app(CNN):
    skip_frame = 10
    data = []
    flag = False
    ix = 0
    count_h = 0
    count_s = 0
    while True:
        ix += 1
        faces, fr, gray_fr = __get_data__()
        for (x, y, w, h) in faces:
            fc = gray_fr[y:y+h, x:x+w]
```

```

roi = cv2.resize(fc, (48, 48))
pred = CNN. predict_emotion (roi [np. new axis: np. new axis])
cv2.putText(fr, pred, (x, y), font, 1, (255, 255, 0), 2)
cv2.rectangle(fr, (x, y), (x+w, y+h), (255,0,0),2)
if(str(pred)=='Happy'):
    count_h+=1
    count_s=0
    print ("Happy ", count_h)
    if(count_h>=5):
        print ('Happy send')
if(str(pred)=='Sad'):
    count_s+=1
    count_h=0
    print ("Sad ", count_s)
    if(count_s>=5):
        print ('Sad send')
else:
    count=0
if cv2.waitKey(1) == 27:
    break
cv2.imshow('Autism', fr)
cv2.destroyAllWindows()
if __name__ == '__main__':
    model = FacialExpressionModel ("Models/face_model.json",
    "Models/face_model.h5")
    start_app(model)

```

## MAIN CODE

```
import cv2
import tensorflow
from Models.model import FacialExpressionModel
import numpy as np
import time
import serial

rgb = cv2.VideoCapture(0)
facec = cv2.CascadeClassifier('Models/haarcascade_frontalface_default.xml')
font = cv2.FONT_HERSHEY_SIMPLEX
found = set ()
Arduino Data = serial.Serial ('COM6', 115200)
readdat=""
def getSerial ():
    global DaTa_r
    global temp_Stat
    global stat
    if (arduinoData.in_waiting >0):
        line = arduinoData.readline()
        readdat=line. Decode ()
        print(readdat)
        if (readdat == "Ready\r\n"):
            print ("Device online")
        if (readdat == "Temperature Safe\r\n"):
            #print ("")
            temp_Stat=1
        if (readdat == "RST\r\n"):
            #print ('reset')
            temp_Stat=0
            stat=75
    else:
        readdat=""
```

```

def __get_data_():
    """
    __get_data__: Gets data from the Video Capture object and classifies them
    to a face or no face.
    returns: tuple (faces in image, frame read, grayscale frame)
    """
    __, fr = rgb.read()
    fr=cv2.flip(fr,1)
    gray = cv2.cvtColor(fr, cv2.COLOR_BGR2GRAY)
    faces = facec.detect Multiscale (gray, 1.3, 5)
    return faces, fr, gray
def start_app (CNN):
    skip_frame = 10
    data = []
    flag = False
    ix = 0
    count_h=0
    count_s=0
    count_n=0
    count_h_max=5
    count_s_max=5
    while True:
        ix += 1
        getSerial ()
        faces, fr, gray_fr = __get_data ()
        for (x, y, w, h) in faces:
            fc = gray_fr [y: y+h, x:x+w]
            roi = cv2.resize(fc, (48, 48))
            pred = CNN.predict_emotion (roi [np.newaxis: np.newaxis])
            cv2.putText(fr, pred, (x, y), font, 1, (255, 255, 0), 2)
            cv2.rectangle(fr, (x, y), (x+w, y+h), (255,0,0),2)
            if(str(pred)=='Happy'):
                count_h+=1
                count_s=0

```

```

count_n=0
print ("Happy ", count_h)
if(count_h>=5 and count_h >= count_h_max):
    count_h=0
    count_h_max=20
    arduinoData.write('Happy'. Encode ())
    print ('Happy send')
elif(str(pred)=='Sad'):
    count_s+=1
    count_h=0
    count_n=0
    print ("Sad ", count_s)
    if(count_s>=5 and count_s >= count_s_max):
        count_s_max=20
        count_s=0
        arduinoData.write('Sad'. Encode ())
        print ('Sad send')
else:
    count_n+=1
    count_s=0
    count_h_max=5
    count_s_max=5
    count_h=0
    if(count_n>=20):
        count_n=0
        arduinoData.write('Neutral'. Encode ())
if cv2.waitKey(30) == 27:
    break
cv2.imshow('Autism', fr)
cv2.destroyAllWindows()
if __name__ == '__main__':
    model = FacialExpressionModel ("Models/face_model.json",
    "Models/face_model.h5")
    start_app(model)

```

## C. RESEARCH PAPER

# MACHINE LEARNING BASED EMOTION MEDIA PLAYBACK SYSTEM FOR PEOPLE WITH AUTISM

Anvesh N

[anveshani4585@gmail.com](mailto:anveshani4585@gmail.com)

Sathyabama Institute of  
Science and Technology

Boomesh M

[boomeshm815@gmail.com](mailto:boomeshm815@gmail.com)

Sathyabama Institute of  
Science and Technology

Brumancia E

[easpinbrumancia@gmail.com](mailto:easpinbrumancia@gmail.com)

Sathyabama Institute of  
Science and Technology

**Abstract** – Now-a-days Children with autism find it challenging to engage socially and become socially isolated. A common face may be recognized and a facial expression quickly understood. However, communication issues between kids with autism spectrum disorder (ASD) and their parents, teachers, and other youngsters are rather common. In this research, we offer a novel approach for detecting facial emotions during study time in children with ASD. Children are seen studying, using tablets, or computers, and the research monitors the child's facial expressions the whole time. For kids with autism spectrum disorders, this experiment suggests emotion detection (ASD). It is self-sufficient of the Python libraries Open CV and the Haar-cascade approach to forecast faces. On the other hand, most current techniques depend on the identification of people's facial expressions on social media platforms like Snapchat, which also employs facial recognition technology to identify facial emotions from those expressions. Here, a face is taken in real-time, and emotions are anticipated using facial expression recognition, in order to better include the children's social behavior (FER). As they often watch their faces and anticipate their emotions, the suggested approach helps to enhance the behavior of autistic youngsters. If the anticipated facial expression is one of happiness, we will use an AT mega microcontroller and a DF mini-Player to play them some interesting audio, which will keep them calm and aid in their interactive learning. Additionally, in order to determine their level of stress and track it online using Node MCU, we created and constructed a stress sensor based on Galvanic Skin Response (GSR) (ESP8266-12E Microcontroller unit). Since autistic children often study human facial expressions and attempt to mimic them, which has a significant impact on their understanding behavior, the suggested approach aids in improving the behavior of autistic children.

**Keywords** - *autism spectrum disorder (ASD), OpenCV, Learning, Facial Expression Recognition (FER), Stress Detection Using Galvanic Skin Response sensor.*

## I. INTRODUCTION

Neurotypical kids can apprehend number one facial expressions together with happiness and unhappiness thru 3 to 4 months but it takes as a lot as 7 months to react and replicate the emotions of others one of the essential diagnostic features of autism spectrum disease ads is the presence of sensory deficits and dysregulation as a stop end result you can have problem studying terms including body language inflections and expressions directed at human beings no matter the truth that autistic kids battle to understand feelings some research have verified that each autistic youngsters and adults can learn how to recognize and interpret emotions in addition research indicates that dependent sports can assist autistic kids become greater adept at recognizing the emotions of others.

## II. LITERATURE SURVEY

In Omar et.al [1], Autism, often known as autism spectrum disorder (ASD), refers to a wide variety of developmental disorders that affect behavior, speech, and social interaction. The development of smart gadgets and software has given rise to a number of practical methods for dealing with this sickness quickly and efficiently. Even though all people should get a basic education, the autistic community still faces several challenges when using a conventional method. ICT-based learning software designed for autistic children is affected by interaction issues, such as how autistic children may interact with the program or equipment. The goal of this research is to provide a functional, transportable, and user-friendly interactive learning tool tailored to the needs of autistic children in order to help them get a head start in school. The device has a pressure-

sensitive keypad to provide autistic children a simple and adaptable way to engage. To analyze the tool's efficiency and usefulness, a laboratory setting is also used to examine it.

In Wodka et.al [2], Autism is a condition of neurological development that is marked by limited and repetitive behavior, as well as poor social interaction and communication. It often comes with the following three symptoms: difficulty communicating, difficulty interacting with others, and limited interests and repetitive behavior. Infants with autism pay less attention to social cues, smile and glance at others less often, and react to their own name less.

In DeFilippis et.al [3], Toddlers with autism deviate more glaringly from social expectations; for instance, they make less eye contact, take fewer turns, and are unable to communicate with basic gestures like pointing. The hypothesis being that autistic children fail to understand metaphorical concepts and take reality for what it is without attaching a secondary thought to it. Many researches have indicated that creation of a phenomenon about a "neumenon" was the biggest challenge to the teacher.

In Hwang et.al [4], For social interactions, faces are very important. Our identities, objectives, and emotional states may all be seen on our faces. Children and adults with autism spectrum disorders (ASD) have difficulty with their ability to identify faces, although other individuals can do so without much thinking. Studies have revealed that children with ASD do not naturally orient and attention to faces in the surroundings, in contrast to children who are generally developing. Children with ASD often ignore the eyes while focusing on a face, making it more probable that they may overlook clues about a person's identity and emotional condition. Additionally, ASD youngsters often break down a face into its component pieces (such as the eyes, nose, and mouth) rather of combining the many elements into a whole recollection of the face. It is not unexpected that children with autism would find it challenging to participate in daily interactions that primarily rely on the perception of facial signals if they lack the foundational abilities necessary for face processing. ASD children's face processing abilities have recently been enhanced by computer-based techniques like the Face Expertise Training and Let's Face It! (LFI!) software. These programs make the assumption that deliberate practice may teach and enhance the perceptual abilities required for face recognition. These programs' outcomes have been shown to be successful in teaching children with ASD how to detect face identification. Additionally, the advancement of cutting-edge technology, including touch screen tablets and virtual reality headsets, holds promise for enhancing the processing of facial expressions in kids with ASD.

In Islam et.al [5], In this study, we offer a deep learning model that can accurately categorize kids as either healthy or maybe autistic with 94.6% of the time. Patients with autism often suffer socially, with repeated actions, and with verbal and nonverbal communication. Even if the condition is thought to be hereditary, testing a child's behavior and facial traits results in the most precise diagnoses. Patients share a set of distinctive facial malformations, making it possible to diagnose a kid's condition only by looking at a photograph of the youngster. While there are different methods and models utilized for both face analysis and autism classification separately, our solution combines these two concepts to enable classification in a more effective and affordable way. In order to accomplish feature extraction and picture classification, our deep learning model combines Mobile Net with two thick layers. 3,014 photos, equally divided between those of autistic children and those of control subjects, are used for training and testing the model. Only 10% is used for actual testing, while the remaining 90% is put to good use in the training process. We suggest that autism can be accurately diagnosed with only a photo based on our accuracy. In addition, other illnesses could be equally detectable.

In Castillo et.al [6], As a result of technological advancements, several automated teaching technologies are currently employed with autistic children. Applied Behavior Analysis (ABA) training is one of the most popular treatments for kids with autism spectrum disorder (ASD). It targets a wide array of skills, from talking and studying to socializing and moving around more effectively. The purpose of this piece is, therefore, to design and develop a gaming app with the express intent of helping autistic children improve their cognitive skills. A puzzle game, an object detection game, and a road crossing game make up the gaming application, which was developed utilizing IoT and ABA techniques. With the help of this program, it is possible to save and track a child's cognitive progress through time (as measured by gaming scores). A light-weight evaluation research was conducted, and the results showed that the suggested game application is suitable, efficient, and helpful for autistic children to enhance their cognitive abilities.

In Shahbodin et.al [7], In order to assist learning and enhance the quality of life for kids with autism spectrum disorder, we put into practice and assess the effectiveness of a novel system based on Internet of Things (IoT) and peer-to-peer (P2P) technology (ASD). Smart technologies like laptops and tablets with touch screens have a strong appeal to and ability to inspire many autistic youngsters. With the use of these assistive technological tools, autistic children are encouraged to engage, make decisions, and communicate with their parents about their

interests, needs, thoughts, and sometimes even feelings. To monitor the kids and establish P2P communication between kids, parents, and therapists, our system employs the JXTA-Overlay platform and the Smart Box gadget. Many different visual systems, such as objects, pictures, realistic drawings, line drawings, and words, may be used with many different kinds of technology, so long as the youngster can readily grasp the visual representation. Our suggested approach may be used to teach students vocabulary, numeracy, and other life skills. Using research sessions with kids who have been diagnosed with ASD, we assessed the impact of our method. According to the trial findings, our program teaches new skills to children with ASD, and the Smart Box improves students' focus while they are learning.

In N.I. of Mental Health et.al [8], Health care is benefiting and relying more and more on apps that connect to the Internet of Things (IoT). A knowledge-based intelligent system is created and enhanced by this study (KBS). It helps with early autism diagnosis in kids. In addition to the systems, it enables these individuals to obtain medical attention as quickly as is practical. Notification of the usage of an Internet of Things service for delivering brief messages to authorities in the field of medicine (SMS). The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) has received approval as a diagnostic resource for mental disorders. In order to send SMS messages to the child's parents that contained a diagnostic of their condition, the Internet of Things (IoT) technology was deployed. The method is also built on a web application that has all the helpful information for parents. It is used to each subsequent diagnosis of a patient. The method was tested on a group of autistic children, and the results supported the physicians' diagnosis.

### III. EMOTION BASED MEDIA PLAYBACK SYSTEM

We are dividing this project into two sectors Convolution Neural Network Algorithm will be used to detect facial emotions, and the Trained Model will be used to identify the emotions. Galvanic Skin Response Sensor uses electrodes which are connected to the subject and, based on the threshold values, we'll store the data in a Cloud Platform so that the parents or caretaker can also analyze the subject's mental space. In Analyzing the Facial Emotions, we can also help them learn things, we believe technology should reach all mediums of users in order to help them out of their problems.

#### A. EXISTING WORK

Children with autism benefit best when

instructors and parents are on the same page and when efforts at home and at school are supportive of one another, just as with any student (Organization for Autism Research). The instructor should first meet with the parents to explore the potential of teaching the class about autism before preparing a session. It's crucial to get feedback from parents and, if necessary, the autistic kid as well.

#### Disadvantages

The main disadvantages of this system are teacher needs to take care of only one child at a time and sometime this system is not effective.

#### B. PROPOSED SYSTEM

Computer vision, a method for identifying and recognizing pictures, includes face recognition in its scope. In numerous domains, including business, manufacturing, healthcare, public security, marketing, and finance, they are now used in a variety of applications to address real-world issues. Social media networks utilize sophisticated algorithms that may conduct a variety of face recognition functions to draw in a larger user base.

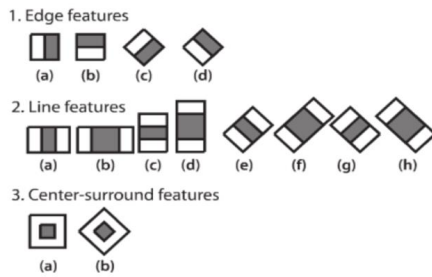
This system's primary goal is to collect a picture in real-time and determine if a human face is there using the Computer Vision approach. Observe the facial expressions using a Deep Neural Network after identifying human faces in a picture. The AT mega Microcontroller and DF mini-Player will be used to play some Interesting Audio to them if the predicted facial expression is one of happiness. This will keep the children relaxed and aid in their learning. Additionally, utilizing the Galvanic Skin Response, we created and constructed a stress detector (GSR).

In order to achieve this goal, we must determine how the skin's conductance changes depending on whether a person is under stress or not utilizing a Galvanic Skin Response (GSR) device.

#### C. PROCESS METHODOLOGY

##### 1) Haar Cascades

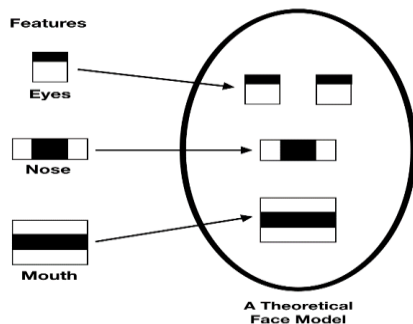
a group of "square-shaped" functions that have been shrunk down that together make up a wavelet family or basis. It uses the Haar Wavelet approach to divide the image's pixels into squares according to their functions. To get a high level of accuracy from what is referred to as "training data," this involves machine learning methods. The "features" that are identified are computed using "integral image" principles. In order to provide an effective classifier output, Haar Cascades use the Ada boost learning method, which chooses a small number of crucial characteristics from a huge collection.



- a) **Face Detection** pinpoints where and how big human faces are in random (digital) photos.
- b) **Face Detection** is used before Face Recognition to identify and isolate a face before it can be identified.

## 2) Feature Extraction

Using machine learning methods, Haar Cascades train a function using a large number of both positive and negative pictures. The algorithm's feature extraction step is this one.



- a. When extracting features from a face, the algorithm analyzes training data to determine which features are the best candidates.
- b. An XML file with the following name serves as the project's training data:
- c. Haar cascade frontal face default.xml.

## D. IMAGE CLASSIFICATION WITH USE OF CONVOLUTIONAL NEURAL NETWORKS (CNN)

deep mastering has been a effective tool over the past numerous decades because of its ability to process big amounts of records sample recognition specifically has visible a decline in the use of conventional approaches a popular sort of deep neural network is the convolutional neural network synthetic intelligence ai has come a protracted way from its origins inside the 1950s while scientists first tried to construct a machine that could apprehend visible

input during the subsequent years this field turned into referred to as pc imaginative and prescient in 2012 computer imaginative and prescient took a giant soar forward when a group of researchers from the college of Toronto developed an artificial intelligence model that considerably beat the satisfactory picture recognition structures a piece of artificial intelligence referred to as Alex net named after its primary author Alex krizhev sky took first region inside the ImageNet pc vision competition in 2012 the second one-vicinity students test result turned into a disheartening 74 the brains at the back of Alex internet had been convolutional neural networks a special form of neural community that correctly simulates human vision in the course of the years convolutional neural networks CNN's have grown into an indispensable part of several computer vision applications making them a fundamental part of any on-line laptop imaginative and prescient route consequently let's examine how CNN's operate.

## E. GROVE – GSR SENSOR

The electrical conductivity of the skin may be measured via a method called galvanic skin response (GSR). Extra perspiration may be produced by the sweat glands in response to emotional arousal, which might h happen if you feel particularly stressed or anxious. By simply placing two electrodes on the tips of two fingers of one hand. Grove's GSR technology enables you to detect such intense emotions. It's an intriguing tool for making projects that deal with emotions, like sleep quality monitors.

## F. ARDUINO IDE

A single-board microcontroller like Arduino allows electronics to be used in interdisciplinary endeavors because it allows for virtually all types of software. In addition to the boot loader, there is also a compiler that runs a famous programming language written by a microcontroller.

## G. NODE MCU

It is an open-source firmware and development kit that helps you to Prototype IOT product within a few Lua script lines.

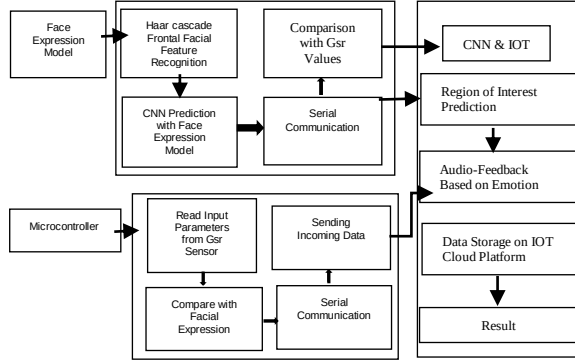
## H. LCD DISPLAY

liquid crystal shows lcds rent materials that blend crystalline and fluid properties these substances lack a melting point and instead have a temperature variety in which the molecules are nearly as cell as they would be in a liquid however are although grouped in a shape just like a crystal the characters to be displayed are written into the show records ram dd ram in the form of 8bit character codes present in the character font table the prolonged capacity of the dd ram is 80 x 8 bits i.e. eighty characters.

## I. DF Player

Mini is a small and low-price MP3 module with a simplified output directly to the speaker. The module can be used as a stand-alone module with attached battery, speaker and push buttons or used in combination with an Arduino UNO or any other with RX/TX capabilities.

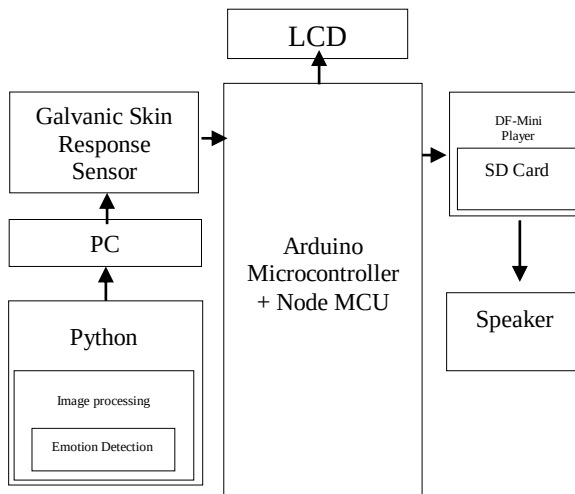
## J. ARCHITECTURE OF THE PROPOSED SYSTEM



## K. TESTING PLAN OF THE PROPOSED MODEL

The major goal of this system is to record a picture in real-time and determine if a human face is there using the Computer Vision approach. After identifying human faces in a picture and analyzing facial expressions using a deep neural network, if the predicted facial emotion is happiness, then we will play some interesting audio to them using a microcontroller and DF Player, keep them relax. Along with that we have designed and built a stress detector using Galvanic Skin Response (GSR).

## L. BLOCKDIAGRAM



## IV. RESULT

When the project is processing software is used to predict the facial expression is happy or sad. The hardware is used to predict the emotion use of galvanic skin response (GSR) Sensor, segregate the emotion use of Node MCU while the both emotions are same it will display LCD display and it will play the Rhyme or motivation speech based on the emotion.

## V. FUTURE WORK

Larger-scale randomized controlled trials are what we want to do in the near future to address the aforementioned limitations. In order to provide children with ASD with a more thorough setting for intervention, the scope of C31 may also be expanded to incorporate other activities, such as reaction to joint attention, triadic play, and imitation.

## VI. CONCLUSION

In conclusion, this research looked at the viability of incorporating traditional therapy modules with assistive technology. This step is important in helping ASD children learn effectively and to help lessen therapist's workload in order for them to be able to focus more on the child themselves. For researchers, this study has offered for additional data and insight into how technologies, even games can be assistive in nature and with therapeutic uses. Simple devices such as these may not always be immediately recognized as assistive technology, but it is able to help therapists by providing an alternative to conventional therapy and data-taking.

## VII. SNAPSHOT

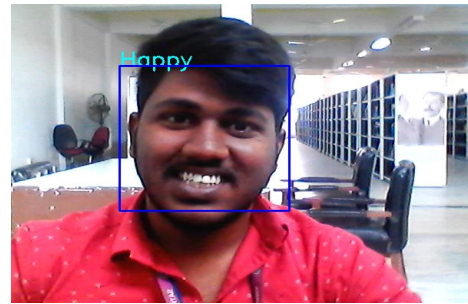
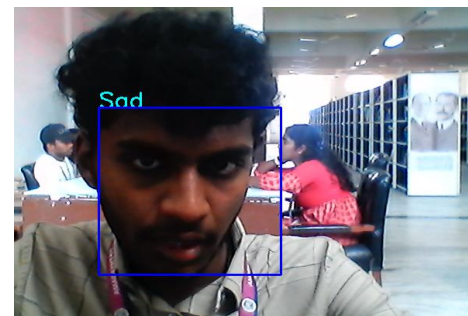


Fig 7.1 HAPPY FACE EXPRESSION

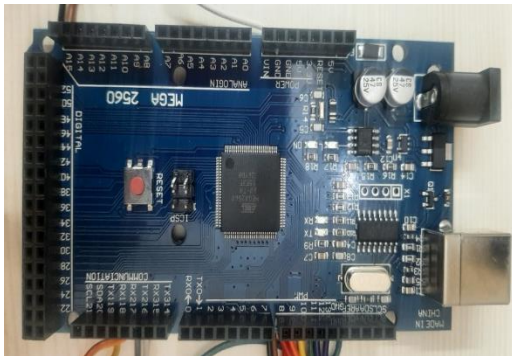


**Fig 7.2 SAD FACE EXPRESSION**



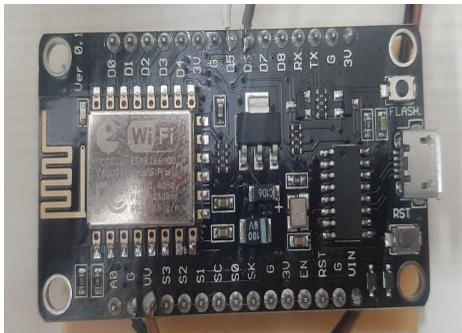
**Fig 7.3 GALVANIC SKIN RESPONSE**

GSR Sensor use to predict the emotions by simply attaching two electrodes to two fingers on one hand, resulting more sweat being secreted by the sweat glands.



**Fig 7.4 ARDUINO**

It will store the output given by the software.



**Fig 7.5 NODE MCU**

Compare the Arduino and GSR Sensor emotions are same or not. If the both are same, result passes to the LCD.



**Fig 7.6 LIQUID CRYSTAL DISPLAYS**

LCD used to display the people's emotion, by the process of Node MCU.



**Fig 7.7 DF Player**

If the both Arduino and GSR sensor predicted data is same after the use DF Player play a rhyme or motivation speech based on the emotion predicted by the node MCU.

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