



# MACHINE LEARNING ANALYSIS FOR DETECTING, ANXIETY AND DEPRESSION IN EARLY CHILDHOOD

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## ABSTRACT:

Whenever we are thinking about any programmable devices then the embedded technology comes into for front. The embedded technology is now a day's very much popular and most of the products were developed with microcontroller or microprocessor based embedded technology. In this paper, we develop face recognition to assists children for independent living in their own homes. It reduces the health expenditures and burden of health care professionals in care facility units. Facial expressions are one of the key features of a human being and it can be used to speculate the emotional state at a particular moment. This paper employs the Convolution Neural Network and Deep Neural Network to develop a facial emotion recognition model that categorize facial expression into some different emotions categorized as Afraid, Angry, Disgusted, Happy, Neutral, Sad and Surprised. This project is mainly developed for children who are not able to take care of by themselves so that we can take care of them based on their facial emotion what actually they needs and also we have some sensor called accelerometer to detect the fall detection of person based on the accelerometer movements.

**Keywords:** Open CV, Emotions, Machine learning, face analysis, Mental health, anxiety, depression

## I. INTRODUCTION

Many embedded systems have substantially different designs according to their functions and utilities. In this project design, structured

modular design methods adopted and the system is mainly composed of a single micro controller. Facial emotions play an important role in communication among humans and help us to understand the intentions of others and how they feel. Humans have a strong tendency to express emotions. They play an essential role in our daily lives. Human spend great amount of time in understanding the emotions of others, decoding what these signals mean and then determine how to respond and deal with them[3]-[4]. Facial Emotion Recognition is getting into our lifestyle and impacting us more rapidly than we have predicted a few years back. Apple released a new feature on iPhone X called Animoji where the user can get a computer simulated emoji to mimic facial expressions. It is now hard for us to ignore the potential capabilities of such features. Facial Emotion Recognition has a wide range of applications[1]. Facial Emotion Recognition(FER) can be helpful in detecting whether the experience of the gamer was enjoyable by analyzing his facial expressions. It can be employed in emotion detection of old age people in old age homes and to monitor the level of stress and anxiety in day to day life[15]. It can help people recognize the expressions of children suffering from autism or speech-impaired people. Moreover, investigation agencies can apply Facial Emotion Recognition (FER) to pre determine their actions before they are carry out interrogation. This paper proposes a new architecture in the convolution neural network frame work and compares it with different

Architecture on parameters like the training accuracy of the network, testing accuracy of the model, training loss, testing or validation loss

etc.[9]. Emergencies, by definition, are unpredictable and rapid response is a key requirement in emergency management. Globally, a significant number of deaths occur each year, caused by excessive delays in rescue activities.

There are high individual and societal bared associated with internalizing disorder[10]. Mood induction tasks have been increasingly used in research contexts to “press” for anxious, furs starting, joyful, or saddening, effect. A child’s behavioral and physiological response to these tasks is recorded using a variety of technologies manually processed and studied in relation to theory driven expectation[11]. That highlight the need for effective early assessments, New tools that can feasibly and objectively screen children for these internalizing disorders during routine pediatriac well-visits would support surrounding adults in understanding the intensity and chronicity of their child’s distresand connect them with interventions early in development, when neuroplasticity and potential for symptom improvement is greatest[12]-[15]



**Description**

R5F100LEA microcontroller from Renessa RL78 series which is a 16-bit microcontroller is used to implement this project. Microcontroller acts as the heart of this project, which controls the whole system. It contains of Flash ROM 64KB, RAM 4KB and Data Flash 4KB, and it has High speed on-chip oscillator, Self-reprogrammable under software control, 58 GPIO’s, 3 UART’s, Simplified I2C, 10 bit resolution ADC, 28 Interrupt Sources, ISP programming support etc.

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The Renessa microcontroller is the heart of the project it is programmed such that it keeps on commanding and controlling the complete action through peripherals connected.

Facial expressions are one of the key features of a human being and it can be used to speculate the emotional state at a particular

**II. OBJECTIVE**

- To study the presents knowledge on the consequences of depression of the development of the children various stages.
- To study the evidence based literature on the treatment of depression and Its impact on newborns, infants and children.
- To monitoring the role of the child’s physician in the detection of symptoms of depression.

**III. BLOCK DIAGRAM**

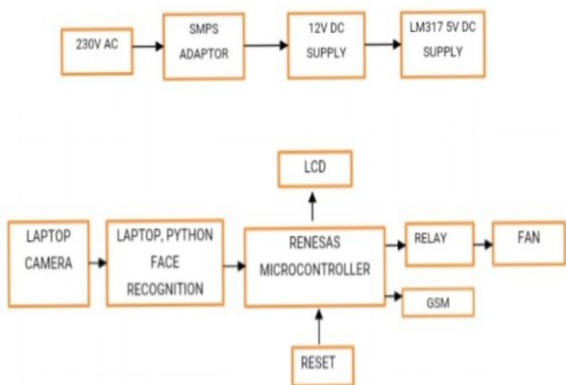


Figure: Block diagram of proposed system

moment. This paper employs the Convolutional Neural Network and Deep Neural Network to develop a facial emotion recognition model that categorize facial expression into some different emotions categorized as Afraid, Angry, Disgusted, Happy, Neutral, Sad and Surprised. This project is mainly developed for children who are not able to take care of by themselves so that we can take care of them based on their facial expression what actually they needs and also Here laptop camera will capture the image of the person and it will also recognize the facial emotion so that we can take care of them what actually they needs and also based on their mood and activates it's going to change like happy or sad .Based on the facial emotions of the person, the fan

**NUMPY**

Numpy is an open source library available in Python that aids in mathematical, scientific, engineering, and data science programming. It works perfectly well for multi-dimensional arrays and matrices multiplication. Numpy is a programming language that deals with multi-dimensional arrays and matrices. On top of the arrays and matrices, Numpy supports a large number of mathematical operations.

**Why use Numpy?**

Numpy is memory efficiency, meaning it can handle the waste amount of data more accessible than any other library. Besides, Numpy is very convenient to work with, especially for matrix multiplication and reshaping. On top of that, Numpy is fast. In fact, Tensor Flow and Scikit learn to use Numpy array to compute the matrix multiplication in the back end.

**Create a NumPy Array**

Simplest way to create an array in Numpy is to use Python List

```
myPythonList = [1,9,8,3]
```

To convert python list to a numpy array by using the object np.array.

```
numpy_array_from_list = np.array(myPythonList)
```

To display the contents of the list

```
numpy_array_from_list
```

Output

```
array([1, 9, 8, 3])
```

In practice, there is no need to declare a Python List. The operation can be combined.

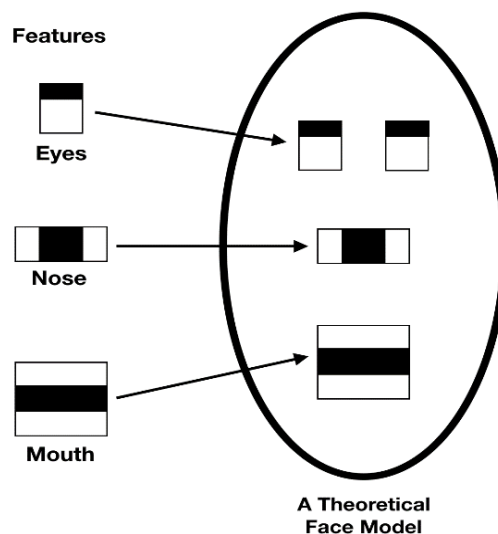
**OPEN CV:**

Object Detection using haar feature-based

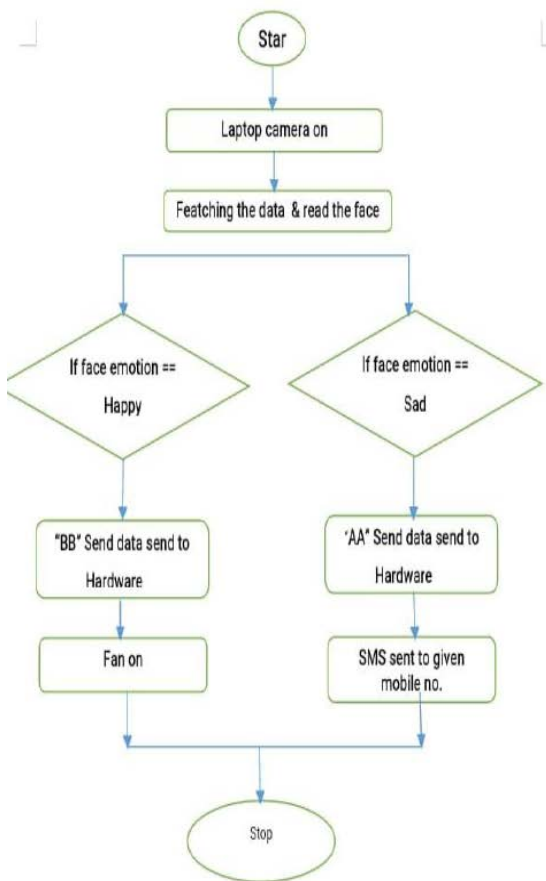
cascade classifiers is an effective object detection method proposed by Paul Viola and Michael Jones in their paper, "Rapid Object Detection using a Boosted Cascade of Simple Features" in 2001. It is a machine learning based approach where a cascade function is trained from a lot of positive and negative images. It is then used to detect objects in other images. But among all these features we calculated, most of them are irrelevant. For example, consider the image below. Top row shows two good features. The first feature selected seems to focus on the property that the region of the eyes is often darker than the region of the nose and cheeks. The second feature selected relies on the property that the eyes are darker than the bridge of the nose. But the same windows applying on cheeks or any other place is irrelevant. So how do we select the best features out of 160000+ features? It is achieved by Adaboost.



Figure: Open CV



**IV. FLOWCHART**



This is the hardware output. A machine learning algorithm was used to analyze children’s face and identify depression or anxiety. In the camera using python scripts to detect the children emotions. All the sensors are connected microcontroller, GSM ,Relay, fan etc.Here LCD is used to display the all the ongoing information. The laptop camera will capture the image of the person and it will also recognize the facial emotion so that we can take care of them , what actually they needs and also based on their mood and activates it’s going to change like happy or sad .Based on the facial emotions of the person, the fan will be ON/OFF. then alert message is send to their parents.

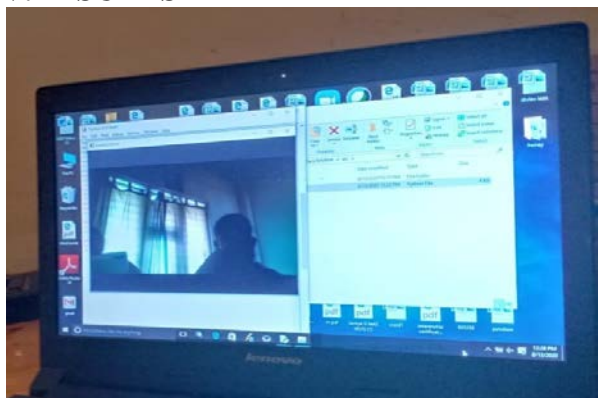
**VI. APPLICATIONS**

- In medical application to detect motion.
- Helpful device for hostel children.
- Usedfor physically challenged children.
- Findthe children’s healthcare.

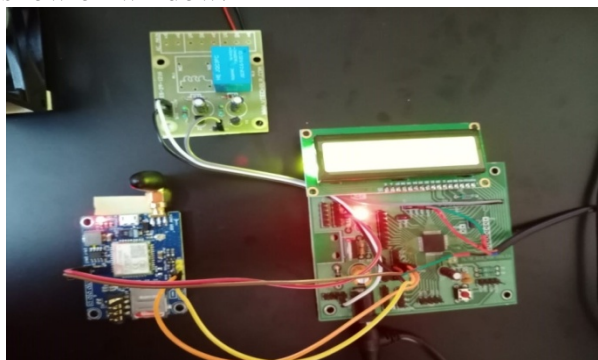
**VII. ADVANTAGES**

- Saves time.
- Efficient and reliable process to monitor changes in environment conditions and ensure security of the old person.

**V.RESULTS**



This is the system output and the laptop camera capture the photo and which expression come show on window.



**VIII. CONCLUSION**

The project is designed using structured modeling and is able to provide the desired results. It can be successfully implemented as a Real Time system with certain modifications. A real-time drowsiness detection system is presented in this work. The system is capable of detecting children activities in the home. The effects of light intensity and the distance of camera placement were studied. The findings conclude that the distance between the two consecutive dips of the light intensity may predict the condition of the eye. The closing eye yielded greater distance value than the threshold value. Meanwhile, the open eye condition yielded shorter distance value than the threshold. Since the system is limited to detect one target at a fixed position, a future work is recommended.

**IX. FUTURE SCOPE**

There is always chance to improve any system as research & development is an endless process. Our system is no exception to this phenomenon. The following developments can be done for this project.

For project demo concern, we have developed a prototype module. In future, this project can be taken to the product level. To make this project as user friendly and durable, we need to make it compact and cost effective. Going further, most of the units can be embedded along with the controller on a single board with change in technology, thereby reducing the size of the system.

## X. REFERENCES

- [1] wort, "Real time face detection and facial expression recognition: Development and applications to human computer interaction," in 2003 Conference on Computer Vision and Pattern Recognition Workshop, IEEE, 2003.
- [2] N.V.Scapel, G.P.Barlier, A. Guzman, B.M.Sommer, N. Damasky, T.Weisse, T. Goossens, H. Pham, B.Amberg, J. D.Stoyles, A.R.Moha, "Emojicon puppeting," in US20180336714A1 United States of America, Patent application publication, 2018.
- [3] K. Kozuka, T. Nakano, S. Yamamoto, T. Ito, and S.Mita, "Driver blink measurement by the motion picture processing and its application to drowsiness detection," in The IEEE 5th International Conference on Intelligent Transportation Systems. IEEE, 2002.
- [4] J. Lu, and S. Z. Li, "Face recognition using then nearest feature line method," in IEEE Transactions on Neural Networks, IEEE, 1999.
- [5] T.V.Barker et al. "Contextual startle responses moderate the relation between behavioral inhibition and anxiety in middle childhood," *Psychophysiology*, 1544-1549, Nov. 2015.
- [6] A.Bittner, H.L.Eggre, A.Eekanli, E.JaneCostello, D.L. Foley, and A.Angold, "what do childhood anxiety disorders predict?," *J.Child Psychol.Psychiatry*, 1174-1183, Dec. 2007.
- [7] T.M.Achenbach and L.Rescorla, ASEBA school-age form and profiles. Burlington, VT:University of Vermont Research center for children, youth, and families, 2001.
- [8] D.L. Davies and D.W.Bouldin, "A Cluster separation Measure," *IEEE Trans. Pattern Anal. Mach. Intel.*, 224-227, Apr. 1979.
- [9] E.J.Topol, S.R. steinhubl, and A.Torkamani, "Digital medical tools and Sensors," *JAMA*, 353-354, Jan. 2015.
- [10] A.Konnopka, F.Leichsenring, E.Leibing, and 4-4 Koning, "cost-of—illness studies and cost-effectiveness analyses in anxiety disorder: A Systematic review," *J.Affect. disorder*, Apr. 2009.
- [11] J.L.Luby, "Preschool Depression: the Importance of Identification of Depression Early in development," *Curr.Dir. Psychol.Sci.*, may. 2010.
- [12] E.W.McGinnis et al., "Wearable sensors detect childhood internalizing disorders during mood induction task," *PLOS ONE*, e0195598, apr. 2018.
- [13] E.McGinnis et al., "movements indicate threat response phases in children at-risk for anxiety," *IEEE J.Biomed Health inform*, 2017.
- [14] D.C.Focules, G.Kochanska, and K.Murray, "Electrodermal acitivity and temperature in preschool children," *Psycho Psysiology*, pp.777-787, Nov. 2000.
- [15] S.D.Calkins, S.E.Dedmon, K.L.Gill, L.E.L. omax, and L.M.Johnson, "Frustration in infancy: Implications for emotion regulation, physiological processes, and temperament," *Infancy*, pp.175-195, 2002.
- [16] B.-H.Lee, and J.G.Lee, "The rapeutic behavior of robot for treating autistic child sing artificial neural network," in *Fuzzy Systems and Data Mining IV: Proceedings of FSDM 2018*, pp. 358 -364, 2018
- [17] R.S.McGinnis et al., "Wearable Sensors and Machine Learning Diagnose Anxiety and Depression in Young Children," in *2018 IEEE International Conference on Biomedical and Health Information (BHI)*, Las Vegas, NV, 2018.
- [18] <https://www.techopedia.com/definition/28254/processor>
- [19] <https://techterms.com/definition/processor>
- [20] <https://www.computer/pricelist/4gb-ram-price-list-in-india.html>
- [21] [https://www.webopedia.com/TERM/H/hard\\_disk.html](https://www.webopedia.com/TERM/H/hard_disk.html)
- [22] <https://whatis.techtarget.com/definition/LCD-liquid-crystal-display>
- [23] <https://techterms.com/definition/lcd>
- [24] <https://www.sunpower-uk.com/glossary/what-is-switch-mode-power-supply/>.
- [25] <https://circuitdigest.com/article/relay-working-types-operation-applications>.
- [26] <https://searchmobilecomputing.techtarget.com/definition/GSM>.
- [27] <https://www.renesas.com/in/en/microcontrollers-microprocessors.html>.