

# HUMAN ACTIVITY RECOGNITION USING DEEP LEARNING

<sup>1</sup>ATHIRA C.S, <sup>2</sup>DONIYA ANTONY

<sup>1</sup>Msc Scholar, <sup>2</sup>Assistant Professor

[<sup>1</sup>athirasivadas17@gmail.com](mailto:athirasivadas17@gmail.com), [<sup>2</sup>doniyaantony96@gmail.com](mailto:doniyaantony96@gmail.com)

<sup>1,2</sup>Department of Computer Science

<sup>1,2</sup>St.Joseph's College (Autonomous), Irinjalakuda, Thrissur, India

## ABSTRACT

The latest improvement of machines showing shrewd traits includes several techniques, together with pc hardware and software program structure improvement. Many special hardware devices, wearable sensors, system gaining knowledge of, and deep gaining knowledge of version implementations are being implemented in human interest popularity (HAR) programs in latest times. However, to broaden excessive accuracy class structures for interest popularity the use of low-price hardware era is of large importance. To gain this goal, the examine makes use of sensor statistics from low-price sensors, a gyroscope and an accelerometer, together with the implementation of an Artificial Neural Network (ANN) primarily based totally on deep gaining knowledge of version for HAR. The implementation makes use of 5 MLP fashions as base-newbies and a neural community as a meta-learner. Evaluation is accomplished on special datasets that include the statistics for diverse human activities, like 'walking', 'sitting', 'lying', 'standing', 'stairup' and 'stairdown', etc. The collected statistics is from the accelerometer and Gyroscope sensors of the user's smartphone.

In the proposed system, we can recognize the current activities of the human being and provide an email alert when the person does the restricted activities. The alert tone is provided only in the real-time implementation of this project. The project also provides reports based on the activity that the person did. The alert will be provided through the email when the restricted activity selected on the registration time.

**KEYWORDS :** Deep Learning, Artificial Neural Network, Human activity recognition.

## 1. INTRODUCTION

Artificial Intelligence (AI) is a vibrantly full-size subject whose technology are utilized in a number of fields starting from professional structures to pc vision. Neural computing is a carefully related vicinity of AI that tries to imitate the human mind. In the ultimate couple of decades, AI has stepped forward extensively closer to the computerization of human reasoning. The try to construct the pc architectures and the manner of

records processing as an imitation of human mind capability outcomes in neural computing structures, or synthetic neural networks (ANNs).

The ANNs are primarily based totally on understanding representations, huge statistics processing, rapid statistics retrieval, and functionality of sample recognition (PR) primarily based totally on experience. ANNs may be for this reason known as emulation fashions of the organic neural gadget wherein synthetic neurons are interconnected as a network. The ANNs are analogous to organic neural networks as those neurons in addition acquire inputs and ship the output to the opposite degree of the network. Thus the ANNs are composed of processing elements (PEs) and a Network. Each PE additionally known as a neuron takes enter statistics, then tactics it to generate a unmarried output. These inputs may be uncooked statistics or output from different PEs. On the opposite hand, the output may be an enter to different PE or the very last output.

The proposed Human Activity Recognition (HAR) process the main contributions of this study are a stack ensemble approach has been proposed for human activity classification using ANNs. The given output of the five base-learners has been used to train the meta-learner in this regard. Six activities are classified using DS-MLP such as walking, sitting, standing, laying, stairup and staidown. The proposed approach is tested with two different datasets that contain data from sensors like gyroscope and accelerometer. The performance is analyzed both with a larger feature vector, as well as, smaller feature set. The system also provide report based on the user activity and provide notifications to the user through email.

## 2. LITERATURE SURVEY

1. The paper “Sensor Based Human Activity Recognition Using stacked Multilayered Perceptron Model” describes the activity recognition using the stacked multilayered model. The modern development of machines showing clever developments involves numerous techniques which consist of computer hardware and software program software shape development. Many one-of-a-type hardware devices, wearable sensors, tool studying, and deep studying model implementations are being carried out in human hobby reputation (HAR) packages in modern times. However, to boom immoderate accuracy elegance systems for hobby reputation using ilow-price hardware era is of huge importance. To attain this cause this have a study uses sensor data from low-price sensors, gyroscope and accelerometer on the aspect of the implementation of an Artificial Neural Network (ANN) based totally definitely deep studying model for HAR. In the implementation of DS-MLP, an ANN model has been used as a meta-learner while five MLP models have been used as base-novices. In this have a study, the ones base-novices and meta-learner have been combined using a stack ensemble technique. The average overall performance evaluations have been finished first on the applicability of individual base-models observed via the software program of DS-MLP, the effects display the immoderate accuracy of 97.3% and 99.4% for heterogeneous datasets used for testing. The average overall performance of the proposed DS-MLP models has been compared to three modern tool studying classifiers and severa modern hobby reputation systems. The comparative give up end result assessment moreover proves that the proposed device performed better than the ones elegance techniques in terms of vital average overall performance metrics together with accuracy, precision, recall, Fscore, Cohen’s Kappa, and Mathew correlation coefficient.
2. “Human Activity Recognition With Smartphones Using Machine Learning Process”, identifying human physical games calls for foreseeing human physical games depending on sensor statistics. Lately, it has grow to be recognised for its severa product programs that usage modern PC equipment. It facts facts on physical games like strolling, mountaineering steps, venturing down, sitting, standing, and resting. Sensor detecting

became done making use of a speedometer and a spinner, and a sensor (pace and whirligig) sensor became these days done making use of a commotion channel. Sensor pace indicators contain weight and frame elements which might be remoted through frame pace and weight making use of a touch Butterworth channel. The strength of gravity is regarded as only a little division. Property barriers had been discovered in computing modifications again and again as soon as more. The goal is to exactly foresee machine-primarily based totally methods to determine human movement. Information research making use of SMLT, extrade location, unmarried route examination, two-layered and multifaceted research, negation, statistics approval, statistics cleaning/planning, and statistics research. Show all entries. Give machine-primarily based totally techniques to exactly foresee the really well worth of the price through contrasting AI calculations with exactly determine the ascent in inventory fees or the situation of the economy. What's more, reflect on consideration on the exhibition of numerous AI calculations from the auto workplace chronicles and have a look at and verify them. Discover the facts gave alongside the disarray framework and the class appraisal document and in a while positioned the facts withinside the essential class, and the results display that the exhibition of the proposed calculation AI calculation may be exactly contrasted with the real, update, and F1 scores.

3. "A Novel Smartphone-Based Human Activity Recognition Using Deep Learning in Health care", in this paper it determines the HAR in health care. Nowadays, maximum smartphones function some of sturdy sensors, along with direction, network, location, and movement sensors. Motion and inertial sensors are in particular famous in human interest recognition (HAR) for detecting human bodily interest which facilitates in lots of studies regions of the Internet of healthcare things (IoHT) which includes numerous patient's illnesses along with Parkinson, obesity, cardiovascular, and diabetes. Deep mastering (DL) strategies had been an increasing number of famous through the years due to their big outcomes. The use of deep mastering strategies to apprehend human bodily interest in wearable and cell sensor conditions has additionally gotten plenty of interest from across the world. In this paper, a deep neural network (DNN) combining bidirectional lengthy short-time period memory (Bi-LSTM) and convolutional neural network (CNN) is proposed. The overall performance of the version has been evaluated on publicly to be had datasets: WISDM and UCI-HAR. The version has finished 97.ninety six and 97.15% accuracy for the WISDM and UCI-HAR, respectively. Moreover, the simulation effects display the effectiveness of the proposed paintings as compared to different brand new methods.

### 3. EXISTING SYSTEM

Human motion reputation is an critical utility area in laptop vision. Its number one goal is to correctly describe human moves and their interactions from a formerly unseen facts series received through sensors. In the preceding try to combine and look into the nation of artwork strategies which include human frame wearable sensor generation and LR,SVM,RF,KNNs to broaden an progressive machine for HAR. The present machine may be utilized in loads of HAR programs like affected person interest tracking in healthcare, non-public interest reputation in health programs, and man or woman interest reputation in

rehabilitation programs, etc. The set of wearable sensors study the real-time facts from the joint actions of the human frame.

This real-time data can be used as input to ANNs based systems for the prediction of the present body position of the person. Specifically, the features related to six daily activities such as standing, sitting, lying, walking, moving upstairs, and moving downstairs have been focused on in this study. The feature set used for ANN classification to detect the current body activity is being collected by the gyroscope, and accelerometer sensors.

#### **4. PROPOSED SYSTEM**

The proposed system entitled as “Human Activity Recognition using Deep Learning” aims to predict the current activities of the human being and provide an email alert when the person does the restricted activities. The alert tone is provided only in the real-time implementation of this project. The project also provides reports based on the activity that the person did. The alert will be provided through the email when the restricted activity selected on the registration time. Train these data from the sensor and predict the activity. we are using the Artificial Neural Networks algorithm. This helps to recognize the activity easily.

##### **ANN**

The Artificial Neural Networks (ANN) are algorithms primarily based totally on mind characteristic and are used to version complex styles and forecast issues. The Artificial Neural Network (ANN) is a deep gaining knowledge of technique that arose from the idea of the human mind Biological Neural Networks. The improvement of ANN become the end result of an try to mirror the workings of the human mind. The workings of ANN are extraordinarily just like the ones of organic neural networks, even though they're now no longer identical. ANN set of rules accepts simplest numeric and based data.

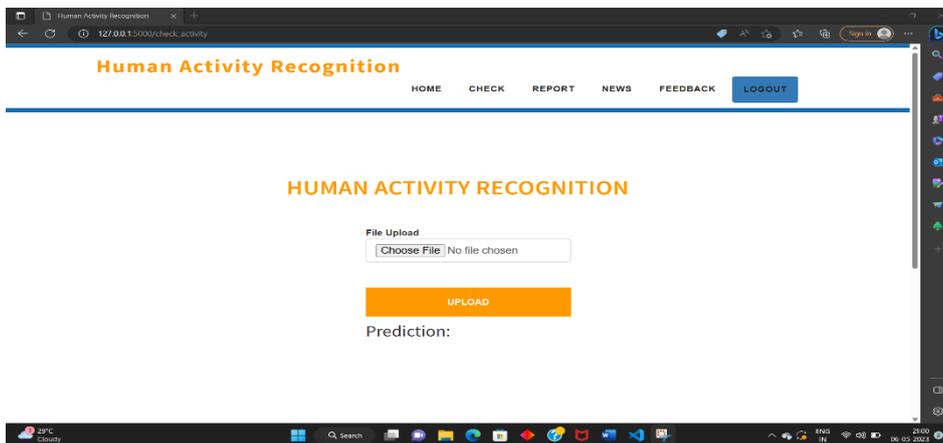
Artificial Neural Networks are a unique sort of gadget getting to know algorithms which can be modelled after the human brain. That is, much like how the neurons in our frightened gadget are capable of examine from the beyond facts, similarly, the ANN is capable of examine from the facts and offer responses withinside the shape of predictions or classifications’ are nonlinear statistical fashions which show a complicated dating among the inputs and outputs to find out a brand new pattern. A kind of obligations together with photograph recognition, speech recognition, gadget translation in addition to clinical analysis uses those synthetic neural networks.

ANNs are used for handwritten man or woman recognition. Neural Networks are knowledgeable to recognize the handwritten characters which can be withinside the form of letters or digits. An Artificial Neural Network withinside the situation of Artificial intelligence wherein it attempts to mimic the network of neurons makes up a human thoughts just so pc structures might also additionally have an desire to apprehend topics and make alternatives in a human-like manner. The artificial neural network is designed thru manner of approach of programming pc structures to behave absolutely like interconnected thoughts cells. There are spherical one thousand billion neurons withinside the human thoughts. Each neuron has an association issue somewhere withinside the kind of 1,000 and 100,000. In the human thoughts, records is stored withinside the type of manner as to be distributed, and we can extract more

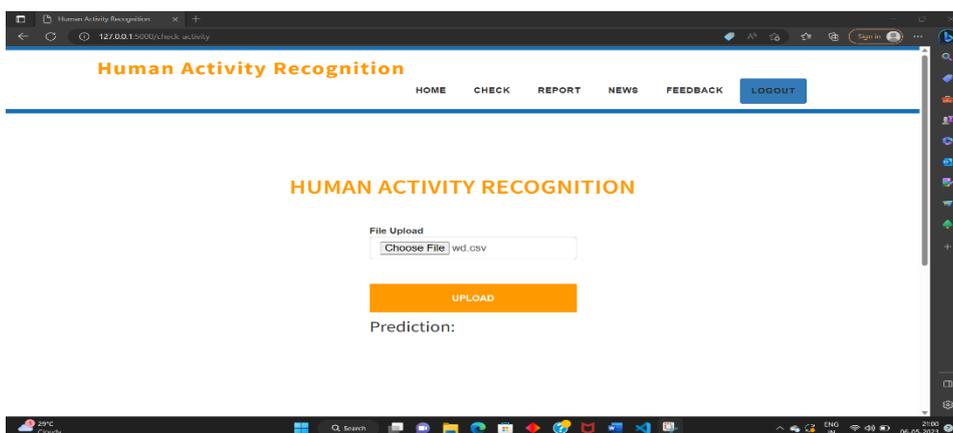
than one piece of this records while vital from our memory parallelly. We can say that the human thoughts is crafted from incredibly first rate parallel processor.

## ADVANTAGES

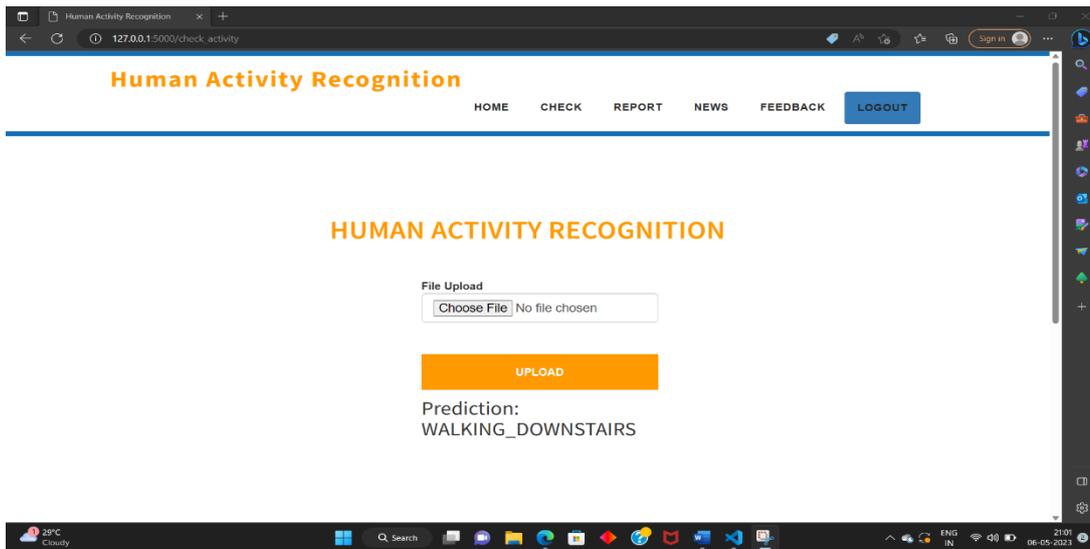
- Fastly recognise the activity and provide email alert.
- Useful and helpful for elderly living alone, old age people etc.
- The system successfully recognise the activity with a good accuracy of approx 94.97%.



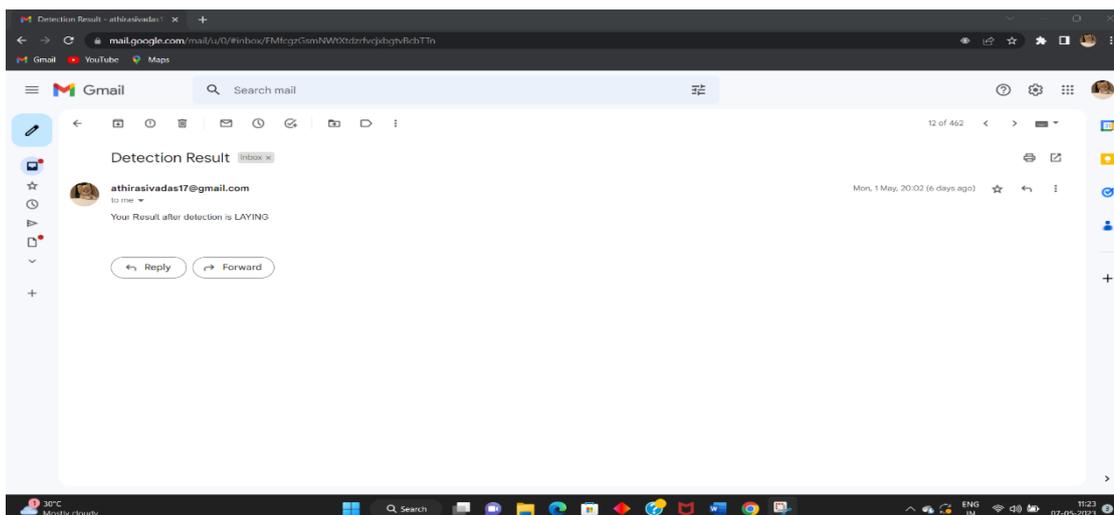
A) Activity checking



B) Upload the CSV file

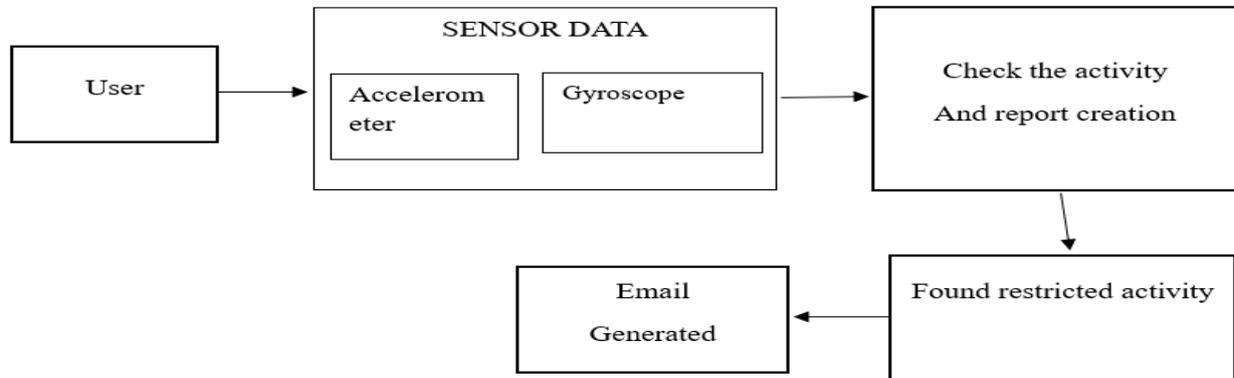


C) Recognise the Activity



D) Email alert for the restricted activity

## BLOCK DIAGRAM:



## 5.CONCLUSION

Human interest reputation, or HAR for short, is a wide subject of observe involved with figuring out the precise motion or movement of someone primarily based totally on sensor data. The goal of growing HAR fashions is to offer facts approximately human movements which allows in studying the conduct of someone in a actual environment. It lets in computer-primarily based totally packages to assist customers in appearing duties and to enhance their way of life along with far off care to the aged residing alone, and posture tracking at some point of exercise. The sensor-primarily based totally technique is make the interest reputation greater easier. We are the usage of the accelerometer and gyroscope sensor data. We are understand the modern sports of the individual and offer an e-mail alert while the individual does the limited sports. We are spotting six sports like on foot, standing, sitting, on foot upstairs, on foot downstairs and laying. These initiatives running with deep getting to know method the usage of the ANN algorithm. The preceding HAR strategies it simplest understand the modern interest however in our device we offer e-mail alert and additionally offer interest primarily based totally reports.

## REFERENCE

- [1] E. Turban and L. E. Frenzel, Expert Systems and Applied Artificial Intelligence. Upper Saddle River, NJ, USA: Prentice-Hall Professional Technical, Reference, 1992.
- [2] J. Wang, Y. Chen, S. Hao, X. Peng, and L. Hu, "Deep learning for sensorbased activity recognition: A survey," Pattern Recognit. Lett., vol. 119, pp. 3–11, Mar. 2019.

- [3] J. K. Aggarwal and L. Xia, "Human activity recognition from 3D data: A review," *Pattern Recognit. Lett.*, vol. 48, pp. 70–80, Oct. 2014.
- [4] C. Jobanputra, J. Bavishi, and N. Doshi, "Human activity recognition: A survey," *Procedia Comput. Sci.*, vol. 155, pp. 698–703, Aug. 2019.
- [5] P. Vepakomma, D. De, S. K. Das, and S. Bhansali, "A-wristocracy: Deep learning on wrist-worn sensing for recognition of user complex activities," in *Proc. IEEE 12th Int. Conf. Wearable Implant. Body Sensor Netw. (BSN)*, Jun. 2015, pp. 1–6.
- [6] J. Qin, L. Liu, Z. Zhang, Y. Wang, and L. Shao, "Compressive sequential learning for action similarity labeling," *IEEE Trans. Image Process.*, vol. 25, no. 2, pp. 756–769, Feb. 2016.
- [7] F. Attal, S. Mohammed, M. Dedabrishvili, F. Chamroukhi, L. Oukhellou, and Y. Amirat, "Physical human activity recognition using wearable sensors," *Sensors*, vol. 15, no. 12, pp. 31314–31338, Dec. 2015.
- [8] R. S. Antunes, L. A. Seewald, V. F. Rodrigues, C. A. D. Costa, L. Gonzaga, Jr., R. R. Righi, A. Maier, B. Eskofier, M. Ollenschläger, F. Naderi, R. Fahrig, S. Bauer, S. Klein, and G. Campanatti, "A survey of sensors in healthcare workflow monitoring," *ACM Comput. Surv.*, vol. 51, no. 2, pp. 1–37, Jun. 2018.
- [9] Y. Wang, S. Cang, and H. Yu, "A survey on wearable sensor modality centred human activity recognition in health care," *Expert Syst. Appl.*, vol. 137, pp. 167–190, Dec. 2019.
- [10] O. D. Lara and M. A. Labrador, "A survey on human activity recognition using wearable sensors," *IEEE Commun. Surveys Tuts.*, vol. 15, no. 3, pp. 1192–1209, 3rd Quart., 2013.
- [11] Y. Liu, L. Nie, L. Liu, and D. S. Rosenblum, "From action to activity: Sensor-based activity recognition," *Neurocomputing*, vol. 181, pp. 108–115, Mar. 2016.
- [12] L. Wang, Y. Qiao, and X. Tang, "Action recognition with trajectory-pooled deep-convolutional descriptors," in *Proc. IEEE Conf. Comput. Vis. Pattern Recognit.*, Jun. 2015, pp. 4305–4314.
- [13] J. Liu, A. Shahroudy, D. Xu, and G. Wang, "Spatio-temporal LSTM with trust gates for 3D human action recognition," in *Computer Vision—ECCV*, B. Leibe, J. Matas, N. Sebe, and M. Welling, Eds. Cham, Switzerland: Springer, 2016, pp. 816–833.
- [14] A. Voulodimos, N. Doulamis, A. Doulamis, and E. Protopapadakis, "Deep learning for computer vision: A brief review," *Comput. Intell. Neurosci.*, vol. 2018, pp. 1–13, Feb. 2018.

- [15] J. Wang, Y. Chen, S. Hao, X. Peng, and L. Hu, “Deep learning for sensorbased activity recognition: A survey,” *Pattern Recognit. Lett.*, vol. 119, pp. 3–11, Mar. 2019.
- [16] W. Sousa Lima, E. Souto, K. El-Khatib, R. Jalali, and J. Gama, “Humanactivity recognition using inertial sensors in a smartphone: An overview,” *Sensors*, vol. 19, no. 14, p. 3213, Jul. 2019.